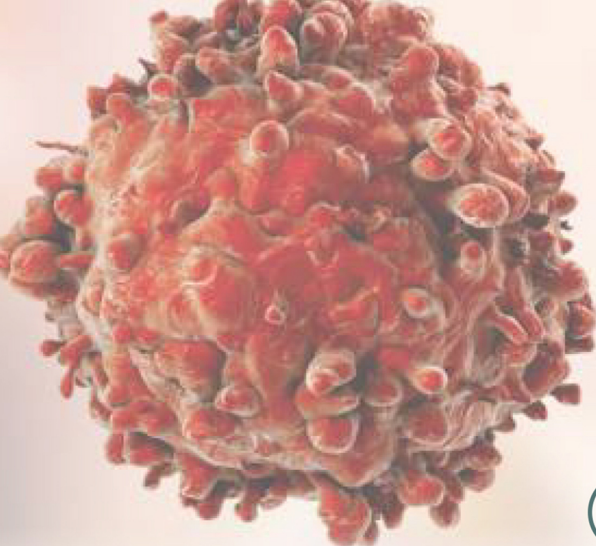




Second Edition

MCQs in
**Microbiology and
Parasitology**
With Explanations



DR Arora



CBSPD *Dedicated to Education*

CBS Publishers & Distributors Pvt Ltd



Second Edition

MCQs in
MICROBIOLOGY
and
PARASITOLOGY
With Explanations

Other Books by D R Arora

- *Textbook of Microbiology with Parasitology*, 7th ed
- *Textbook of Microbiology for Dental Students*, 4th ed
- *Medical Parasitology*, 5th ed
- *Medical Mycology*, 3rd ed
- *Microbiology for Nursing & Allied Sciences*, 2nd ed
- *Practical Microbiology*, 3rd ed
- *Practical Microbiology for Dental Students*
- *Exam-Oriented Microbiology (Questions & Answers)*
- *Essentials of Microbiology for BSc Nursing Students*
- *Microbiology for Medical Laboratory Technology Students*

Second Edition

MCQs in MICROBIOLOGY and PARASITOLOGY With Explanations

D R Arora MD PhD MNAMS

*Ex-Professor and Head, Department of Microbiology,
Postgraduate Institute of Medical Sciences, Rohtak, Haryana (India), and
Maharaja Agarsen Medical College, Agroha, Hisar, Haryana (India)*

*Ex-Professor and Head, Department of Microbiology,
Medical Superintendent, and Dean, Faculty of Allied Health Sciences,
SGT University, Gurugram, Haryana (India)*

*Ex-WHO Fellow; and Visiting Professor, University of Mauritius
Lead Assessor and Member, Accreditation Committee,
National Accreditation Board for Testing and Calibration
Laboratories (NABL), Gurugram, Haryana (India)*

*Principal Assessor, National Accreditation Board for Hospitals and
Healthcare Providers (NABH), New Delhi (India)*

*Assessor, National Accreditation Board for
Education and Training (NABET), New Delhi (India)*



CBS Publishers & Distributors Pvt Ltd

New Delhi • Bengaluru • Chennai • Kochi • Kolkata • Lucknow • Mumbai
Hyderabad • Jharkhand • Nagpur • Patna • Pune • Uttarakhand

Disclaimer

Science and technology are constantly changing fields. New research and experience broaden the scope of information and knowledge. The authors have tried their best in giving information available to them while preparing the material for this book. Although, all efforts have been made to ensure optimum accuracy of the material, yet it is quite possible some errors might have been left uncorrected. The publisher, the printer and the authors will not be held responsible for any inadvertent errors, omissions or inaccuracies.

eISBN: 978-93-546-6870-8

Copyright © Authors and Publisher

Second eBook Edition: 2024

All rights reserved. No part of this eBook may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system without permission, in writing, from the authors and the publisher.

Published by Satish Kumar Jain and produced by Varun Jain for

CBS Publishers & Distributors Pvt. Ltd.

Corporate Office: 204 FIE, Industrial Area, Patparganj, New Delhi-110092

Ph: +91-11-49344934; Fax: +91-11-49344935; Website: www.cbspd.com; www.eduport-global.com;

E-mail: eresources@cbspd.com

Head Office: CBS PLAZA, 4819/XI Prahlad Street, 24 Ansari Road, Daryaganj, New Delhi-110002, India.

Ph: +91-11-23289259, 23266861, 23266867; Fax: 011-23243014; Website: www.cbspd.com;

E-mail: publishing@cbspd.com; eduportglobal@gmail.com.

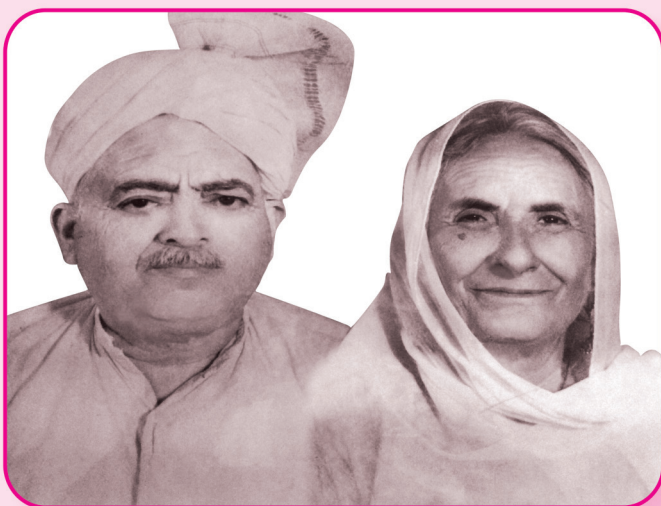
Branches

-
- **Bengaluru:** Seema House 2975, 17th Cross, K.R. Road, Banasankari 2nd Stage, Bengaluru - 560070, Karnataka Ph: +91-80-26771678/79; Fax: +91-80-26771680; E-mail: bangalore@cbspd.com
 - **Chennai:** No.7, Subbaraya Street Shenoy Nagar Chennai - 600030, Tamil Nadu
Ph: +91-44-26680620, 26681266; E-mail: chennai@cbspd.com
 - **Kochi:** 36/14 Kalluvilakam, Lissie Hospital Road, Kochi - 682018, Kerala
Ph: +91-484-4059061-65; Fax: +91-484-4059065; E-mail: kochi@cbspd.com
 - **Mumbai:** 83-C, 1st floor, Dr. E. Moses Road, Worli, Mumbai - 400018, Maharashtra
Ph: +91-22-24902340 - 41; Fax: +91-22-24902342; E-mail: mumbai@cbspd.com
 - **Kolkata:** No. 6/B, Ground Floor, Rameswar Shaw Road, Kolkata - 700014
Ph: +91-33-22891126 - 28; E-mail: kolkata@cbspd.com

Representatives

-
- **Hyderabad**
 - **Pune**
 - **Nagpur**
 - **Manipal**
 - **Vijayawada**
 - **Patna**

*Dedicated to the
Sweet Memories of My Parents*



Preface to the Second Edition

Multiple choice questions (MCQs) in various subjects, are asked in PG entrance examination. If a candidate is thorough in microbiology and parasitology MCQs, then he/she can easily attempt infection-related MCQs in other subjects, e.g. surgery, medicine, paediatrics, community medicine, etc. also. Therefore, it is highly scoring in PG entrance examination. Most of the books available in the market deal with MCQs and their answers only. No explanation of the correct or incorrect choices is given. Therefore, the candidate forgets the correct answer. For understanding and remembering, a candidate must know why a particular choice is correct and other choices are wrong. In this book, explanations of both correct and incorrect choices have been given. In addition, more MCQs with explanations have been added.

This book has been divided into 15 chapters. The subjects covered are bacteriology, virology, mycology and parasitology. In the last chapter, image-based MCQs have been given. Each MCQ carries one photomicrograph or photograph and the candidate is asked to identify the correct choice. Explanations of both correct and incorrect choices are given.

I am deeply indebted for valuable professional help provided by Mr Y N Arjuna (Senior Vice President—Publishing, Editorial and Publicity), and Ms Ritu Chawla (GM—Production). Thanks are also due to Mr Neeraj Kumar Sharma for thorough and meticulous proof-reading and to Mr Sushil Rawat for formatting of this book. This book will be highly useful to postgraduate students and PG entrance examination-appearing candidates. The readers are requested to send their suggestions for improvement of the book at draroradr@rediffmail.com. The suggestions will be incorporated in the subsequent editions.

DR Arora

Preface to the First Edition

The questions asked in the PG entrance examinations are multiple choice questions. A large number of questions in microbiology are asked in the examinations. If a candidate is thorough in microbiology, then he/she can easily attempt many infection-related MCQs in other subjects (e.g. surgery, medicine, paediatrics, community medicine, etc.) also. Therefore, it is a high-scoring subject in PG entrance examinations. Most of the books available in the market deal with MCQs and answers only. No explanation of the correct and incorrect choices is given. Therefore, the candidate forgets the correct answers. This book gives explanation of correct answers and why the other choices are wrong. This helps the candidates to remember the correct answers.

The book has been divided into 15 chapters. The subjects covered are bacteriology, virology, mycology and parasitology. In the last chapter, image-based MCQs are given. Each question carries one photomicrograph or photograph and the candidate is asked to identify the correct choice. Explanation of the correct and incorrect choices is given.

I am thankful for valuable professional help and support provided by Mr BM Singh and other staff at CBS Publishers & Distributors. I honestly acknowledge the most sincere and dedicated support and advice of Mr Dharmvir.

This book will be highly useful to the PG entrance exam-appearing students. The readers are requested to send their suggestions for the improvement of the book at draroradr@rediffmail.com. The suggestions and changes will be incorporated in subsequent editions.

DR Arora

Contents

<i>Preface to the Second Edition</i>	<i>vii</i>
<i>Preface to the First Edition</i>	<i>ix</i>
1. General Bacteriology	1
2. Systemic Bacteriology	60
3. Virology	138
4. Medical Mycology	175
5. Clinical Microbiology	179
6. Bacteriology of Water, Milk & Air, and Biological Warfare	191
7. Quality Assurance of Microbiology	195
8. General Parasitology	196
9. Protozoology	200
10. Helminthology	229
11. Cestodes or Tapeworms	230
12. Trematodes or Flukes	239
13. Nematodes	246
14. Applied Parasitology, Diagnostic Procedures, Medically Important Arthropods and Quality Assurance	258
15. Image-based MCQs	262

General Bacteriology

INTRODUCTION TO MICROBIOLOGY

Q. 1. Which of the following organisms **does not** meet all the criteria of Koch's postulates?

- (a) *Streptococcus pneumoniae*
- (b) *Treponema pallidum*
- (c) *Leptospira interrogans*
- (d) *Mycobacterium scrofulaceum*

Ans. (b) *Treponema pallidum*, the causative agent of syphilis, cannot be grown in culture media, while *Streptococcus pneumoniae*, *Leptospira interrogans* and *Mycobacterium scrofulaceum* can be easily grown in culture media. All these four organisms (a to d) produce disease in suitable laboratory animals.

Q. 2. The construction and use of the compound microscope is attributed to:

- (a) Antonie van Leeuwenhoek
- (b) Louis Pasteur
- (c) Robert Koch
- (d) Ferdinand Cohn

Ans. (a) Antonie van Leeuwenhoek was expert in grinding simple magnifying lenses. He constructed many 'microscopes' each containing a single lens ground by himself.

Q. 3. The techniques of sterilization were introduced by:

- (a) Louis Pasteur
- (b) Robert Koch
- (c) Ferdinand Cohn
- (d) John Needham

Ans. (a) Louis Pasteur invented autoclave, hot air oven and steam sterilizer, basic tools in any microbiology laboratory.

Q. 4. The foundations of immunochemistry were laid down by:

- (a) Edward Jenner
- (b) Alexander Fleming
- (c) Gerhardt Domagk
- (d) Karl Landsteiner

Ans. (d) Karl Landsteiner discovered blood groups and laid down the foundations of immunochemistry.

Q. 5. Salvarsan was discovered by:

- (a) Karl Landsteiner (b) Paul Ehrlich
- (c) Gerhardt Domagk (d) Howard Florey

Ans. (b) Salvarsan, an arsenical compound, sometimes called magic bullet, was discovered by Paul Ehrlich in 1909.

Q. 6. Robert Koch substituted agar in place of gelatin as solidifying agent for culture media at the suggestion of:

- (a) Pfeiffer (b) Kitasato
- (c) Loeffler (d) Anglina Hesse

Ans. (d) At the suggestion of Anglina Hesse, the American wife of his assistant, Robert Koch substituted agar in place of gelatin as solidifying agent for culture media.

Q. 7. Bacillus of tuberculosis was discovered by:

- (a) Hansen (b) Loeffler
- (c) Robert Koch (d) Bruce

Ans. (c) Bacillus of tuberculosis (*Mycobacterium tuberculosis*) was discovered by Robert Koch in 1882.

Q. 8. Following statement is true about which of the following scientists?

He was originally trained as a chemist, but his studies on fermentation led him to take interest in microorganisms. His discoveries revolutionized medical practice, although he never studied medicine.

- (a) Robert Koch
- (b) Louis Pasteur
- (c) Antonie van Leeuwenhoek
- (d) Edward Jenner

Ans. (b) Louis Pasteur was originally trained as a chemist, but his studies on fermentation led him to take interest in microorganisms.

Q. 9. The term microbiology, as the study of living organisms of microscopic size, was coined by:

- (a) Antonie van Leeuwenhoek
- (b) Robert Koch
- (c) Louis Pasteur
- (d) Edward Jenner

Ans. (c) The term microbiology, as the study of living organisms of microscopic size, was coined by Louis Pasteur.

Q. 10. The term vaccine was coined by:

- (a) Edward Jenner
- (b) Kitasato
- (c) Ehrlich
- (d) Louis Pasteur

Ans. (d) Louis Pasteur coined the term vaccine.

Q. 11. Rabies vaccine was developed for the first time in 1885 by:

- (a) Louis Pasteur
- (b) Semple
- (c) Edward Jenner
- (d) Paul Ehrlich

Ans. (a) The crowning achievement of Louis Pasteur was the successful application of principle of vaccination to the prevention of rabies, or hydrophobia, in human beings and developed Pasteur rabies vaccine.

Q. 12. Who discovered *Mycobacterium tuberculosis* and *Vibrio cholerae*?

- (a) Loeffler
- (b) Welch
- (c) Pfeiffer
- (d) Robert Koch

Ans. (d) Robert Koch discovered *Mycobacterium tuberculosis* in 1882 and *Vibrio cholerae* in 1883.

Q. 13. Who introduced the method of vaccination to prevent smallpox?

- (a) Louis Pasteur
- (b) Edward Jenner
- (c) Paul Ehrlich
- (d) John Hunter

Ans. (b) Method of vaccination to prevent smallpox was introduced by Edward Jenner. In 1997, World Health Organization masterminded a final global plan to eradicate smallpox. Success was announced in 1980 with the declaration: Smallpox is dead. Thanks to Jenner.

Q. 14. Which of the following scientists proposed side chain theory of antibody production in 1898?

- (a) Paul Ehrlich
- (b) Elie Metchnikoff
- (c) John Hunter
- (d) Edward Jenner

Ans. (a) Paul Ehrlich proposed side chain theory of antibody production in 1898.

Q. 15. Living organisms including bacteria and protozoa were first observed by:

- (a) Louis Pasteur
- (b) Robert Koch
- (c) Antonie van Leeuwenhoek
- (d) Christian Gram

Ans. (c) Antonie van Leeuwenhoek observed, drew and measured a large number of living organisms including bacteria and protozoa in rainwater, pond as well as well water, and saliva and the intestinal contents of healthy subjects and communicated them to Royal Society of London in 1683.

Q. 16. Who is known as father of antiseptic surgery?

- (a) Alexander Fleming
- (b) Joseph Lister
- (c) Charles Nicolle
- (d) Christian Gram

Ans. (b) Joseph Lister introduced antiseptics in surgery. By spraying carbolic acid on surgical instruments, wounds and dressings, he reduced surgical mortality due to bacterial infections considerably. He established the guiding principle of antiseptics for good surgical practice. For this work, he is known as Father of Antiseptic Surgery.

Q. 17. Attenuated vaccine was first developed by:

- (a) Louis Pasteur
- (b) Robert Koch
- (c) Landsteiner
- (d) Ehrlich

Ans. (a) Louis Pasteur developed live attenuated anthrax vaccine in 1881.

Q. 18. The event that triggered the development and establishment of microbiology as a science is the:

- (a) Vaccinations
- (b) Spontaneous generation
- (c) Use of disinfectants
- (d) Development of the microscope

Ans. (d) The development of microscope in 1683 by Antonie van Leeuwenhoek triggered the development and establishment of microbiology as a science.

Q. 19. Which of the following pioneers of microbiology is credited with the discovery of microorganisms using high-quality magnifying lenses (early microscopes)?

- (a) Robert Koch
- (b) Louis Pasteur
- (c) Antonie van Leeuwenhoek
- (d) Hooke

Ans. (c) Refer to Q. No. 2 above.

Q. 20. Which of the following is not a condition of Koch's postulates?

- (a) Isolate the causative agent of a disease
- (b) Cultivate the microbe in the laboratory
- (c) Inoculate a test animal to observe the disease
- (d) Produce a vaccine

Ans. (d) Production of vaccine is not one of the criteria of Koch's postulates while the criteria at (a), (b) and (c) are three of the four criteria of Koch's postulates. The fourth criterion is—re-isolate the microorganism in pure culture from the lesions produced in the experimental animal.

Q. 21. Which of the following microorganisms meets the criteria of Koch's postulates?

- (a) *Treponema pallidum*
- (b) *Mycobacterium leprae*
- (c) *Neisseria gonorrhoeae*
- (d) *Staphylococcus aureus*

Ans. (d) *Treponema pallidum* and *Mycobacterium leprae*, causative agents of syphilis and leprosy, respectively, cannot be grown in culture media, however, they produce disease in suitable laboratory animals. In case of *Neisseria gonorrhoeae*, which causes gonorrhoea, there is no animal model even though the bacteria can readily be grown in culture media. *Staphylococcus aureus* can be easily grown in culture media and causes disease by inoculation of suitable laboratory animals (mice and rabbits). Hence, the correct answer is (d).

MORPHOLOGY OF BACTERIA

Q. 1. Which of the following bacteria is cell wall-deficient?

- (a) *Mycoplasma*
- (b) *Treponema*
- (c) *Staphylococcus*
- (d) *Klebsiella*

Ans. (a) *Treponema*, *Staphylococcus* and *Klebsiella* possess well-developed cell wall. *Mycoplasma* is cell wall-deficient bacterium.

Q. 2. Chinese letter arrangement is characteristic of:

- (a) *Mycobacterium tuberculosis*
- (b) *Bacillus anthracis*
- (c) *Corynebacterium diphtheriae*
- (d) *Clostridium tetani*

Ans. (c) In *Corynebacterium diphtheriae* there occurs incomplete separation of the daughter cells after binary fission. The bacilli remain attached to each other at various angles, resembling the letters V or L. This is called Chinese letter arrangement and is characteristic of *Corynebacterium diphtheriae*.

Q. 3. Peptidoglycan is major constituent of cell wall of:

- (a) Gram-positive bacteria
- (b) Gram-negative bacteria
- (c) Fungi
- (d) Protozoa

Ans. (a) Peptidoglycan constitutes 50–90% of the dry weight of the cell wall of Gram-positive bacteria, while it constitutes only 5–10% of the dry weight of the cell wall of Gram-negative bacteria. Peptidoglycan is absent in fungi and protozoa.

Q. 4. Lipopolysaccharide is a constituent of cell wall in:

- (a) Gram-positive bacteria
- (b) Gram-negative bacteria
- (c) Fungi
- (d) Protozoa

Ans. (b) Lipopolysaccharide is unique to Gram-negative bacteria. It is firmly bound to the cell surface and is released only when the cells are lysed. It is, therefore, known as endotoxin.

Q. 5. Sterols are present in the cytoplasmic membrane of:

- (a) *Mycoplasma*
- (b) *Bacillus*
- (c) *Clostridium*
- (d) *Proteus*

Ans. (a) With the exception of *Mycoplasma*, bacterial cytoplasmic membrane lacks sterol.

Q. 6. Mesosomes of bacteria are analogous to:

- (a) Mitochondria of eukaryotes
- (b) Lysosomes of eukaryotes
- (c) Golgi apparatus of eukaryotes
- (d) Nucleolus of eukaryotes

Ans. (a) Mesosomes are analogous to mitochondria of eukaryotes and are more prominent in Gram-positive bacteria.

Q. 7. When flagella are distributed all round the bacterial cell, the arrangement is known as:

- (a) Monotrichous
- (b) Lophotrichous

- (c) Amphitrichous
- (d) Peritrichous

Ans. (d) The distribution of bacterial flagella all round the cell is known as peritrichous arrangement. Organisms with monotrichous arrangement have a single polar flagellum. Those with lophotrichous arrangement have a tuft of flagella at one pole, and those with amphitrichous arrangement have single polar flagellum or tuft of flagella at both poles.

Q. 8. Ultraviolet light is used in:

- (a) Fluorescence microscope
- (b) Dark ground microscope
- (c) Phase contrast microscope
- (d) Interference microscope

Ans. (a) Ultraviolet light is used in fluorescence microscope. In dark ground, phase contrast and interference microscopes visible light is used.

Q. 9. *N*-acetylglucosamine and *N*-acetylmuramic acid are found in:

- (a) Cell membrane
- (b) Cell wall
- (c) Outer membrane
- (d) Capsule

Ans. (b) *N*-acetylglucosamine and *N*-acetylmuramic acid are found in peptidoglycan layer of cell wall of bacteria. Peptidoglycan is not found in cell membrane, outer membrane and capsule.

Q. 10. Teichoic acid is present in:

- (a) Gram-negative organisms
- (b) Gram-positive organisms
- (c) *Mycoplasma*
- (d) *Rickettsia*

Ans. (b) Membrane teichoic acid and cell wall teichoic acid are present in the cell wall of Gram-positive organisms and not in the cell wall of Gram-negative organisms, *Mycoplasma* and *Rickettsia*.

Q. 11. Cell wall-deficient forms of Gram-positive bacteria are called:

- (a) Spheroplasts
- (b) Trophozoites
- (c) Cysts
- (d) Protoplasts

Ans. (d) Cell wall of a Gram-positive bacterium is removed when it is treated with lysozyme. Cell wall-deficient forms of Gram-positive bacteria are called protoplasts.

Q. 12. Sedimentation coefficient of bacterial ribosomes is:

- (a) 50S
- (b) 60S
- (c) 70S
- (d) 80S

Ans. (c) Bacteria have 70S ribosomes, whereas mammalian cells have 80S ribosomes.

Q. 13. Bacterial structure/s concerned with respiration is/are:

- (a) Mesosomes
- (b) Ribosomes
- (c) Mitochondria
- (d) Golgi apparatus

Ans. (a) Mesosomes develop by invagination of cytoplasmic membrane into the cytoplasm. They provide increased membrane surface and are principal sites of respiratory enzymes in bacteria.

Q. 14. Which of the following bacteria has peritrichous flagella?

- (a) *Vibrio cholerae*
- (b) *Proteus*
- (c) *Pseudomonas*
- (d) *Shigella*

Ans. (b) *Proteus* has peritrichous flagella. *Vibrio cholerae* has a single polar flagellum, *Pseudomonas* has one or more polar or subpolar flagella. *Shigella* does not possess flagella.

Q. 15. Which of the following bacteria has single polar flagellum?

- (a) *Vibrio*
- (b) *Salmonella*
- (c) *Proteus*
- (d) *Citrobacter*

Ans. (a) *Vibrio* has a single polar flagellum while *Salmonella*, *Proteus* and *Citrobacter* have peritrichous flagella.

Q. 16. Which of the following bacterial structures is/are involved in attachment to cell surface?

- (a) Flagella
- (b) Fimbriae
- (c) Capsule
- (d) Mesosomes

Ans. (b) Fimbriae are the organelles of adhesion (attachment), flagella are organelles of locomotion (motility), capsule protects the bacteria from antibacterial agents and inhibits phagocytosis. For mesosomes refer to Q. No. 13 above.

Q. 17. Which of the following are eukaryotes?

- (a) Fungi
- (b) Bacteria
- (c) Chlamydiae
- (d) Mycoplasmas

Ans. (a) Fungi are eukaryotes, and bacteria, chlamydiae and mycoplasmas are prokaryotes.

Q. 18. Which of the following structures is found in Gram-negative and not in Gram-positive bacteria?

- (a) Capsule
- (b) Cytoplasmic membrane
- (c) Spores
- (d) Outer membrane

Ans. (d) Outer membrane is present in Gram-negative bacteria and not in Gram-positive bacteria. Capsule and cytoplasmic membrane are present in both Gram-positive and Gram-negative bacteria. Spores are formed by some species of Gram-positive bacteria only.

Q. 19. Which of the following structures are found in Gram-positive and not in Gram-negative bacteria?

- (a) Capsule
- (b) Cytoplasmic membrane
- (c) Spores
- (d) Outer membrane

Ans. (c) Spores develop in Gram-positive but not in Gram-negative bacteria. Capsule may be present in both Gram-positive and Gram-negative bacteria. Cytoplasmic membrane and peptidoglycan are present in both Gram-positive and Gram-negative bacteria.

Q. 20. Which of the following is a distinctive component of the cell wall of Gram-negative bacteria?

- (a) Capsule
- (b) Lipopolysaccharide
- (c) Peptidoglycan
- (d) Cytoplasmic membrane

Ans. (b) Lipopolysaccharide is a distinctive component of the cell wall of Gram-negative bacteria. Capsule, peptidoglycan and cytoplasmic membrane occur in both Gram-positive and Gram-negative bacteria.

Q. 21. When determining distances and sizes, the smallest unit of measurement is:

- (a) Centimetre
- (b) Millimetre
- (c) Micrometre
- (d) Nanometre

Ans. (d) Nanometre, a billionth part of a metre (m) or a thousandth part of a micrometre (μm), is the smallest unit of measurement.

Q. 22. What function does a condenser serve in light microscope?

- (a) Focuses the light onto our eyes.
- (b) Focuses the light rays on the sample.
- (c) Increases light intensity.
- (d) Reduces glare.

Ans. (b) Condenser of a light microscope, focuses the light rays on the sample.

Q. 23. Bacterial capsules are generally viewed by:

- (a) Albert staining
- (b) Ziehl-Neelsen staining
- (c) Negative staining
- (d) All of the above

Ans. (c) Bacterial capsules are generally viewed by negative staining. They cannot be stained by Albert stain and Ziehl-Neelsen stain.

Q. 24. Which of the following is likely to contain a structure composed of *N*-acetylglucosamine and *N*-acetyl-muramic acid?

- (a) Protoplasts
- (b) Spheroplasts.
- (c) Mycoplasmas
- (d) *Escherichia coli*

Ans. (d) *N*-acetylglucosamine and *N*-acetylmuramic acid are constituents of peptidoglycan. The latter is present in *Escherichia coli* and not in protoplasts, spheroplasts and mycoplasmas.

Q. 25. Fimbriae present on the outer surface of bacteria are used for:

- (a) Inhibition of phagocytosis
- (b) Bacterial motility
- (c) Adherence to surfaces
- (d) Antibiotic resistance

Ans. (c) Fimbriae are the organelles of adhesion. They are not organelles of bacterial motility and antibiotic resistance, and they do not inhibit phagocytosis.

Q. 26. The diameter of the smallest body that can be resolved and seen clearly with naked eye can be:

- (a) 100 μm
- (b) 200 μm
- (c) 300 μm
- (d) 500 μm

Ans. (b) The diameter of the smallest body that can be resolved and seen clearly is 200 μm .

Q. 27. The best resolution that can be obtained with electron microscope is:

- (a) 0.1–0.2 nm
- (b) 0.3–0.5 nm
- (c) 0.6–0.7 nm
- (d) 0.8–0.9 nm

Ans. (b) In practice, the best resolution that can be obtained with electron microscope is 0.3–0.5 nm.

Q. 28. Which of the following statements is **not** correct about dark-ground microscope?

- (a) This microscope renders visible delicate organisms.
- (b) The resolving power of this microscope is significantly improved.
- (c) With this microscope internal structure of the organisms can be easily studied.
- (d) The organisms appear brightly illuminated against a dark background.

Ans. (c) With dark-ground microscope, light passes around rather than through the organisms, making it difficult to study their internal structure.

GROWTH AND NUTRITION OF BACTERIA

Q. 1. Generation time of *Escherichia coli* is:

- (a) 20 seconds
- (b) 20 minutes
- (c) 14–15 hours
- (d) 12–13 days

Ans. (b) The generation time of *Escherichia coli* is about 20 minutes, in tubercle bacilli it is about 14–15 hours and in lepra bacilli it is about 12–13 days.

Q. 2. The period between inoculation of bacteria in a culture medium and beginning of multiplication is known as:

- (a) Lag phase
- (b) Log phase
- (c) Stationary phase
- (d) Decline phase

Ans. (a) The period between inoculation of bacteria in a culture medium and beginning of multiplication is known as lag phase.

Q. 3. Peptone water and nutrient broth are:

- (a) Basal media
- (b) Enriched media
- (c) Selective media
- (d) Enrichment media

Ans. (a) Peptone water and nutrient broth are basal media.

Q. 4. When a substance is added to a solid medium which inhibits the growth of unwanted bacteria but permits the growth of wanted bacteria, it is known as:

- (a) Selective medium
- (b) Enrichment medium
- (c) Enriched medium
- (d) Differential medium

Ans. (a) All selective media are solid media. These inhibit the growth of unwanted bacteria but permit the growth of wanted bacteria.

Q. 5. When a substance is added to a liquid medium which inhibits the growth of unwanted bacteria and favours the growth of wanted bacteria, it is known as:

- (a) Selective medium
- (b) Enrichment medium
- (c) Enriched medium
- (d) Differential medium

Ans. (b) All enrichment media are liquid media. These inhibit the growth of unwanted bacteria and favour the growth of wanted bacteria.

Q. 6. MacConkey medium is an example of:

- (a) Transport medium
- (b) Differential medium
- (c) Enrichment medium
- (d) Enriched medium

Ans. (b) MacConkey medium is a differential medium because on this medium lactose fermenting organisms form red colonies.

Q. 7. Stuart's transport medium is used for transport of specimen containing:

- (a) *Salmonella*
- (b) *Vibrio cholerae*
- (c) *Neisseria gonorrhoeae*
- (d) *Shigella*

Ans. (c) Stuart's transport medium is used for transport of *Neisseria gonorrhoeae*. Buffered 30% glycerol saline is used for transport of *Salmonella* and *Shigella*. Venkatraman-Ramakrishnan medium is used for transport of *Vibrio cholerae*.

Q. 8. Bacteria whose optimum temperature for growth is 37°C are known as:

- (a) Mesophiles
- (b) Psychrophiles
- (c) Thermophiles
- (d) None of the above

Ans. (a) Bacteria whose optimum temperature for growth is 37°C are known as mesophiles. Bacteria with optimum temperature of 20°C and 55–80°C are known as psychrophiles and thermophiles, respectively.

Q. 9. Which of the following bacteria dies quickly after drying?

- (a) *Mycobacterium tuberculosis*
- (b) *Staphylococcus aureus*
- (c) *Pseudomonas aeruginosa*
- (d) *Treponema pallidum*

Ans. (d) *Treponema pallidum* is a delicate organism. It dies quickly after drying. *Mycobacterium tuberculosis*, *Staphylococcus aureus* and *Pseudomonas aeruginosa* are hardier organisms.

Q. 10. Which of the following bacteria can grow in alkaline pH?

- (a) *Lactobacilli*
- (b) *Vibrio cholerae*
- (c) *Salmonella*
- (d) *Shigella*

Ans. (b)

Q. 11. Which of the following bacteria can grow in acidic pH?

- (a) *Lactobacilli*
- (b) *Vibrio cholerae*
- (c) *Salmonella*
- (d) *Shigella*

Ans. (a) *Vibrio cholerae* can grow at alkaline pH (optimum pH 8.2). *Lactobacilli* grow best at acidic pH (pH 6). Optimum pH for growth of *Salmonella* and *Shigella* is 7.4.

Q. 12. All bacteria that inhabit the human body are:

- (a) Autotrophs
- (b) Heterotrophs
- (c) Phototrophs
- (d) Chemolithotrophs

Ans. (b) All bacteria that inhabit the human body are unable to synthesize their own metabolites. They depend upon preformed organic compounds from the host and are known as heterotrophs. Autotrophs can utilize very simple inorganic compounds. They can obtain energy either photosynthetically (phototrophs) or by oxidation of inorganic compounds (chemolithotrophs).

Q. 13. Which of the following is **not** a differential medium?

- (a) Christensen's medium
- (b) MacConkey medium
- (c) Blood tellurite agar
- (d) Mueller-Hinton agar

Ans. (d) Christensen's medium, MacConkey medium and blood tellurite agar are differential media, whereas Mueller-Hinton agar is not.

Q. 14. Chocolate agar is an example of which of the following?

- (a) Basal media
- (b) Selective media
- (c) Differential media
- (d) Enriched media

Ans. (d) Chocolate agar is an enriched medium, whereas basal media, selective media and differential media are not.

Q. 15. Log or exponential phase of bacterial growth is of limited duration because of:

- (a) Exhaustion of nutrients
- (b) Accumulation of toxic metabolic end-products
- (c) Change in pH
- (d) All of the above

Ans. (d) Log or exponential phase of bacterial growth is of limited duration because of factors (a), (b) and (c). Hence the correct answer is (d).

IDENTIFICATION OF BACTERIA AND TAXONOMY

Q. 1. Which of the following organisms is **not** acid-fast?

- (a) Tubercle bacilli
- (b) Lepra bacilli
- (c) *Nocardia*
- (d) *Corynebacterium diphtheriae*

Ans. (d) Tubercle bacilli, lepra bacilli and *Nocardia* are acid-fast bacteria, whereas *Corynebacterium diphtheriae* is not.

Q. 2. Which of the following organisms is Gram-negative?

- (a) *Clostridium*
- (b) *Bacillus*
- (c) *Actinomyces*
- (d) *Bacteroides*

Ans. (d) *Clostridium*, *Bacillus* and *Actinomyces* are Gram-positive, whereas *Bacteroides* is Gram-negative.

Q. 3. *Nocardia* resists decolourization with:

- (a) 1% sulphuric acid
- (b) 5% sulphuric acid
- (c) 20% sulphuric acid
- (d) 30% sulphuric acid

Ans. (a) *Nocardia* resists decolourization with 1% sulphuric acid. Tubercle bacilli and lepra bacilli resist decolourization with 20% and 5% sulphuric acid, respectively.

Q. 4. Silver impregnation method is used for demonstration of:

- (a) *Treponema pallidum*
- (b) *Vibrios*
- (c) *Shigella*
- (d) *Salmonella*

Ans. (a) The width of *Treponema pallidum* in dried state is 0.13 μm . With light microscope only those organisms which are at least 0.2 μm wide can be seen. Therefore, to be visible it needs to be thickened by silver impregnation method. The width of vibrios, *Shigella* and *Salmonella* is enough to be seen under microscope.

Q. 5. Which test detects the production of sufficient acid by fermentation of glucose so that pH of the medium falls below 4.5?

- (a) Methyl red test
- (b) Voges-Proskauer test
- (c) Indole test
- (d) Citrate utilization test

Ans. (a) Methyl red test detects the production of sufficient acid by fermentation of glucose so that pH of the medium falls and is maintained below 4.5.

Q. 6. Urease test is positive in:

- (a) *Klebsiella pneumoniae*
- (b) *Escherichia coli*
- (c) *Salmonella* serotype Typhi
- (d) *Shigella flexneri*

Ans. (a) *Klebsiella pneumoniae* produces urease enzyme whereas *Escherichia coli* *Salmonella* serotype Typhi and *Shigella flexneri* do not.

Q. 7. Oxidase test is negative in:

- (a) *Neisseria*
- (b) *Pseudomonas*
- (c) *Vibrio*
- (d) *Proteus*

Ans. (d) *Neisseria*, *Pseudomonas* and *Vibrio* produce oxidase, whereas *Proteus* does not.

Q. 8. Catalase production is negative in:

- (a) *Staphylococcus*
- (b) *Streptococcus*
- (c) *Proteus*
- (d) *Salmonella*

Ans. (b) Catalase enzyme is produced by *Staphylococcus* and family Enterobacteriaceae. *Streptococcus* does not produce catalase. *Proteus* and *Salmonella* belong to the family Enterobacteriaceae.

Q. 9. Which of the following tests detects the production of acetoin?

- (a) Methyl red test
- (b) Voges-Proskauer test
- (c) Indole test
- (d) Citrate test

Ans. (b) Acetoin production is detected by Voges-Proskauer test.

Q. 10. Phenylalanine deaminase test is negative in:

- (a) *Proteus*
- (b) *Morganella*
- (c) *Providencia*
- (d) *Escherichia*

Ans. (d) *Proteus*, *Morganella* and *Providencia* produce phenylalanine deaminase enzyme, whereas *Escherichia* does not.

Q. 11. Capsules are generally viewed by:

- (a) Gram staining
- (b) Ziehl-Neelsen staining
- (c) Negative staining
- (d) All of the above

Ans. (c) Capsules are generally viewed by negative staining. These cannot be stained with Gram staining and Ziehl-Neelsen staining.

Q. 12. Which of the following is/are reason(s) to reject a specimen for culture?

- (a) The specimen is preserved in formalin.
- (b) The information on the requisition does not match with the information given on the specimen label.
- (c) A second stool sample is submitted from the same patient on the same day.
- (d) All of the above.

Ans. (d) Specimen preserved in formalin is non-viable. If the information on requisition and specimen label does not match, then the report of another patient may be given. Stool samples are recommended to be submitted on at least three consecutive days and not twice on the same day. Therefore, (d) is the correct answer.

Q. 13. Which of the following stains are used for identification of *Corynebacterium diphtheriae*?

- (a) Ziehl-Neelsen stain
- (b) Albert's stain
- (c) Silver impregnation method
- (d) Negative staining

Ans. (b) *Corynebacterium diphtheriae* can be stained with Albert's stain. Ziehl-Neelsen stain is used for staining tubercle bacilli. Thin bacteria may be rendered visible by light microscope by silver impregnation method which thickens the bacteria. In case of negative staining, encapsulated organisms like cryptococci are mixed with India ink or nigrosin that provides a uniform-coloured background, against which the unstained organisms can be seen. Capsules which do not take simple stains can be seen by negative staining.

STERILIZATION AND DISINFECTION

Q. 1. The process of freeing of an article from living organisms including bacterial and fungal spores and viruses is known as:

- (a) Sterilization
- (b) Disinfection
- (c) Antisepsis
- (d) All of the above

Ans. (a)

Q. 2. Destruction or inhibition of microorganisms in living tissues is known as:

- (a) Sterilization
- (b) Disinfection
- (c) Antisepsis
- (d) None of the above

Ans. (c)

Q. 3. Incineration is an efficient method for:

- (a) Destroying contaminated materials
- (b) Sterilizing points of forceps
- (c) Sterilizing scalpel blades and needles
- (d) Sterilizing all glass syringes

Ans. (a)

Q. 4. Red heat is used for sterilization of:

- (a) Inoculating wires and loops
- (b) All glass syringes
- (c) Soiled dressings
- (d) Glass slides

Ans. (a)

Q. 5. Heating in a hot air oven at 160°C for one hour is used for sterilization of:

- (a) All glass syringes
- (b) Oils and jellies
- (c) Swab sticks
- (d) All of the above

Ans. (d)

Q. 6. In holder method of pasteurization, milk is kept at:

- (a) 63°C for 30 minutes
- (b) 63°C for 60 minutes
- (c) 72°C for 20 seconds
- (d) 72°C for 30 seconds

Ans. (a)

Q. 7. Which of the following organisms can survive on pasteurization by holder method?

- (a) *Mycobacterium*
- (b) *Brucella*
- (c) *Salmonella*
- (d) *Coxiella burnetii*

Ans. (d)

Q. 8. Exposure of material to steam at 100°C for 20 minutes on three consecutive days is known as:

- (a) Tyndallization
- (b) Autoclaving
- (c) Inspissation
- (d) Pasteurization

Ans. (a)

Q. 9. Which of the following articles can be sterilized in an autoclave?

- (a) Dressing material
- (b) Gloves
- (c) Culture media
- (d) All of the above

Ans. (d)

Q. 10. Biological control used in an autoclave is the spores of:

- (a) *Bacillus stearothermophilus*
- (b) *Clostridium perfringens*
- (c) *Bacillus cereus*
- (d) *Clostridium histolyticum*

Ans. (a)

Q. 11. Which of the following organisms is retained in the fluids filtered by Seitz filter?

- (a) *Proteus*
- (b) *Staphylococcus*
- (c) *Clostridium*
- (d) None of the above

Ans. (d) Because of their large size, *Proteus*, *Staphylococcus* and *Clostridium* cannot pass through the Seitz filter. Therefore, the correct answer is (d).

Q. 12. Gamma rays can be used for sterilization of:

- (a) Plastic syringes
- (b) Catheters
- (c) Cannulas
- (d) All of the above

Ans. (d)

Q. 13. Phenol is bactericidal at a concentration of:

- (a) 0.1%
- (b) 0.25%
- (c) 0.5%
- (d) 1%

Ans. (d)

Q. 14. Iodophores are mixture of:

- (a) Iodine and surface active agents
- (b) Iodine and phenols
- (c) Iodine and aldehydes
- (d) Iodine and alcohols

Ans. (a)

Q. 15. Glutaraldehyde is useful for sterilization of:

- (a) Cystoscopes
- (b) Bronchoscopes
- (c) Thermometers
- (d) All of the above

Ans. (d)

Q. 16. Most important surface active disinfectants are:

- (a) Anionic compounds
- (b) Cationic compounds
- (c) Non-ionic compounds
- (d) Amphoteric compounds

Ans. (b)

Q. 17. Which of the following tests is designed to simulate the natural conditions under which the disinfectants are used in hospitals?

- (a) Minimum inhibitory concentration test
- (b) Phenol coefficient test
- (c) Capacity test
- (d) Presumptive coliform count

Ans. (c) In capacity test, the additions of inoculum are made in increments with or without organic matter. This simulates the natural conditions.

Q. 18. The hospital waste is to be collected in different coloured plastic bags. Which of the following bags contains cadmium and is not to be incinerated because it leads to toxic emissions?

- (a) Yellow
- (b) Red
- (c) Blue
- (d) Black

Ans. (b)

Q. 19. Infectious diseases transmitted by consumption of raw milk include all of the following, **except**:

- (a) Q fever
- (b) Brucellosis
- (c) Tuberculosis
- (d) Whooping cough

Ans. (d) The causative agents of Q fever, brucellosis and tuberculosis may be present in raw milk. On the other hand, causative agent of whooping cough, *Bordetella pertussis*, is not present in raw milk. It is acquired by droplet infection. Therefore, the correct answer is (d).

Q. 20. Heat-sensitive materials (rubber and plastic) and bulky materials (mattresses) can be sterilized by using:

- (a) Dry heat
- (b) Autoclaving
- (c) UV radiation
- (d) Ethylene oxide

Ans. (d) Ethylene oxide is useful for sterilization of articles liable to be damaged by heat, e.g. plastic and rubber articles.

Q. 21. Dry heat damages microbes by:

- (a) Destructive oxidation of essential cell constituents
- (b) Denaturing proteins
- (c) Denaturing nucleic acid
- (d) None of the above

Ans. (a)

Q. 22. How is a liquid sterilized without damaging heat-labile proteins in the solution?

- (a) By boiling
- (b) By autoclaving
- (c) By passing the liquid through 0.22 μm filter
- (d) By passing the liquid through 0.5 μm filter

Ans. (c)

Q. 23. Which of the following can destroy prions?

- (a) Exposure to formalin vapour
- (b) Treatment with sodium hydroxide and sodium hypochlorite
- (c) Irradiation
- (d) Boiling

Ans. (b)

Q. 24. Which of the following bacteria is used as control for ethylene oxide sterilization?

- (a) *Bacillus subtilis* subsp. *niger*
- (b) *Bacillus stercorophilus*
- (c) *Bacillus globigii*
- (d) *Bacillus pumilis*

Ans. (c)

Q. 25. Autoclave is ineffective for sterilization of:

- (a) Culture media
- (b) Dressing material
- (c) Gloves
- (d) Powders

Ans. (d) Hot air oven is used for sterilization of sealed materials such as powders, oils and jellies which are impervious to steam. Therefore, the correct answer is (d).

Q. 26. Which of the following disinfectants has little activity against viruses?

- (a) Phenol
- (b) Sodium hypochlorite
- (c) Iodine
- (d) Formaldehyde

Ans. (a)

Q. 27. Formaldehyde is **not active against:**

- (a) Vegetative bacteria
- (b) Bacterial spores
- (c) Viruses
- (d) Prions

Ans. (d)

Q. 28. Glutaraldehyde has high microbicidal activity against:

- (a) Bacteria and their spores
- (b) Mycelial and spore forms of fungi
- (c) Various types of viruses
- (d) All of the above

Ans. (d)

Q. 29. Alcohols are **not active against:**

- (a) Vegetative bacteria
- (b) Fungi
- (c) Lipid-containing viruses
- (d) Spores

Ans. (d)

Q. 30. Alcohols have excellent *in vitro* bactericidal activity against most vegetative Gram-positive and Gram-negative bacteria; however, they are:

- (a) Not fast acting
- (b) Not sporicidal
- (c) Not bactericidal
- (d) None of the above

Ans. (b)

Q. 31. What type of filter does a class II biologic safety cabinet use to filter out infectious agents?

- (a) Millipore filters
- (b) HEPA filters
- (c) Dust filters
- (d) Charcoal filters

Ans. (b) Large volumes of air may be rapidly freed from infection by passage through high efficient particulate air (HEPA) filters.

Q. 32. Which of the following characteristics should be considered when selecting an antimicrobial agent?

- (a) Spectrum of activity
- (b) Rate of action
- (c) Mechanism of action
- (d) All of the above

Ans. (d)

Q. 33. In which of the following situations hand hygiene is indicated?

- (a) Before touching a patient
- (b) Before aseptic procedure
- (c) After body fluid exposure
- (d) All of the above

Ans. (d) Hand hygiene is indicated in situations mentioned in (a), (b) and (c). These help in prevention of transmission of infection. Therefore, correct answer is (d).

Q. 34. What precautions should be taken while using the N95 mask?

- (a) Discard N95 mask when contaminated with blood, respiratory or nasal secretions, etc.
- (b) Consider use of a cleanable faceshield to reduce surface contamination.
- (c) Perform hand hygiene before and after touching or adjusting the N95 mask.
- (d) All of the above.

Ans. (d) Situations mentioned in (a), (b) and (c) help in prevention of transmission of infection. Therefore, correct answer is (d).

CHEMOTHERAPY

Q. 1. Penicillins and cephalosporins interfere with:

- (a) Cell wall synthesis
- (b) Cell membrane function
- (c) DNA function
- (d) Protein synthesis

Ans. (a)

Q. 2. Which of the following penicillins is resistant to β -lactamases?

- (a) Cloxacillin
- (b) Carbenicillin
- (c) Penicillin-G
- (d) Ampicillin

Ans. (a)

Q. 3. Which of the following penicillins is stable in gastric acid and suitable for oral administration?

- (a) Penicillin-G
- (b) Cloxacillin
- (c) Carbenicillin
- (d) Methicillin

Ans. (b)

Q. 4. Resistance to penicillin may be due to:

- (a) Production of β -lactamases by bacteria
- (b) Impermeability of cell envelope
- (c) Alteration or lack of penicillin-binding proteins
- (d) All of the above

Ans. (d)

Q. 5. Which of the following agents is a third generation cephalosporin?

- (a) Cephalixin
- (b) Cephalothin
- (c) Cefotaxime
- (d) Cefoxitin

Ans. (c)

Q. 6. Polymyxin B and amphotericin B interfere with:

- (a) Cell wall synthesis
- (b) Cell membrane function
- (c) DNA function
- (d) Protein synthesis

Ans. (b)

Q. 7. Ciprofloxacin and norfloxacin interfere with:

- (a) Cell wall synthesis
- (b) Cell membrane function
- (c) DNA function
- (d) Protein synthesis

Ans. (c)

Q. 8. Aminoglycosides interfere with:

- (a) Cell wall synthesis
- (b) Cell membrane function
- (c) DNA function
- (d) Protein synthesis

Ans. (d)

Q. 9. Which of the following compounds inhibits bacterial nucleic acid synthesis?

- (a) Ampicillin
- (b) Trimethoprim
- (c) Ciprofloxacin
- (d) Rifampicin

Ans. (b)

Q. 10. Resistance against which of the following drugs may be plasmid-mediated?

- (a) Methicillin
- (b) Rifampicin
- (c) Nalidixic acid
- (d) Ampicillin

Ans. (d)

Q. 11. Resistance against which of the following drugs involves modification of the drug by enzymatic modification or degradation of its active element?

- (a) Penicillins
- (b) Chloramphenicol
- (c) Aminoglycosides
- (d) All of the above

Ans. (d)

Q. 12. Following antibiotics inhibit cell wall synthesis, except:

- (a) Methicillin
- (b) Clindamycin
- (c) Nafcillin
- (d) Oxacillin

Ans. (b) Clindamycin inhibits protein synthesis while methicillin, nafcillin and oxacillin inhibit cell wall synthesis. Therefore, the correct answer is (b).

Q. 13. Infections with β -lactamase-producing *Staphylococcus aureus* can be treated with all of the following antibiotics **except** for which of the following?

- (a) Cephalothin
- (b) Vancomycin
- (c) Ampicillin/sulbactam
- (d) Piperacillin

Ans. (d) Piperacillin is inactivated by β -lactamase produced by *Staphylococcus aureus*. Therefore, infections with β -lactamase-producing *S. aureus* can be treated with cephalothin, vancomycin and ampicillin/sulbactam and not with piperacillin.

Q. 14. Which of the following antibiotics affords a broad-spectrum of antimicrobial coverage against aerobic and anaerobic bacteria, rickettsiae, chlamydiae and mycoplasmas?

- (a) Vancomycin
- (b) Metronidazole
- (c) Tetracycline
- (d) Gentamicin

Ans. (c)

Q. 15. Which of the following antimicrobial agents does not have good activity against Enterobacteriaceae?

- (a) Clindamycin
- (b) Trimethoprim-sulphamethoxazole
- (c) Cefoxitin
- (d) Ciprofloxacin

Ans. (a)

Q. 16. Which of the following antimicrobial agents is not generally clinically useful for *Pseudomonas aeruginosa* infections?

- (a) Ceftazidime
- (b) Piperacillin
- (c) Aminoglycosides
- (d) Trimethoprim-sulphamethoxazole

Ans. (d)

Q. 17. Bacitracin acts on:

- (a) Cell wall
- (b) Cell membrane
- (c) Nucleic acids
- (d) Ribosomes

Ans. (a)

Q. 18. All of the following drugs act on cell membrane, **except**:

- (a) Nystatin
- (b) Griseofulvin
- (c) Amphotericin B
- (d) Polymixin B

Ans. (b)

Q. 19. Bacteria can be killed by antimicrobial agents that:

- (a) Inhibit RNA polymerase
- (b) Inhibit cell wall synthesis
- (c) Inhibit protein synthesis
- (d) All of the above

Ans. (d)

Q. 20. Cephalosporins resemble which antibiotic in their mode of action and their structure?

- (a) Bacitracin
- (b) Penicillin
- (c) Tetracycline
- (d) Polymyxin B

Ans. (b) Penicillin resembles cephalosporins in its mode of action and structure.

Q. 21. An antibiotic that contains β -lactam ring in its structure is:

- (a) Bacitracin
- (b) Penicillin
- (c) Tetracycline
- (d) Polymyxin B

Ans. (b)

Q. 22. Aminoglycoside antibiotics inhibit bacteria by:

- (a) Inhibiting DNA replication
- (b) Disrupting cell membrane
- (c) Interfering cell wall synthesis
- (d) Inhibiting protein synthesis

Ans. (d)

Q. 23. The antibiotics with the widest spectrum of activity are:

- (a) Aminoglycosides
- (b) Cephalosporins
- (c) Polymyxins
- (d) Tetracyclines

Ans. (d)

Q. 24. Synergistic drug combinations are prescribed to treat bacterial infections. The purpose of such treatment is to:

- (a) Use lower doses of antibiotics
- (b) Prevent microorganisms from acquiring drug resistance
- (c) Reduce toxic side effects of the antibiotics
- (d) Reduce treatment time of the disease

Ans. (b)

Q. 25. An antibiotic that has a broad spectrum of activity but may cause aplastic anaemia is:

- (a) Streptomycin
- (b) Cephalosporin
- (c) Bacitracin
- (d) Chloramphenicol

Ans. (d)

Q. 26. Which of the following antibiotics blocks RNA transcription?

- (a) Streptomycin
- (b) Cephalosporin
- (c) Rifampicin
- (d) Bacitracin

Ans. (c)

Q. 27. The target for quinolones is:

- (a) RNA transcription
- (b) DNA transcription
- (c) Protein synthesis
- (d) Cell wall synthesis

Ans. (b)

Q. 28. The drug of choice for treating systemic fungal infection is:

- (a) Amphotericin B
- (b) Griseofulvin
- (c) Flucytosine
- (d) Nystatin

Ans. (a)

Q. 29. Amphotericin B inactivates fungi because it:

- (a) Attacks 30S ribosomes
- (b) Inhibits fungal DNA polymerase
- (c) Inhibits fungal cell wall synthesis
- (d) Binds to sterols in fungal cell membrane

Ans. (d)

Q. 30. An antiviral compound that prevents influenza virus from penetrating cells is:

- (a) Acyclovir
- (b) Amantadine
- (c) Ribavirin
- (d) Vidarabine

Ans. (b)

Q. 31. β -lactam antibiotics are inactive against:

- (a) *Mycoplasma*
- (b) Fungi
- (c) Protozoa
- (d) All of the above

Ans. (d) β -Lactam antibiotics inhibit bacterial cell wall synthesis. *Mycoplasma* is cell wall-deficient organism. Fungi and protozoa have cell walls different from that of bacteria. Therefore, β -lactam antibiotics are inactive against *Mycoplasma*, fungi and protozoa. Therefore, the correct answer is (d).

Q. 32. Which characteristic/s describe/s the origin of antibiotics?

- (a) They are natural molecules
- (b) They are synthetic molecules
- (c) They are semisynthetic molecules
- (d) All of the above

Ans. (d) Antibiotic is a substance produced by a microorganism or a similar substance produced wholly or partially by chemical synthesis. Therefore, the correct answer is (d).

Q. 33. Microorganisms can exhibit antibiotic resistance due to which of the following?

- (a) Intrinsic
- (b) Acquired
- (c) Both
- (d) Neither

Ans. (c) A microorganism may be intrinsically resistant to an antibiotic or may subsequently acquire antibiotic resistance. Therefore, the correct answer is (c).

BACTERIAL GENETICS

Q. 1. Which of the following is nonsense codon?

- (a) UAA
- (b) GGC
- (c) AAG
- (d) CGA

Ans. (a) Codon UAA, does not code for any amino acid and is known as nonsense codon. Therefore, the correct answer is (a).

Q. 2. Plasmids which **do not** possess information for self transfer to another cell are known as:

- (a) Conjugative plasmids
- (b) Cryptic plasmids
- (c) Non-conjugative plasmids
- (d) F plasmids

Ans. (c)

Q. 3. Which of the following properties may be plasmid-mediated?

- (a) Resistance to antibiotics
- (b) Production of enterotoxin
- (c) Fermentation of lactose
- (d) All of the above

Ans. (d)

Q. 4. Lactose fermentation requires which of the following enzymes?

- (a) β -Galactosidase
- (b) Galactoside permease
- (c) Transacetylase
- (d) All of the above

Ans. (d)

Q. 5. Genotypic variations are:

- (a) Stable
- (b) Not heritable
- (c) Temporary
- (d) Influenced by the environment

Ans. (a) Genotypic variations are stable, heritable and are not influenced by the environment. These are not temporary. Therefore, the correct answer is (a).

Q. 6. When mutations involve vital functions so that the mutants are nonviable, it is a:

- (a) Missense mutation
- (b) Nonsense mutation
- (c) Transversion
- (d) Lethal mutation

Ans. (d)

Q. 7. Acquisition of naked DNA by a bacterium from its environment and incorporation in its genome is known as:

- (a) Transformation
- (b) Transduction
- (c) Lysogenic conversion
- (d) Conjugation

Ans. (a)

Q. 8. Fertility factor possessing chromosomal genes is known as:

- (a) F factor
- (b) F' (F prime) factor
- (c) Hfr
- (d) R factor

Ans. (b) F plasmid may get integrated into the cell's chromosome. Such cells are known as Hfr cells. F plasmid may revert from Hfr state to free state. Sometimes, it may carry with it chromosomal genes from near the site of its attachment leaving a part of its own DNA. Such F factor possessing chromosomal genes is known as F' (F prime) factor.

Q. 9. Plasmids which possess both resistance transfer factor (RTF) and resistance (*r*) determinants are known as:

- (a) Conjugative plasmids
- (b) Non-conjugative plasmids
- (c) Nonself-transmissible plasmids
- (d) F plasmids

Ans. (a)

Q. 10. Drug resistance in tuberculosis is due to:

- (a) Mutation
- (b) Conjugation
- (c) Transduction
- (d) Transformation

Ans. (a)

Q. 11. Acquisition of penicillin resistance in staphylococci is due to:

- (a) Mutation
- (b) Conjugation
- (c) Transduction
- (d) Transformation

Ans. (c)

Q. 12. A segment of DNA with one or more genes in the centre and the two ends carrying inverted repeat sequences of nucleotides is known as:

- (a) Insertion sequence
- (b) Transposon
- (c) Plasmid
- (d) None of the above

Ans. (b)

Q. 13. Diagnostic DNA probes have been developed for:

- (a) Hepatitis B virus
- (b) Human immunodeficiency virus
- (c) *Mycobacterium tuberculosis*
- (d) All of the above

Ans. (d)

Q. 14. Polymerase chain reaction is used for the diagnosis of infection/s due to:

- (a) HIV-1 and HIV-2 viruses
- (b) Hepatitis B virus
- (c) *Mycoplasma pneumoniae*
- (d) All of the above

Ans. (d)

Q. 15. Transfer of genetic information from DNA to RNA is called:

- (a) Transduction
- (b) Transcription
- (c) Transformation
- (d) Recombination

Ans. (b)

Q. 16. Transmission of a piece of DNA from one bacterium to another by a bacteriophage is known as:

- (a) Transduction
- (b) Transformation
- (c) Conjugation
- (d) Translation

Ans. (a)

Q. 17. Which of the following processes is **not** involved in transfer of genetic material between bacteria?

- (a) Transformation
- (b) Transduction
- (c) Conjugation
- (d) Mutation

Ans. (d) Mutation is not due to transfer of DNA. It is due to addition, deletion or substitution of one or more bases of DNA.

Q. 18. Which of the following are referred to as 'jumping genes'?

- (a) Plasmids
- (b) Transposons
- (c) Bacteriophages
- (d) Operons

Ans. (b) Because of the ability of transposable elements to move from one plasmid to another or to a phage or to a bacterial chromosome, they (transposons) have assumed the popular name of 'jumping genes'.

Q. 19. What type of RNA is involved in protein synthesis?

- (a) Messenger RNA
- (b) Ribosomal RNA
- (c) Transfer RNA
- (d) All of the above

Ans. (d)

Q. 20. The process used in the laboratory to produce millions of copies of DNA is:

- (a) *In situ* polymerization
- (b) Polymerase chain reaction
- (c) Reverse transcription
- (d) Fluctuation test

Ans. (b)

Q. 21. Transfer of genetic material through direct contact between donor and recipient bacteria is called:

- (a) Transformation
- (b) Conjugation
- (c) Transduction
- (d) Sexduction

Ans. (b)

Q. 22. When a temperate phage incorporates its DNA into the host cell's genome, it is called a:

- (a) Lysophage
- (b) Lytic phage
- (c) Prophage
- (d) Coliphage

Ans. (c)

Q. 23. The first vaccine for human use produced using DNA technology was:

- (a) Polio vaccine
- (b) MMR vaccine
- (c) AIDS vaccine
- (d) Hepatitis B vaccine

Ans. (d)

Q. 24. Who is the father of genetics?

- (a) Gregor Mendel
- (b) Griffith
- (c) Hargobind Khurana
- (d) Jacob

Ans. (a)

Q. 25. The helical structure of DNA was discovered by:

- (a) James Watson and Francis Crick
- (b) Oswald Avery and Colin McLeod
- (c) Paul Ehrlich
- (d) Edward Tatum

Ans. (a)

BACTERIA IN HEALTH AND DISEASE

Q. 1. Tetanus is transmitted by:

- (a) Inoculation
- (b) Inhalation
- (c) Ingestion
- (d) Insect bite

Ans. (a) Spores of *Clostridium tetani* are present in the soil. These get inoculated into the host tissues following severe wounds leading to tetanus.

Q. 2. Exotoxins do not have which of the following characteristics?

- (a) They are produced extracellularly.
- (b) They are produced by both Gram-positive and Gram-negative bacteria.
- (c) Cannot be converted into toxoids.
- (d) They are heat-labile.

Ans. (c) Exotoxins are produced extracellularly by both Gram-positive and Gram-negative bacteria and are heat-labile. These can be converted into toxoids by treatment with formaldehyde. Toxoids lack toxicity but retain antigenicity inducing protective immunity when used as vaccines. Therefore, the correct answer is (c).

Q. 3. Which of the following bacteria is not invasive?

- (a) *Streptococcus pyogenes*
- (b) *Salmonella* serotype Typhi
- (c) *Vibrio cholerae*
- (d) *Neisseria meningitidis*

Ans. (c) *Vibrio cholerae* enters orally by the ingestion of faecally contaminated food or drink. They multiply in the small intestine and produce cholera enterotoxin which causes diarrhoea. They do not invade intestine. *Streptococcus pyogenes*, *Salmonella* serotype Typhi and *Neisseria meningitidis* are invasive.

Q. 4. Which of the following infections is acquired from animals?

- (a) Plague
- (b) Diphtheria
- (c) Meningococcal meningitis
- (d) Poliomyelitis

Ans. (a) Plague is a zoonosis. Rat flea transmits plague bacilli from diseased rat to man. Diphtheria and meningococcal meningitis are transmitted from person-to-person by droplet infection. Poliomyelitis is a water-borne infection.

Q. 5. Which of the following is not a congenital infection?

- (a) Toxoplasmosis
- (b) AIDS
- (c) Poliomyelitis
- (d) Cytomegalovirus infection

Ans. (c) Poliomyelitis is acquired by ingestion of faecally-contaminated food or drink. Toxoplasmosis, AIDS and cytomegalovirus infection may be acquired congenitally.

Q. 6. Japanese encephalitis is transmitted by:

- (a) *Anopheles* (b) *Culex*
- (c) *Aedes* (d) *Mansonia*

Ans. (b)

Q. 7. Which of the following bacteria is **not** capsulated?

- (a) *Haemophilus influenzae*
- (b) *Streptococcus pneumoniae*
- (c) *Neisseria meningitidis*
- (d) *Corynebacterium diphtheriae*

Ans. (d)

Q. 8. Which of the following bacteria **does not** produce enterotoxin?

- (a) *Vibrio cholerae*
- (b) *Escherichia coli*
- (c) *Bacillus cereus*
- (d) *Bacillus anthracis*

Ans. (d)

Q. 9. Which of the following infections is **not** spread by the respiratory route?

- (a) Common cold (b) Measles
- (c) Mumps (d) Hepatitis B

Ans. (d) Hepatitis B is acquired by parenteral, sexual and perinatal routes, and not by respiratory route. Common cold, measles and mumps are spread by the respiratory route.

Q. 10. A carrier who acquires the organisms from another carrier is known as:

- (a) A contact carrier
- (b) A paradoxical carrier
- (c) A convalescent carrier
- (d) A chronic carrier

Ans. (b)

Q. 11. Which of the following fungi forms part of the normal flora, but may cause disease also?

- (a) *Histoplasma* (b) *Blastomyces*
- (c) *Candida* (d) *Aspergillus*

Ans. (c) *Candida* is a human commensal. It resides primarily in gastrointestinal tract. It may cause endogenous infection.

Q. 12. Large number of bacteria forming normal flora are found:

- (a) In the mouth
- (b) On the skin
- (c) In the large intestine
- (d) In the nose

Ans. (c)

Q. 13. Majority of microorganisms on the surface of human skin are:

- (a) Gram-positive bacteria
- (b) Gram-negative bacteria
- (c) Endospore-forming bacteria
- (d) Coliform bacteria

Ans. (a)

Q. 14. Which of the following pathogens is/are transmitted by rat flea?

- (a) *Yersinia pestis*
- (b) *Rickettsia typhi*
- (c) *Hymenolepsis diminuta*
- (d) All of the above

Ans. (d)

Q. 15. Infectious agents can enter the body through which of the following routes?

- (a) Inhalation
- (b) Ingestion
- (c) Inoculation
- (d) All of the above

Ans. (d)

IMMUNITY

Q. 1. To which of the following diseases immunity is **not** long-lasting?

- (a) Diphtheria
- (b) Influenza
- (c) Whooping cough
- (d) Mumps

Ans. (b) In case of influenza, short-lived immunity is due to the ability of influenza virus to undergo antigenic variation, so that immunity following first infection is not effective against second infection due to an antigenically different virus.

Q. 2. Passive immunization is indicated in:

- (a) Tuberculosis
- (b) Enteric fever
- (c) Diphtheria
- (d) Rubella

Ans. (c)

Q. 3. Which of the following vaccines is live?

- (a) Salk
- (b) Sabin
- (c) TAB
- (d) Human diploid cell rabies vaccine

Ans. (b)

Q. 4. Which class of immunoglobulins can cross the placenta?

- (a) IgG
- (b) IgM
- (c) IgD
- (d) IgA

Ans. (a) IgG is the only class of immunoglobulins that can cross the placenta and is responsible for the protection of the infant during first few months of life. IgM, IgD, IgA and IgE cannot cross the placenta.

Q. 5. Lysozyme is present in:

- (a) Tears
- (b) CSF
- (c) Sweat
- (d) Urine

Ans. (a)

Q. 6. Large parasites such as helminths may be killed extracellularly by the action of:

- (a) Neutrophils
- (b) Eosinophils
- (c) Basophils
- (d) Monocytes

Ans. (b) Eosinophils are not efficient phagocytic cells. However, their granules possess molecules that are toxic to parasites. Large parasites such as helminths cannot be internalized. Therefore, they must be killed extracellularly.

Q. 7. Which of the following cells are implicated in immunity against cancers?

- (a) Natural killer cells
- (b) Neutrophils
- (c) Eosinophils
- (d) Platelets

Ans. (a) Natural killer cells are large lymphocytes containing azurophilic granules in the cytoplasm. They are implicated in immunity against cancers.

Q. 8. Clinical infection leads to:

- (a) Active natural immunity
- (b) Active artificial immunity
- (c) Passive natural immunity
- (d) Passive artificial immunity

Ans. (a)

Q. 9. Concomitant immunity is seen in:

- (a) Tuberculosis
- (b) Whooping cough
- (c) Enteric fever
- (d) Malaria

Ans. (d) In some infections like malaria and syphilis immunity lasts only till original infection remains active. This is known as concomitant immunity (previously called premunition or infection-immunity).

Q. 10. Which of the following characteristics is **not** associated with live vaccines?

- (a) Single dose is immunogenic
- (b) Dose is less
- (c) Strict conditions of storage are essential
- (d) Only humoral response is elicited

Ans. (d) Live vaccines elicit both cellular and humoral responses. Therefore, the correct answer is (d).

Q. 11. Phagocytes are potent non-specific host defences. Which of the following are the major phagocytic cells in the body?

- (a) B lymphocytes
- (b) T lymphocytes
- (c) Neutrophils
- (d) Basophils

Ans. (c)

Q. 12. Inflammation is influenced by histamine, which is released by:

- (a) Basophils
- (b) Eosinophils
- (c) Erythrocytes
- (d) Platelets

Ans. (a)

Q. 13. Which of the following microorganisms resist intracellular digestion and may actively multiply inside the phagocyte?

- (a) *Corynebacterium diphtheriae*
- (b) *Mycobacterium tuberculosis*
- (c) *Clostridium tetani*
- (d) *Staphylococcus aureus*

Ans. (b) Some microorganisms such as mycobacteria and brucellae resist intracellular digestion and may actively multiply inside the phagocyte. Therefore, the correct answer is (b).

Q. 14. The cells responsible for killing intracellular viruses are:

- (a) Natural killer cells
- (b) Eosinophils
- (c) Basophils
- (d) Platelets

Ans. (a) Residing in the peripheral lymphoid organs, natural killer cells recognize virus-infected cells, bind to them and subsequently lyse them.

Q. 15. Naturally acquired active immunity would be most likely acquired through which of the following processes?

- (a) Vaccination
- (b) Drinking colostrum
- (c) Injection of antiserum
- (d) Infection with disease-causing organism followed by recovery.

Ans. (d) Naturally acquired active immunity results from infection with disease-causing organism followed by recovery. It is the longest-lasting immunity to an infectious agent. Immunity acquired following vaccination is artificial active immunity and is of lower order than that acquired following subclinical or clinical infection. Immunity following drinking colostrum and administration of antiserum is natural passive immunity and artificial passive immunity, respectively.

Q. 16. Which of the following leads to longest-lasting immunity to an infectious agent?

- (a) Naturally acquired passive immunity
- (b) Artificially acquired passive immunity
- (c) Naturally acquired active immunity
- (d) None of the above

Ans. (c) Refer to Q. No. 15 above.

Q. 17. Immunity due to genetic and constitutional make-up of an individual is known as:

- (a) Innate immunity
- (b) Acquired immunity
- (c) Passive immunity
- (d) Active immunity

Ans. (a) In case of innate immunity, prior contact with microorganisms or their products is not essential.

ANTIGENS

Q. 1. The chemical nature of an antigen may be:

- (a) Protein
- (b) Polysaccharide
- (c) Lipid
- (d) All of the above

Ans. (d)

Q. 2. The example of a serological test based on heterophile antigens is:

- (a) Paul-Bunnell test
- (b) Widal test
- (c) VDRL test
- (d) Antistreptolysin O test

Ans. (a) In patients with infectious mononucleosis heterophile antibodies appear in the serum of the patient. These antibodies agglutinate sheep erythrocytes. This test is known as Paul-Bunnell test.

Q. 3. The determinants of antigenicity is/are:

- (a) Size of the antigen
- (b) Foreignness
- (c) Chemical nature
- (d) All of the above

Ans. (d)

Q. 4. Isoantigens are:

- (a) Antigens found in all members of a species
- (b) Antigens found in some members of a species
- (c) Antigens found in all members of different species
- (d) Antigens found in some members of different species

Ans. (b) Isoantigens are found in some but not all members of a species. On the basis of isoantigens, a species may be divided into different groups. The best example of isoantigens is human blood group antigens on the basis of which all humans can be divided into different groups—A, B, AB and O. Each of these groups may be further divided into Rh-positive or Rh-negative.

Q. 5. An antigen that occurs in various tissues of different species is referred to as:

- (a) Heterophile antigen
- (b) Isoantigen
- (c) Autoantigen
- (d) Hapten

Ans. (a) Same or closely-related antigens occurring in different biological species, classes and kingdoms are known as heterogenic or heterophile antigens.

ANTIBODIES

Q. 1. The function/s of Fc fragment of IgG is/are:

- (a) It binds complement.
- (b) It is related to passage of IgG across the placental barrier.
- (c) It determines catabolic rate.
- (d) All of the above.

Ans. (d)

Q. 2. Phylogenetically, the oldest immunoglobulin class is:

- (a) IgA
- (b) IgM
- (c) IgG
- (d) IgE

Ans. (b) Phylogenetically, IgM is the oldest immunoglobulin class. It is usually the first antibody to appear following stimulation by an antigen.

Q. 3. Most efficient complement fixing antibody class is:

- (a) IgG
- (b) IgE
- (c) IgM
- (d) IgA

Ans. (c) IgM is much more efficient than IgG in its ability to fix complement, promoting lysis and death of most Gram-negative bacteria. This greater activity is due to the fact that

complement may bind to several Fc regions of pentameric IgM simultaneously, thus initiating complement cascade and target lysis with a single molecule.

Q. 4. Type I hypersensitivity reaction is mediated by:

- (a) IgE (b) IgG (c) IgM (d) IgD

Ans. (a)

Q. 5. Which immunoglobulin class is heat-labile?

- (a) IgG (b) IgM (c) IgA (d) IgE

Ans. (d)

Q. 6. Which class of immunoglobulin can bind to mast cells and basophils?

- (a) IgA (b) IgM (c) IgD (d) IgE

Ans. (d)

Q. 7. IgG participates in which of the following reactions?

- (a) Complement fixation
(b) Precipitation
(c) Neutralization of toxins and viruses
(d) All of the above

Ans. (d)

Q. 8. First antibody to appear following stimulation by an antigen is:

- (a) IgM (b) IgG (c) IgA (d) IgE

Ans. (a)

Q. 9. Most abundant class of immunoglobulin in the body is:

- (a) IgG (b) IgM (c) IgD (d) IgE

Ans. (a)

Q. 10. J chain is present in:

- (a) IgG (b) IgM (c) IgD (d) IgE

Ans. (b)

Q. 11. J chain is present in:

- (a) secretory IgA
(b) IgM
(c) Both of the above
(d) None of the above

Ans. (c) There is an additional peptide chain called the joining (J) chain in IgM and secretory IgA. The J chain may be largely responsible for the polymerization process. Therefore, the correct answer is (c).

Q. 12. The earliest immunoglobulin to be synthesized by the foetus is:

- (a) IgA (b) IgD (c) IgG (d) IgM

Ans. (d)

Q. 13. Which of the following is a strong agglutinating antibody?

- (a) IgA (b) IgD (c) IgG (d) IgM

Ans. (d)

Q. 14. Isohaemagglutinins and antibodies to *Salmonella* serotype Typhi O antigen and Wasserman reaction antibodies in syphilis are usually:

- (a) IgA (b) IgD (c) IgG (d) IgM

Ans. (d)

Q. 15. IgM is the earliest class of immunoglobulin to be synthesized by foetus beginning by about:

- (a) 15 weeks of age (b) 20 weeks of age
(c) 25 weeks of age (d) 30 weeks of age

Ans. (b)

Q. 16. Which subclass of immunoglobulin G (IgG) does not cross the placental barrier?

- (a) IgG1 (b) IgG2 (c) IgG3 (d) IgG4

Ans. (b) There are four subclasses of human IgG (IgG1, IgG2, IgG3 and IgG4). Of the four subclasses, IgG2 does not cross the placenta.

Q. 17. Which subclass of immunoglobulin G (IgG) is the most effective in binding complement in classical pathway?

- (a) IgG1 (b) IgG2 (c) IgG3 (d) IgG4

Ans. (c)

THE COMPLEMENT SYSTEM

Q. 1. Classical pathway of the complement system is activated by:

- (a) IgG (b) IgM
(c) Both of the above (d) None of the above

Ans. (c)

Q. 2. Alternative pathway of the complement system is activated by:

- (a) Yeast cell walls
(b) Bacterial endotoxins
(c) Snake venom proteins
(d) All of the above

Ans. (d)

Q. 3. Number of proteins in the complement system is:

- (a) Five (b) Seven (c) Nine (d) Eleven

Ans. (d) Complement consists of nine different proteins denoted C1 to C9. The fraction C1 occurs in serum as calcium-dependent complex, which on chelation with EDTA yields three protein subunits called C1q, C1r and C1s. Thus, complement is made-up of 11 different proteins.

Q. 4. Complement participates in:

- (a) Type II hypersensitivity reactions
(b) Type III hypersensitivity reaction
(c) Both of the above
(d) None of the above

Ans. (c)

Q. 5. C1, C2 and C4 are components of:

- (a) Classical pathway of complement
(b) Alternative pathway of complement
(c) Both of the above
(d) None of the above

Ans. (a)

Q. 6. Chemical nature of components of the complement system is:

- (a) Lipid (b) Polysaccharide
(c) Protein (d) Nucleic acid

Ans. (c)

Q. 7. Factor B, factor D and properdin are components of:

- (a) Classical pathway of complement
(b) Alternative pathway of complement
(c) Both of the above
(d) None of the above

Ans. (b)

Q. 8. First component of complement which binds to Fc portion of antibody molecule is:

- (a) C1q (b) C1r (c) C1s (d) C2

Ans. (a)

Q. 9. Potent mediator/s of inflammation is/are:

- (a) C3a (b) C5a
(c) Both of the above (d) None of the above

Ans. (c)

Q. 10. Which type of bacteria are killed without lysis due to complement-mediated damage?

- (a) Gram-positive
- (b) Gram-negative
- (c) Both of the above
- (d) None of the above

Ans. (a)

Q. 11. Which of the following is C3 convertase of classical pathway of complement activation?

- (a) $C4b2a$
- (b) $C3bBb$
- (c) $C4b2a3b$
- (d) $C3bBb3b$

Ans. (a)

Q. 12. Which of the following is C3 convertase of alternative pathway of complement activation?

- (a) $C4b2a$
- (b) $C3bBb$
- (c) $C4b2a3b$
- (d) $C3bBb3b$

Ans. (b)

Q. 13. Which of the following is C5 convertase of classical pathway of complement activation?

- (a) $C4b2a$
- (b) $C3bBb$
- (c) $C4b2a3b$
- (d) $C3bBb3b$

Ans. (c)

Q. 14. Which of the following is C5 convertase of alternative pathway of complement activation?

- (a) $C4b2a$
- (b) $C3bBb$
- (c) $C4b2a3b$
- (d) $C3bBb3b$

Ans. (d)

Q. 15. A membrane attack complex that can lyse microorganisms is produced by components of:

- (a) Complement
- (b) Interferon alpha
- (c) Interferon gamma
- (d) Antibodies

Ans. (a)

Q. 16. Which complement component is involved in alternative pathway of complement activation?

- (a) C1
- (b) C2
- (c) C3
- (d) C4

Ans. (c) The activation of C3, without the prior participation of C1, C4 and C2, is known as alternative or properdin pathway of complement activation.

ANTIGEN–ANTIBODY REACTIONS

Q. 1. A large lattice is formed when:

- (a) Antigen is in excess
- (b) Antibody is in excess
- (c) Antigens and antibodies are in optimal proportion
- (d) All of the above

Ans. (c)

Q. 2. Precipitation reaction is relatively less sensitive for detection of:

- (a) Antibodies
- (b) Antigens
- (c) Antigen–antibody complexes
- (d) Complement

Ans. (a)

Q. 3. Ring test is used for:

- (a) Typing of streptococci and pneumococci
- (b) C-reactive protein test
- (c) Ascoli's thermoprecipitation test
- (d) All of the above

Ans. (d)

Q. 4. VDRL test is an example of:

- (a) Ring test
- (b) Slide flocculation test
- (c) Tube test
- (d) None of the above

Ans. (b)

Q. 5. Amount of various immunoglobulin classes can be measured by:

- (a) Single diffusion in one dimension
- (b) Double diffusion in one dimension
- (c) Single diffusion in two dimensions
- (d) Double diffusion in two dimensions

Ans. (c)

Q. 6. Counterimmunoelectrophoresis is used for detection of:

- (a) Hepatitis B surface antigen
- (b) Alpha-fetoprotein
- (c) Meningococcal antigen
- (d) All of the above

Ans. (d)

Q. 7. Agglutination reaction is more sensitive than precipitation for detection of:

- (a) Antigen
- (b) Antibody

- (c) Antigen–antibody complex
- (d) Complement

Ans. (b) Precipitation reaction is relatively less sensitive than agglutination reaction for detection of antibodies.

Q. 8. Slide agglutination reaction is useful for identification of culture/s of:

- (a) *Salmonella*
- (b) *Shigella*
- (c) *Vibrio cholerae*
- (d) All of the above

Ans. (d)

Q. 9. Incomplete antibodies may be detected by doing the test:

- (a) In hypertonic saline
- (b) In albumin saline
- (c) By the antiglobulin test
- (d) All of the above

Ans. (d)

Q. 10. Tube agglutination is employed for serological diagnosis of:

- (a) Enteric fever
- (b) Brucellosis
- (c) Typhus fever
- (d) All of the above

Ans. (d)

Q. 11. Anti-Rh antibodies are:

- (a) IgG type
- (b) IgD type
- (c) IgA type
- (d) IgE type

Ans. (a)

Q. 12. A precipitation reaction can be converted into agglutination reaction by coating soluble antigen onto:

- (a) RBCs
- (b) Latex particles
- (c) Bentonite particles
- (d) All of the above

Ans. (d)

Q. 13. Example/s of passive agglutination is/are:

- (a) RA factor test
- (b) C-reactive protein test
- (c) *Treponema pallidum* haemagglutination test
- (d) All of the above

Ans. (d)

Q. 14. Test employing complement is:

- (a) Widal test
- (b) VDRL test
- (c) *Treponema pallidum* immobilization test
- (d) None of the above

Ans. (c)

Q. 15. The test/s based on the principle of toxin neutralization is/are:

- (a) Schick test
- (b) Nagler's reaction
- (c) Both of the above
- (d) None of the above

Ans. (c) Schick test is *in vivo* neutralization test and Nagler's reaction is *in vitro* neutralization test. Therefore, the correct answer is (c).

Q. 16. Supplemental test for the diagnosis of AIDS is:

- (a) Southern blot
- (b) Western blot
- (c) Northern blot
- (d) Eastern blot

Ans. (b) Western blot test detects anti-HIV antibodies. It is a supplemental test for the diagnosis of AIDS. It is not a confirmatory test because it detects anti-HIV antibodies and not HIV or its antigens.

Q. 17. ELISA kits are commercially available for detection of:

- (a) Anti-HIV antibodies
- (b) Hepatitis B surface antigen
- (c) Rotavirus
- (d) All of the above

Ans. (d)

Q. 18. Quelling reaction is used for typing of:

- (a) *Streptococcus pneumoniae*
- (b) *Klebsiella pneumoniae*
- (c) Both of the above
- (d) None of the above

Ans. (c) Both *Streptococcus pneumoniae* and *Klebsiella pneumoniae* are capsulated organisms. Treatment of these organisms with the specific antibodies causes a characteristic swelling of the capsule. It is known as Quelling reaction. Therefore, the correct answer is (c).

Q. 19. Widal test is an example of:

- (a) Agglutination test
- (b) Precipitation test
- (c) Flocculation test
- (d) Complement-fixation test

Ans. (a)

Q. 20. An agglutination reaction which makes use of *Staphylococcus aureus* bound IgG as a reagent, is known as:

- (a) Passive agglutination
- (b) Reversed passive agglutination

- (c) Coagglutination
- (d) Flocculation

Ans. (c) Most strains of *Staphylococcus aureus* (especially Cowan strain 1) possess protein A on their surface. Protein A binds IgG molecules, non-specifically, through Fc region leaving specific Fab sites free to combine with specific antigen. When suspension of such sensitized staphylococcal cells is treated with homologous (test) antigen, antigen combines with free Fab sites of IgG attached to staphylococcal cells leading to visible clumping of staphylococci. This is known as coagglutination.

Q. 21. Coombs' test is:

- (a) Complement fixation test (b) Antiglobulin test
- (c) Agglutination test (d) Precipitation test

Ans. (b)

Q. 22. Inactivation of a toxin by an antibody is known as:

- (a) Opsonization (b) Neutralization
- (c) Attenuation (d) Lyophilization

Ans. (b)

Q. 23. Which of the following is a flocculation reaction?

- (a) Widal test (b) Coagglutination reaction
- (c) VDRL test (d) C-reactive protein test

Ans. (c) When, instead of sedimenting, the precipitate remains suspended as floccules, the reaction is called flocculation reaction. VDRL test is flocculation reaction.

ARCHITECTURE OF THE IMMUNE SYSTEM

Q. 1. Primary lymphoid organ/s is/are:

- (a) Thymus (b) Bursa of Fabricius
- (c) Bone marrow (d) All of these

Ans. (d) Primary lymphoid organs create special immune system cells called lymphocytes.

Q. 2. Secondary lymphoid organ/s is/are:

- (a) Lymph nodes
- (b) Spleen
- (c) Mucosa-associated lymphoid tissue
- (d) All of the above

Ans. (d) In secondary lymphoid organs, the cells of the immune system do their actual job of fighting off germs and foreign substances.

Q. 3. Stem cells arise from:

- (a) Yolk sac
- (b) Foetal liver
- (c) Bone marrow
- (d) All of the above

Ans. (d) During embryonic development, blood cell precursors are found in foetal liver and in postnatal life, stem cells reside in bone marrow. In birds, stem cells arise from yolk sac.

Q. 4. Lymphoid follicles of lymph nodes are:

- (a) Bursa-dependent areas
- (b) Bursa-independent areas
- (c) Thymus-dependent areas
- (d) None of the above

Ans. (a) Lymphoid follicles of lymph nodes are bursa-dependent areas, while paracortex (paracortical area) which contains T lymphocytes constitutes thymus-dependent areas.

Q. 5. CD3 surface antigen is expressed only by:

- (a) T cells
- (b) B cells
- (c) monocytes
- (d) granulocytes

Ans. (a)

Q. 6. CD8 surface antigen is present in:

- (a) Helper T cells
- (b) Delayed-type-hypersensitivity T cells
- (c) Both of the above
- (d) None of the above

Ans. (b)

Q. 7. CD8 surface antigen is present in:

- (a) Suppressor T cells
- (b) Cytotoxic T cells
- (c) Both of the above
- (d) None of the above

Ans. (c)

Q. 8. EAC rosettes are formed by:

- (a) T cells
- (b) B cells
- (c) Monocytes
- (d) Granulocytes

Ans. (b) Receptors for C3 component of complement (CRs) are found on most B cells. Because of the presence of CRs on the surface of B cells they bind to sheep RBCs which have been coated with antibody and complement forming EAC (erythrocyte-antibody-complement) rosettes. Therefore, the correct answer is (b).

Q. 9. Blast transformation on treatment with bacterial endotoxins occurs in:

- (a) T cells
- (b) B cells
- (c) Monocytes
- (d) None of the above

Ans. (b) B cells undergo blast transformation on treatment with bacterial endotoxins.

Q. 10. Natural killer cells are involved in:

- (a) Allograft rejection
- (b) Tumour rejection
- (c) Non-specific killing of virus transformed target cells
- (d) All of the above

Ans. (d)

Q. 11. Which of the following immune cells/molecules are most effective in destroying intracellular pathogens?

- (a) Th cells
- (b) Tc cells
- (c) B cells
- (d) Antibodies

Ans. (b) Cytotoxic T (Tc) cells are involved in cell-mediated immune responses and lyse target cells by direct cell-cell contact.

Q. 12. B cells that produce and release large amounts of antibody are called:

- (a) Memory cells
- (b) Killer cells
- (c) Basophils
- (d) Plasma cells

Ans. (d) Upon contact with antigen, B lymphocytes differentiate into antibody-producing plasma cells. They release large amounts of antibody.

IMMUNE RESPONSE

Q. 1. CMI participates in:

- (a) Allograft rejection
- (b) Graft versus host reaction
- (c) Delayed hypersensitivity reaction
- (d) All of the above

Ans. (d)

Q. 2. Negative phase is observed in:

- (a) Primary humoral response
- (b) Secondary humoral response
- (c) Both of the above
- (d) None of the above

Ans. (b) If the same animal, after first injection of the antigen, is subsequently exposed to the same antigen, there occurs temporary fall in the level of antibodies due to combination of the antigen with pre-existing antibody.

Q. 3. Most widely accepted theory of antibody production is:

- (a) Direct template theory (b) Indirect template theory
- (c) Side chain theory (d) Clonal selection theory

Ans. (d)

Q. 4. The requirement/s for monoclonal antibody production is/are:

- (a) Mouse myeloma cells
- (b) Mouse splenic lymphocytes
- (c) Both of the above
- (d) None of the above

Ans. (c) Lymphocytes from the spleen of a mouse immunized with desired antigen are fused with mouse myeloma cell to produce hybrid cells (hybridoma). Among the two cell types chosen for fusion, one provides the hybrid immortality (myeloma cell) while the other (splenic lymphocyte) provides the antibody-producing capacity. Therefore, the correct choice is (c).

Q. 5. Immunosuppressive agent/s is/are:

- (a) Methotrexate (b) Cyclosporine
- (c) Anti-lymphocytic serum (d) All of the above

Ans. (d)

Q. 6. Delayed-type hypersensitivity cells secrete which of the following lymphokines?

- (a) Migration-inhibiting factor
- (b) Macrophage-activating factor
- (c) Macrophage-stimulating factor
- (d) All of the above

Ans. (d)

Q. 7. Interleukin-2 promotes:

- (a) B cell differentiation (b) Bone marrow stem cells
- (c) Maturation of eosinophils (d) Growth of fibroblasts

Ans. (a)

Q. 8. Interferon- γ is produced by following cells, except:

- (a) Td cells (b) Th cells
- (c) Macrophages (d) NK cells

Ans. (c)

Q. 9. Interleukin-1 promotes growth and expression of:

- (a) Fibroblasts
- (b) NK cells
- (c) B and T cells
- (d) All of these

Ans. (d)

Q. 10. CMI can be detected by which of the following methods?

- (a) Skin test for delayed hypersensitivity
- (b) Migration inhibition factor test
- (c) Target cell destruction
- (d) All of the above

Ans. (d)

Q. 11. Mechanism/s of induction of tolerance is/are:

- (a) Clonal deletion
- (b) Clonal anergy
- (c) Suppression
- (d) All of these

Ans. (d)

Q. 12. Fusion between a plasma cell and a tumour cell produces:

- (a) Hybridoma
- (b) Lymphoma
- (c) Myeloma
- (d) Natural killer cell

Ans. (a) Refer to Q. 4, above.

Q. 13. Monoclonal antibodies recognize a single:

- (a) Antigen
- (b) Epitope
- (c) Paratope
- (d) None of these

Ans. (b) A single antibody-forming cell or clone produces antibodies directed against specific epitope of the antigen. Therefore, monoclonal antibodies recognize a single epitope.

Q. 14. Which of the following antibodies would most likely be found in body secretions such as tears, milk, saliva and mucus?

- (a) IgA
- (b) IgG
- (c) IgD
- (d) IgM

Ans. (a) Secretory IgA is synthesized by plasma cells as a dimer containing four heavy chains, four light chains and one J chain. Therefore, the correct answer is (a).

IMMUNODEFICIENCY DISEASES

Q. 1. Thymic hypoplasia leads to:

- (a) Humoral immunodeficiency
- (b) Cellular immunodeficiency
- (c) Complement deficiency
- (d) All of the above

Ans. (b) Pleuripotent stem cells in the bone marrow give rise to precursor T cells, which migrate to the thymus for further development. Since T cells mediate cell-mediated immunity, thymic hypoplasia leads to cellular immunodeficiency.

Q. 2. Swiss-type agammaglobulinaemia is due to:

- (a) B cell defect
- (b) T cell defect
- (c) Both B and T cell defects
- (d) Complement deficiency

Ans. (c)

Q. 3. DiGeorge's syndrome is due to:

- (a) T cell defect
- (b) B cell defect
- (c) Both of the above
- (d) None of the above

Ans. (a)

Q. 4. Systemic lupus erythematosus is associated with deficiency of:

- (a) C1
- (b) C4
- (c) Both of the above
- (d) None of the above

Ans. (c) Systemic lupus erythematosus is associated with deficiency of C1 and C4. Therefore, the correct answer is (c).

Q. 5. Myeloperoxidase deficiency is a defect of:

- (a) B cells
- (b) T cells
- (c) Complement
- (d) Phagocytes

Ans. (d)

Q. 6. Polymorphonuclear leucocytes in patients with which condition possess large lysosomes?

- (a) Chediak-Higashi syndrome
- (b) Chronic granulomatous disease
- (c) Myeloperoxidase deficiency
- (d) Leucocyte G6PD deficiency

Ans. (a) Polymorphonuclear leucocytes in patients with Chediak-Higashi syndrome possess large (giant) lysosomes. These abnormal lysosomes do not fuse readily with cytoplasmic phagosome.

Q. 7. Immunodeficiency with elevated IgM results in:

- (a) Recurrent pyogenic infections
- (b) Autoimmune disorders
- (c) Both of the above
- (d) None of the above

Ans. (c)

Q. 8. Due to the deficiency of secretory IgA (sIgA), infections occur predominantly in:

- (a) Respiratory tract (b) Gastrointestinal tract
- (c) Urogenital tract (d) All of the above

Ans. (d) On mucous surfaces, sIgA forms an antibody paste and is believed to play an important role in local immunity against respiratory, gastrointestinal and urogenital tracts. Therefore, due to deficiency of sIgA, infections occur predominantly in these organs. Therefore, the correct answer is (d).

Q. 9. Chronic granulomatous disease is due to deficiency of:

- (a) NADPH oxidase (b) MPO
- (c) G6PD (d) None of the above

Ans. (a) Chronic granulomatous disease is a frequently fatal disorder in which there is a deficiency of NADPH oxidase.

Q. 10. The most common immunoglobulin deficiency is of:

- (a) IgA (b) IgD (c) IgE (d) IgM

Ans. (a) Absence or near absence of serum and secretory IgA is thought to be the most common well-defined immunodeficiency disorder.

HYPERSENSITIVITY

Q. 1. Anaphylactic reactions are mediated by which class of immunoglobulins?

- (a) IgE (b) IgM (c) IgA (d) IgD

Ans. (a) IgE immunoglobulins mediate anaphylactic reactions (type I hypersensitivity).

Q. 2. Pharmacologically, active agent/s released during anaphylactic reaction is/are:

- (a) Histamine
- (b) Bradykinin
- (c) Eosinophil chemotactic factor of anaphylaxis
- (d) All of the above

Ans. (d)

Q. 3. Wheal and flare response is a characteristic of:

- (a) Type I hypersensitivity reaction
- (b) Type II hypersensitivity reaction
- (c) Type III hypersensitivity reaction
- (d) Type IV hypersensitivity reaction

Ans. (a) Wheal and flare response is a characteristic of type I hypersensitivity. Type IV hypersensitivity leads to erythema due to increased blood flow to the damaged area and induration due to infiltration with a large number of mononuclear cells mainly T lymphocytes and about 10–20% macrophages.

Q. 4. Which of the following reactions is/are complement-dependent?

- (a) Type II hypersensitivity (b) Type III hypersensitivity
- (c) Both of the above (d) None of the above

Ans. (c)

Q. 5. Raised level of immune complexes can be demonstrated in:

- (a) Poststreptococcal glomerulonephritis
- (b) Lepromatous leprosy
- (c) Hepatitis B
- (d) All of the above

Ans. (d)

Q. 6. Delayed hypersensitivity reaction is mediated by:

- (a) T lymphocytes (b) B lymphocytes
- (c) Killer cells (d) Natural killer cells

Ans. (a) Delayed hypersensitivity is the outcome of cell-mediated immune reaction. It is mediated by sensitized T lymphocytes.

Q. 7. Thyroid hyperactivity in Graves' disease is due to:

- (a) Type I hypersensitivity reaction
- (b) Type II hypersensitivity reaction
- (c) Type III hypersensitivity reaction
- (d) Type V hypersensitivity reaction

Ans. (d) Thyroid hypersensitivity in Graves' disease is due to type V hypersensitivity reaction. This is an antibody-mediated hypersensitivity. Here, antibody (thyroid-stimulating antibody) reacts with hormone receptor and stimulates the cell, thus secreting thyroxine.

Q. 8. Schwartzman reaction is:

- (a) Antibody-mediated reaction
- (b) Cell-mediated reaction
- (c) Complement-dependent reaction
- (d) None of the above

Ans. (d)

Q. 9. Drug-induced immune haemolytic anaemia is due to:

- (a) Type I hypersensitivity reaction
- (b) Type II hypersensitivity reaction
- (c) Type III hypersensitivity reaction
- (d) Type IV hypersensitivity reaction

Ans. (b) Drugs such as antibiotic penicillin can bind to surface of red cells and form an antigenic complex with the surface of these cells. This can lead to production of complement-fixing antibodies to the drug. Reaction of this antibody with the RBC-bound drug activates the complement system resulting in RBC lysis and anaemia (type II hypersensitivity).

Q. 10. Allergic rhinitis is mediated by which class of antibody?

- (a) IgG
- (b) IgM
- (c) IgA
- (d) IgE

Ans. (d) Allergic rhinitis or hay fever affects the mucosal surfaces of upper respiratory tract. It is mediated by IgE antibody.

Q. 11. Erythema and induration are characteristic of:

- (a) Type I hypersensitivity reaction
- (b) Type III hypersensitivity reaction
- (c) Type IV hypersensitivity reaction
- (d) Type V hypersensitivity reaction

Ans. (c) Refer to Q. No. 3 above.

Q. 12. Schultz-Dale phenomenon is a type of:

- (a) Type I hypersensitivity
- (b) Type II hypersensitivity
- (c) Type III hypersensitivity
- (d) Type IV hypersensitivity

Ans. (a) Schultz-Dale phenomenon is anaphylaxis *in vitro* (type I hypersensitivity). It is mediated by IgE antibody.

Q. 13. Prausnitz-Kustner reaction is a type of:

- (a) Type I hypersensitivity
- (b) Type II hypersensitivity
- (c) Type III hypersensitivity
- (d) Type IV hypersensitivity

Ans. (a) Prausnitz-Kustner reaction is type I hypersensitivity. It can be demonstrated by injecting intracutaneously serum containing IgE antibodies from allergic person followed 24 hours later by intracutaneous injection of the allergen to which the allergic person is allergic. This leads to wheal and flare response.

Q. 14. Which hypersensitivity reaction is T cell-mediated?

- (a) Type I
- (b) Type II
- (c) Type III
- (d) Type IV

Ans. (d)

Q. 15. A positive tuberculin test is an example of:

- (a) Type I hypersensitivity
- (b) Type II hypersensitivity
- (c) Type III hypersensitivity
- (d) Type IV hypersensitivity

Ans. (d)

Q. 16. An example of type III immune complex disease is:

- (a) Contact dermatitis
- (b) Atopy
- (c) Serum sickness
- (d) Graft rejection

Ans. (c)

Q. 17. Pollen would most likely evoke which type of hypersensitivity response?

- (a) Type I
- (b) Type II
- (c) Type III
- (d) Type IV

Ans. (a)

Q. 18. Which subclass of immunoglobulin G (IgG) can bind to mast cells?

- (a) IgG1
- (b) IgG2
- (c) IgG3
- (d) IgG4

Ans. (d) IgE and IgG4 can bind to mast cells.

AUTOIMMUNITY

Q. 1. Overactivity of Th cells may lead to:

- (a) Optimal antibody response
- (b) Optimal cell-mediated response
- (c) Autoimmunity
- (d) Immunodeficiency

Ans. (c) Overactivity of helper T (Th) cells or decreased activity of suppressor T (Ts) cells causes abnormal immune responses as seen in autoimmunity. Diminished Th cell function or increased activity of Ts cell leads to immunodeficiency.

Q. 2. Which of the following is/are example/s of autoimmune disease/s?

- (a) Rheumatoid arthritis
- (b) Systemic lupus erythematosus
- (c) Polyarteritis nodosa
- (d) All of the above

Ans. (d)

Q. 3. Pathogenesis of rheumatic fever is due to immunological injury caused by:

- (a) Cross-reacting antigens
- (b) Neoantigens
- (c) Forbidden clones
- (d) Hidden antigens

Ans. (a) Cross-reacting antigens exist in some group A streptococci and the heart. In this case, antibodies synthesized in response to the streptococcal infection could react with antigens in the heart causing cellular destruction and permanent damage.

Q. 4. Lens antigens of the eye are:

- (a) Sequestered antigens
- (b) Cross-reacting antigens
- (c) Neoantigens
- (d) None of the above

Ans. (a) Lens protein is enclosed (sequestered) in its capsule and does not circulate in the blood. Therefore, immunological tolerance against this antigen does not develop during foetal life. When the lens protein antigen leaks out, following cataract surgery or injury to the eye, it leads to immune response and damage to the other eye (sympathetic ophthalmia).

Q. 5. Immunopathological lesions seen in ulcerative colitis are possibly due to:

- (a) Cross-reacting antigens
- (b) Neoantigens
- (c) Forbidden clones
- (d) Hidden antigens

Ans. (a) *Escherichia coli* O14 possesses cross-reacting antigen with human colon. It occurs as commensal in the intestine. Antibodies raised against this organism may damage human colon cells leading to ulcerative colitis.

HISTOCOMPATIBILITY SYSTEMS

Q. 1. Grafts between members of the same species but of different genetic constitution are known as:

- (a) Autografts
- (b) Isografts
- (c) Allografts
- (d) Xenografts

Ans. (c)

Q. 2. Application of a skin allograft for the second time from the same donor will result in:

- (a) First-set reaction
- (b) Second-set reaction
- (c) Both of the above
- (d) None of the above

Ans. (b) Application of a skin graft for the first time leads to first-set reaction and application of a skin graft from the same individual second time leads to second-set reaction.

Q. 3. Major histocompatibility complex in man is known as:

- (a) H-2 complex
- (b) HLA complex
- (c) Both of the above
- (d) None of the above

Ans. (b) Major histocompatibility complex (MHC) in mouse is referred to as H-2 complex, and the MHC in humans is known as human leucocyte antigen (HLA) complex.

Q. 4. Class I histocompatibility antigens are products of:

- (a) HLA-A locus
- (b) HLA-B locus
- (c) HLA-C locus
- (d) All of the above

Ans. (d)

Q. 5. Class II histocompatibility antigens are encoded by:

- (a) HLA-DP locus
- (b) HLA-DQ locus
- (c) HLA-DR locus
- (d) All of the above

Ans. (d)

Q. 6. Which of the following disease/s is/are associated with particular HLA antigens?

- (a) Graves' disease
- (b) Ankylosing spondylitis
- (c) Rheumatoid arthritis
- (d) All of the above

Ans. (d)

Q. 7. The first line of defence against many tumours is:

- (a) Natural killer cells
- (b) Polymorphs
- (c) Monocytes
- (d) None of the above

Ans. (a) Natural killer cells are capable of non-specific killing of virus-transformed target cells and are involved in allograft and tumour rejection.

Q. 8. Example/s of immunomodulator/s is/are:

- (a) *Mycobacterium bovis* cell wall
- (b) *Corynebacterium parvum* cell wall
- (c) Interferon
- (d) All of the above

Ans. (d)

Q. 9. A transplant between individuals of different animal species is known as:

- (a) Xenograft
- (b) Isograft
- (c) Homograft
- (d) Allograft

Ans. (a)

- **Autograft:** Graft from one part of the body to another in the same individual.
- **Isograft:** Graft between genetically identical individuals (twins).
- **Allograft:** Graft between members of the same species but of different genetic constitution.
- **Xenograft:** Grafts between members of different species.

IMMUNOHAEMATOLOGY

Q. 1. An individual with blood group A possesses:

- (a) Antigen A on RBCs
- (b) Anti-A antibodies in serum
- (c) None of the above
- (d) Both of the above

Ans. (a)

Q. 2. An individual with blood group B possesses:

- (a) Antigen B on RBCs
- (b) Anti-B antibodies in serum
- (c) Both of the above
- (d) None of the above

Ans. (a)

Q. 3. An individual with blood group AB possesses:

- (a) A and B antigens on RBCs
- (b) Neither anti-A nor anti-B antibodies in serum
- (c) Both of the above
- (d) None of the above

Ans. (c) An individual with blood group AB possesses A and B antigens on RBCs. Because of the immune tolerance to self antigens (A and B) neither anti-A nor anti-B antibodies develop in the serum of the individual with AB group. Therefore, the correct answer is (c).

Q. 4. An individual with blood group O possesses:

- (a) Neither A nor B antigens on RBCs
- (b) Both anti-A and anti-B antibodies in serum
- (c) Both of the above
- (d) None of the above

Ans. (c) Anti-A and anti-B isoantibodies appear in the serum of infants by the age of 6 months and persist thereafter. It is believed that they develop as a result of cross-immunization with bacteria of Enterobacteriaceae that colonize the infant's gut. Since O group individuals possess neither A nor B antigen, there is no immune tolerance. Therefore, they develop anti-A and anti-B antibodies. Therefore, the correct answer is (c).

Q. 5. The commonest ABO blood group in Indian individuals is:

- (a) O
- (b) A
- (c) B
- (d) AB

Ans. (a)

Q. 6. Least common ABO blood group in Indian individuals is:

- (a) O
- (b) A
- (c) B
- (d) AB

Ans. (d)

Q. 7. Haemolytic disease of newborn may occur when:

- (a) An Rh-negative woman carries an Rh-positive foetus
- (b) An Rh-positive woman carries an Rh-negative foetus
- (c) Both of the above
- (d) None of the above

Ans. (a) Haemolytic disease of newborn may develop when an Rh-negative woman carries an Rh-positive foetus. She may be immunized against Rh antigen by the passage of foetal (Rh-positive) cells into maternal circulation. During subsequent pregnancy, Rh antibodies of the IgG class pass from the mother to the foetus, through the placenta, and damage its erythrocytes.

Q. 8. Which of the following infectious agents can be transmitted by blood transfusion?

- (a) Hepatitis B virus
- (b) Human immunodeficiency virus
- (c) *Plasmodium*
- (d) All of the above

Ans. (d)

Q. 9. Immunological complications of blood transfusion may be due to:

- (a) Red cell incompatibility
- (b) Leucocyte incompatibility
- (c) Platelet incompatibility
- (d) All of the above

Ans. (d)

Q. 10. Individuals with Bombay blood group lack:

- (a) A antigen
- (b) B antigen
- (c) H antigen
- (d) All of the above

Ans. (d) Red blood cells of all ABO groups possess a common antigen, the H antigen, which is the precursor antigen for the formation of A and B antigens. In Bombay blood group, the precursor (H) antigen for the formation of A and B antigens is absent. Therefore, such individuals lack H, A and B antigens. Therefore, the correct answer is (d).

Systemic Bacteriology

STAPHYLOCOCCUS

Q. 1. Most strains of *Staphylococcus aureus* show:

- (a) A golden-yellow pigment
- (b) β -haemolysis on sheep blood agar
- (c) Phosphatase production
- (d) All of the above

Ans. (d)

Q. 2. Which of the following bacteria are inhibited on crystal violet (1 : 500,000) blood agar?

- (a) Staphylococci
- (b) Streptococci
- (c) Both of the above
- (d) None of the above

Ans. (a) The addition of 0.0002% (1 : 500,000) crystal violet to blood agar inhibits the growth of staphylococci, while permitting the growth of streptococci. Crystal violet blood agar is, therefore, a selective medium for isolation of β -haemolytic streptococci.

Q. 3. Which of the following bacteria is catalase-positive and oxidase-negative?

- (a) *Staphylococcus*
- (b) *Micrococcus*
- (c) *Neisseria*
- (d) *Pseudomonas*

Ans. (a) *Staphylococcus* is catalase-positive and oxidase-negative, whereas *Micrococcus*, *Neisseria* and *Pseudomonas* are both catalase-positive and oxidase-positive.

Q. 4. Protein A is present in cell wall of:

- (a) *Staphylococcus aureus*
- (b) Coagulase-negative staphylococci
- (c) Micrococci
- (d) None of the above

Ans. (a) Protein A is present in the cell wall of most strains of *Staphylococcus aureus* (especially Cowan strain 1).

Q. 5. Clumping factor can be detected by the:

- (a) Slide coagulase test
- (b) Tube coagulase test
- (c) Precipitation test
- (d) None of the above

Ans. (a) Clumping factor in *Staphylococcus aureus* is detected by slide coagulase test and coagulase is detected by tube coagulase test.

Q. 6. Which of the following staphylococcal haemolysins is less active against human RBCs?

- (a) α -haemolysin
- (b) β -haemolysin
- (c) γ -haemolysin
- (d) δ -haemolysin

Ans. (a)

Q. 7. Which of the following staphylococcal haemolysins gives rise to 'hot-cold' haemolysis?

- (a) α -haemolysin
- (b) β -haemolysin
- (c) γ -haemolysin
- (d) δ -haemolysin

Ans. (b) β -haemolysin gives rise to 'hot-cold' haemolysis, the cells that have been exposed to the haemolysin at 37°C lyse, only when cooled to 4°C.

Q. 8. Scalded skin syndrome is due to which toxin of *Staphylococcus aureus*?

- (a) Epidermolytic toxins
- (b) Enterotoxin
- (c) Leucocidin
- (d) Haemolysin

Ans. (a) Scalded skin syndrome is produced by the strains of *Staphylococcus aureus* which produce epidermolytic toxins. These toxins separate the outer layer of epidermis from the underlying tissues leading to blistering disease.

Q. 9. Coagulase-reacting factor is necessary for:

- (a) Slide coagulase test
- (b) Tube coagulase test
- (c) Both of the above
- (d) None of the above

Ans. (b)

Q. 10. Staphylococcal food poisoning usually manifests itself within how much time after ingestion of contaminated food?

- (a) 2–6 hours
- (b) 6–12 hours
- (c) 12–24 hours
- (d) 24–48 hours

Ans. (a) The enterotoxin produced by *Staphylococcus aureus* is a preformed toxin already present in the contaminated food. Therefore, patient develops symptoms within a short time (2–6 hours).

Q. 11. Which of the following bacteria are novobiocin resistant?

- (a) *Staphylococcus aureus* (b) *S. epidermidis*
- (c) *S. saprophyticus* (d) None of the above

Ans. (c) *Staphylococcus saprophyticus* is resistant to novobiocin, while *S. aureus* and *S. epidermidis* are novobiocin-sensitive.

Q. 12. Which of the following bacteria ferment mannitol?

- (a) *Staphylococcus aureus* (b) *S. epidermidis*
- (c) *S. saprophyticus* (d) None of the above

Ans. (a) Most strains of *Staphylococcus aureus* ferment mannitol, while most strains of *S. epidermidis* and *S. saprophyticus* are mannitol-negative.

Q. 13. Which of the following genus/genera belong/s to family Micrococcaceae?

- (a) *Micrococcus* (b) *Planococcus*
- (c) *Staphylococcus* (d) All of the above

Ans. (d)

Q. 14. Which of the following bacteria produces coagulase?

- (a) *Staphylococcus aureus* (b) *S. epidermidis*
- (c) *S. saprophyticus* (d) *S. hominis*

Ans. (a)

Q. 15. The most common cause of cystitis after *Escherichia coli* in young healthy sexually active women is:

- (a) *Proteus mirabilis*
- (b) *Pseudomonas aeruginosa*
- (c) *Klebsiella pneumoniae*
- (d) *Staphylococcus saprophyticus*

Ans. (d) *Staphylococcus saprophyticus* is the most common cause of cystitis after *Escherichia coli* in young healthy and sexually active women. When present in urine cultures, it may be found in low numbers and yet considered significant. It adheres more effectively to the epithelial cells lining the urogenital tract.

Q. 16. Three consecutive blood cultures from a case of endocarditis revealed catalase-positive, coagulase-negative, Gram-positive cocci. Which of the following organisms is the most likely cause?

- (a) *Staphylococcus aureus* (b) *S. epidermidis*
- (c) *Enterococcus faecalis* (d) *Kingella kingae*

Ans. (b) *Staphylococcus epidermidis* is catalase-positive and coagulase-negative. It may cause endocarditis. *S. aureus* is catalase-positive and coagulase-positive. *Enterococcus faecalis* and *Kingella kingae* are catalase-negative and coagulase-negative.

Q. 17. Culture from a case of scalded skin syndrome has yielded a Gram-positive organism that is highly salt (NaCl) tolerant. Which of the following tests is useful to establish the diagnosis?

- (a) Catalase test
- (b) Coagulase test
- (c) Bile solubility test
- (d) Bacitracin sensitivity

Ans. (b) *Staphylococcus aureus* is coagulase-positive, highly salt (NaCl) tolerant and many strains produce epidermolytic toxins which cause scalded skin syndrome. Therefore, coagulase test is useful to establish the diagnosis.

Q. 18. Which of the following cocci are oxidase-positive?

- (a) Staphylococci
- (b) Streptococci
- (c) Enterococci
- (d) Micrococci

Ans. (d) Refer to Q. No. 3 above.

Q. 19. Scalded skin syndrome is caused by exotoxin produced by:

- (a) *Staphylococcus aureus*
- (b) *Streptococcus pyogenes*
- (c) *Pseudomonas aeruginosa*
- (d) *Propionibacterium acnes*

Ans. (a) Refer to Q. No. 17 above.

Q. 20. The use of superabsorbent tampons has been associated with increased risk for:

- (a) Bacterial vaginitis
- (b) Trichomoniasis
- (c) Toxic shock syndrome
- (d) Scarlet fever

Ans. (c) The use of superabsorbent tampons has been associated with increased risk for toxic shock syndrome. It is due to certain strains of *Staphylococcus aureus* producing toxic shock syndrome toxin-1. The latter is a superantigen.

Q. 21. Toxic shock syndrome is caused by a superantigen produced by:

- (a) *Escherichia coli*
- (b) *Neisseria gonorrhoeae*
- (c) *Streptococcus pyogenes*
- (d) *Staphylococcus aureus*

Ans. (d) Refer to Q. No. 20 above.

Q. 22. Septicaemia leading to endotoxin-induced shock is not likely to be caused by:

- (a) *Escherichia coli* (b) *Pseudomonas aeruginosa*
- (c) *Staphylococcus aureus* (d) *Klebsiella pneumoniae*

Ans. (c) Endotoxins are produced by Gram-negative bacteria (*Escherichia coli*, *Pseudomonas aeruginosa* and *Klebsiella pneumoniae*) and not by Gram-positive bacteria. Therefore, *Staphylococcus aureus*, which is a Gram-positive coccus, is not likely to cause endotoxin-induced shock.

STREPTOCOCCUS AND ENTEROCOCCUS

Q. 1. Which type of haemolysis is produced by *Streptococcus pyogenes*?

- (a) α -haemolysis (b) β -haemolysis.
- (c) γ -haemolysis (d) None of the above

Ans. (b)

Q. 2. On the basis of Lancefield grouping β -haemolytic streptococci can be divided into:

- (a) 21 serological groups (b) 18 serological groups
- (c) 16 serological groups (d) 14 serological groups

Ans. (a)

Q. 3. Crystal violet blood agar is a selective medium for:

- (a) β -haemolytic streptococci
- (b) *Staphylococcus aureus*
- (c) *Corynebacterium diphtheriae*
- (d) *Mycobacterium tuberculosis*

Ans. (a) Refer to Q. No. 2 of *Staphylococcus*.

Q. 4. *Streptococcus pyogenes* can be differentiated from other haemolytic streptococci on the basis of its sensitivity to:

- (a) Penicillin (b) bacitracin
- (c) Erythromycin (d) Aminoglycosides

Ans. (b) *Streptococcus pyogenes* is more sensitive to bacitracin than other streptococci. This property can be used for differentiation of *S. pyogenes* from other haemolytic streptococci.

Q. 5. Most useful protein for serotyping of *Streptococcus pyogenes* is:

- (a) M (b) T
- (c) R (d) None of the above

Ans. (a)

Q. 6. Cell wall protein of *Streptococcus pyogenes* cross-reacts with human:

- (a) Synovial fluid
- (b) Myocardium
- (c) Cardiac valves
- (d) Vascular intima

Ans. (b)

Q. 7. Cell wall carbohydrate of *Streptococcus pyogenes* cross-reacts with human:

- (a) Synovial fluid
- (b) Myocardium
- (c) Cardiac valves
- (d) Vascular intima

Ans. (c) Cell wall protein and carbohydrate of *Streptococcus pyogenes* cross-react with human myocardium and cardiac valves, respectively.

Q. 8. Susceptibility to streptococcal pyrogenic exotoxins is indicated by:

- (a) Dick test
- (b) Schick test
- (c) ASO test
- (d) None of the above

Ans. (a)

Q. 9. Streptolysin O is:

- (a) Oxygen-labile
- (b) Heat-labile
- (c) Antigenic
- (d) All of the above

Ans. (d)

Q. 10. Which of the following streptodornases is the most antigenic in man?

- (a) Type A
- (b) Type B
- (c) Type C
- (d) Type D

Ans. (b) Streptodornase B (deoxyribonuclease B, DNase B) is the most antigenic, therefore, detection of anti-DNase B is used for retrospective diagnosis of *Streptococcus pyogenes* infection.

Q. 11. The most important cause of bacterial sore throat is:

- (a) *Streptococcus pyogenes*
- (b) *Staphylococcus aureus*
- (c) *Haemophilus* spp.
- (d) *Mycoplasma pneumoniae*

Ans. (a)

Q. 12. Which of the following conditions is/are non-suppurative sequelae of *Streptococcus pyogenes* infection?

- (a) Acute rheumatic fever
- (b) Acute glomerulonephritis
- (c) Both of the above
- (d) None of the above

Ans. (c)

Q. 13. Retrospective diagnosis of streptococcal infection may be established by:

- (a) ASO test
- (b) Anti-DNase B test
- (c) Streptozyme test
- (d) All of the above

Ans. (d)

Q. 14. CAMP test is useful for identification of:

- (a) Group A streptococci
- (b) Group B streptococci
- (c) Group C streptococci
- (d) Group D streptococci

Ans. (b) CAMP test can be demonstrated as an accentuated zone of haemolysis (butterfly appearance) when group B streptococci are inoculated perpendicular to a streak of *Staphylococcus aureus* (NCTC 1803) on a sheep or bovine blood agar plate.

Q. 15. Which of the following bacteria is/are involved in the production of dental caries?

- (a) *Streptococcus mutans*
- (b) *S. sanguis*
- (c) Both of the above
- (d) None of the above

Ans. (c)

Q. 16. Individuals suffering from primary atypical pneumonia have agglutinins to:

- (a) *Streptococcus MG*
- (b) *S. avium*
- (c) *S. mutans*
- (d) *Enterococcus faecalis*

Ans. (a)

Q. 17. Neonatal meningitis acquired during passage through birth canal is due to:

- (a) *Streptococcus pyogenes*
- (b) *S. agalactiae*
- (c) *S. pneumoniae*
- (d) *S. mutans*

Ans. (b) Group B streptococci (*Streptococcus agalactiae*) are present in the vaginal flora of about 25% of all women. Therefore, neonatal meningitis may be acquired during passage through birth canal.

Q. 18. A 9-year-old child develops glomerulonephritis after he was treated for a sore throat. The causative agent is identified by serotyping of the:

- (a) Capsule
- (b) M protein
- (c) Outer membrane proteins
- (d) pili

Ans. (b) Acute glomerulonephritis is non-suppurative sequelae of infection with *Streptococcus pyogenes* M types 1, 12, 49, 53–55 and 59–61. Therefore, the causative agent is identified by serotyping of M protein (M serotyping).

Q. 19. An optochin-resistant, catalase-negative, Gram-positive coccus that was α -haemolytic was isolated from blood culture of a 60-year-old woman suffering from endocarditis. Which of the following is the most likely causative agent?

- (a) *Streptococcus sanguis*
- (b) *Streptococcus pneumoniae*
- (c) *Staphylococcus aureus*
- (d) *Listeria monocytogenes*

Ans. (a) *Streptococcus sanguis* and *Streptococcus pneumoniae* are α -haemolytic, Gram-positive cocci. *Streptococcus sanguis* is optochin-resistant and *S. pneumoniae* is highly sensitive to killing by optochin. Therefore, the correct answer is (a).

Q. 20. A 5-day-old infant has developed fever, convulsions and neck rigidity. Which of the following agents is the most likely cause?

- (a) *Escherichia coli*
- (b) *Haemophilus influenzae*
- (c) *Streptococcus agalactiae*
- (d) *Listeria monocytogenes*

Ans. (c) *Streptococcus agalactiae*, which is normally carried in the vaginal flora of 25% of all women, is the most common cause of neonatal meningitis. The neonate acquires infection during its passage from the birth canal.

Q. 21. Gram-positive cocci that are catalase-negative and capable of growth in 6.5% sodium chloride have been isolated from the urine of a 60-year-old woman suffering from urinary tract infection. Which of the following is the most likely causative agent?

- (a) *Enterococcus faecalis*
- (b) *Staphylococcus aureus*
- (c) *Staphylococcus epidermidis*
- (d) *Streptococcus pyogenes*

Ans. (a) All the microorganisms listed in (a) to (d) are Gram-positive cocci. *Enterococcus faecalis* is catalase-negative and it is capable of growth in 6.5% sodium chloride. *Staphylococcus aureus*, *Staphylococcus epidermidis* and *Streptococcus pyogenes* are catalase-positive. Therefore, the correct answer is (a).

Q. 22. Simplest test for differentiating *Staphylococcus* and *Streptococcus* is:

- (a) Antistreptokinase test
- (b) Catalase test

- (c) Polymerase chain reaction
- (d) Growth of the organism in 6.5% sodium chloride

Ans. (b) Staphylococci are catalase-positive and streptococci are catalase-negative. Therefore, the correct answer is (b).

Q. 23. Which of the following organisms causes scarlet fever?

- (a) *Staphylococcus aureus* (b) *Streptococcus pyogenes*
- (c) *Pseudomonas aeruginosa* (d) *Propionibacterium acnes*

Ans. (b) *Streptococcus pyogenes* produces erythrogenic toxins which cause scarlet fever.

Q. 24. Rheumatic fever caused by *Streptococcus pyogenes* most likely results from:

- (a) Toxin produced by bacteria
- (b) Invasion of heart cells by bacteria
- (c) Growth of bacteria on heart cells without invasion
- (d) A reaction between heart antigens and antibodies against bacteria

Ans. (d) Rheumatic fever is a non-suppurative sequelae of *Streptococcus pyogenes* infection. Cross-reacting antigens exist in some group A streptococci and the heart. The antibodies synthesized in response to the streptococcal infection react with antigens of heart causing cellular destruction and permanent damage. Therefore, the correct answer is (d).

Q. 25. Puerperal fever is caused by:

- (a) *Streptococcus pyogenes* (b) *Staphylococcus aureus*
- (c) *Pseudomonas aeruginosa* (d) *Escherichia coli*

Ans. (a)

Q. 26. CAMP test is based on enhanced haemolysis between CAMP factor and β -lysin from:

- (a) *Streptococcus agalactiae*
- (b) *Enterococcus faecalis*
- (c) *Staphylococcus aureus*
- (d) *Staphylococcus epidermidis*

Ans. (c) When *Streptococcus agalactiae* is inoculated perpendicular to a streak of *Staphylococcus aureus* (NCTC 1803) on a sheep or bovine blood agar plate, it leads to accentuated zone of haemolysis (butterfly appearance). This is known as CAMP test. Therefore, the correct answer is (c).

STREPTOCOCCUS PNEUMONIAE (PNEUMOCOCCUS)

Q. 1. Pneumococcal capsule can be demonstrated by:

- (a) Quellung reaction
- (b) Negative staining
- (c) Both of the above
- (d) None of the above

Ans. (c)

Q. 2. Draughtsman colony is characteristic of:

- (a) *Streptococcus pneumoniae*
- (b) *S. pyogenes*
- (c) *Enterococcus faecalis*
- (d) Viridans streptococci

Ans. (a) *Streptococcus pneumoniae*, after 18–24-hour incubation at 37°C, forms small, round, dome-shaped colony. On further incubation, the colonies develop a central depression because of autolysis with raised rim (draughtsman colony). Autolysis is due to autolytic enzyme produced by *S. pneumoniae*.

Q. 3. *Streptococcus pneumoniae* can be differentiated from viridans streptococci on the basis of which of the following tests?

- (a) Optochin sensitivity test
- (b) Bile solubility test
- (c) Inulin fermentation test
- (d) All of the above

Ans. (d)

Q. 4. Capsular polysaccharide of *Streptococcus pneumoniae* may cross-react with polysaccharides of:

- (a) *Klebsiella*
- (b) *Haemophilus influenzae* type b
- (c) *Escherichia coli*
- (d) All of the above

Ans. (d)

Q. 5. Pneumolysin is immunologically related to which of the following haemolysins?

- (a) *Clostridium tetani* haemolysin
- (b) *C. perfringens* haemolysin
- (c) Streptococcal oxygen-labile haemolysin
- (d) All of the above

Ans. (d)

Q. 6. Which of the following diseases is/are caused by *Streptococcus pneumoniae*?

- (a) Lobar pneumonia
- (b) Bronchopneumonia
- (c) Meningitis
- (d) All of the above

Ans. (d)

Q. 7. Pneumococcal antigen in CSF can be detected by:

- (a) Coagglutination
- (b) Latex agglutination
- (c) Counterimmunoelectrophoresis
- (d) All of the above

Ans. (d)

Q. 8. Isolation of pneumococci from clinical specimens may be attempted by intraperitoneal inoculation of:

- (a) Rabbits (b) Rats (c) Mice (d) Sheep

Ans. (c) In specimens where pneumococci are scanty, isolation may be obtained by intraperitoneal inoculation in mice, even if culture is negative. Inoculated mice die in 1–3 days, and *S. pneumoniae* may be demonstrated in the peritoneal exudate and heart blood.

Q. 9. Which of the following is **not** a property of *Streptococcus pneumoniae*?

- (a) Bacitracin sensitivity (b) Virulent to mice
- (c) Bile solubility (d) Fermentation of inulin

Ans. (a) Virulent to mice, bile solubility and fermentation of inulin are the properties of *Streptococcus pneumoniae*. *Streptococcus pneumoniae* is resistant to bacitracin. Therefore, the correct answer is (a).

Q. 10. Which of the following structures of *Streptococcus pneumoniae* provides protection against phagocytosis?

- (a) Capsule (b) Peptidoglycan
- (c) M protein (d) Cytoplasmic membrane

Ans. (a)

Q. 11. The optochin sensitivity is most valuable in the identification of:

- (a) *Streptococcus pneumoniae*
- (b) *Streptococcus pyogenes*
- (c) *Streptococcus agalactiae*
- (d) *Streptococcus dysgalactiae*

Ans. (a)

NEISSERIA

Q. 1. How many serogroups of *Neisseria meningitidis* are known?

- (a) Seven (b) Nine (c) Eleven (d) Twelve

Ans. (d)

Q. 2. Which of the following bacteria is non-pathogenic?

- (a) *N. meningitidis* (b) *N. gonorrhoeae*
- (c) *N. sicca* (d) *Moraxella catarrhalis*

Ans. (c)

Q. 3. Which of the following organisms is oxidase-negative?

- (a) *Neisseria meningitidis* (b) *Neisseria gonorrhoeae*
- (c) *Vibrio cholerae* (d) *Streptococcus pyogenes*

Ans. (d)

Q. 4. The causative agent of Waterhouse-Friderichsen syndrome is:

- (a) *Neisseria meningitidis* (b) *Treponema pallidum*
- (c) *Streptococcus pyogenes* (d) *Staphylococcus aureus*

Ans. (a) *Neisseria meningitidis* may cause massive bilateral haemorrhages in the adrenals. This leads to Waterhouse-Friderichsen syndrome.

Q. 5. Prophylaxis against meningococcal meningitis, in children, is done with:

- (a) Rifampicin (b) Gentamicin
- (c) Ciproflaxacin (d) Chloramphenicol

Ans. (a) Penicillin G is the treatment of choice in meningococcal meningitis. Rifampicin is recommended for chemoprophylaxis in children.

Q. 6. Which of the following antimicrobial agents is/are incorporated in Thayer-Martin medium?

- (a) Vancomycin (b) Colistin
- (c) Nystatin (d) All of the above

Ans. (d) Vancomycin, colistin and nystatin are added in Thayer-Martin medium. They inhibit Gram-positive bacteria, Gram-negative bacteria and fungi, respectively. It is used for isolation of *Neisseria gonorrhoeae*. Therefore, the correct answer is (d).

Q. 7. Which of the following gonococcal types is/are non-piliated?

- (a) T1 (b) T2 (c) T3 (d) T4

Ans. (c)

Q. 8. *Neisseria gonorrhoeae* possesses which of the following antigen/s?

- (a) Pilins
- (b) LPS
- (c) Outer membrane protein I
- (d) All of the above

Ans. (d)

Q. 9. Most common route of entry of gonococci inside the human body is:

- (a) Mucosa of genitourinary tract
- (b) Mucosa of alimentary canal
- (c) Mucosa of respiratory tract
- (d) Skin

Ans. (a) Gonorrhoea is a sexually transmitted disease, therefore, it is transmitted through the mucosa of genitourinary tract.

Q. 10. The causative agent/s of non-gonococcal urethritis is/are:

- (a) *Chlamydia trachomatis*
- (b) *Ureaplasma urealyticum*
- (c) *Trichomonas vaginalis*
- (d) All of the above

Ans. (d)

Q. 11. Ophthalmia neonatorum is caused by:

- (a) *Neisseria gonorrhoeae*
- (b) *Neisseria meningitidis*
- (c) *Neisseria subflava*
- (d) *Neisseria sicca*

Ans. (a) In women, endocervix is the primary site of infection with *Neisseria gonorrhoeae*. Babies born to infected women may contract gonococcal infection of the eye (ophthalmia neonatorum), from the endocervix of the mother. Therefore, the correct answer is (a).

Q. 12. Thayer-Martin medium is used for the isolation of:

- (a) *Staphylococcus aureus*
- (b) *Streptococcus pyogenes*
- (c) *Neisseria gonorrhoeae*
- (d) *Neisseria subflava*

Ans. (c) Refer to Q. No. 6 above

Q. 13. Serogrouping of *Neisseria meningitidis* is based on:

- (a) Flageller antigen
- (b) Fimbrial antigen
- (c) Capsular antigen
- (d) Somatic antigen

Ans. (c)

Q. 14. Capsule of *Neisseria meningitidis* is made up of:

- (a) Polysaccharide
- (b) Polypeptide
- (c) Hyaluronic acid
- (d) Polyphosphate

Ans. (a)

Q. 15. Virulence of *Neisseria gonorrhoeae* is due to:

- (a) Cell wall
- (b) Cell membrane
- (c) Pili
- (d) Protein I

Ans. (c)

Q. 16. Throat smear from a sexually-active 25-year-old male shows Gram-positive cocci in chains and Gram-negative diplococci. What is the significance of the Gram stain smear in this case?

- (a) It provides a rapid means of diagnosing the infection.
- (b) It is not useful as it is not possible to make a diagnosis this way.
- (c) It strongly suggests gonococcal pharyngitis.
- (d) It indicates infection with haemolytic streptococci and neisseriae.

Ans. (b) Throat contains plenty of normal flora. Therefore, Gram stain is not useful to make a diagnosis in this way.

Q. 17. An 18-year-old man was brought to emergency department with a petechial rash, headache, neck rigidity and vomiting. Which of the following describes the most likely causative agent?

- (a) Gram-negative cocci, capsulated, ferment glucose and maltose.
- (b) Gram-negative cocci, ferment glucose only.
- (c) Gram-negative coccobacilli capsular serotype b.
- (d) Gram-positive cocci, α -haemolytic, optochin sensitive.

Ans. (a)

Q. 18. Gonococci must possess which surface structures in order to attach to and colonize epithelial cells in the reproductive and urinary tracts?

- (a) Pili
- (b) Flagella
- (c) Capsule
- (d) Lipopolysaccharide

Ans. (a) Pili play an important role in the attachment and colonization of gonococci to the cell surface. Furthermore, pili are antiphagocytic.

Q. 19. Most cases of non-gonococcal urethritis are caused by:

- (a) *Trichomonas vaginalis*
- (b) *Chlamydia trachomatis*
- (c) *Haemophilus ducreyi*
- (d) *Treponema pallidum*

Ans. (b) Most cases of non-gonococcal urethritis are caused by *Chlamydia trachomatis*. *Trichomonas vaginalis* causes mild vaginitis with discharge. *Haemophilus ducreyi* and *Treponema pallidum* cause painful and painless genital ulcers, respectively.

Q. 20. With which of the following organisms a complication of infection (Waterhouse-Friderichsen syndrome) can occur if the organism becomes widely distributed in the body?

- (a) *Haemophilus influenzae* type b
- (b) *Neisseria meningitidis*
- (c) *Listeria monocytogenes*
- (d) *Streptococcus pneumoniae*

Ans. (b) Refer to Q. No. 4 above.

Q. 21. Which of the following is optimal specimen to be collected for the diagnosis of gonorrhoea by culture in males?

- (a) Urine
- (b) Urethral swab
- (c) Rectal swab
- (d) Pharyngeal swab

Ans. (b)

CORYNEBACTERIUM

Q. 1. Thin, slender and Gram-positive bacilli possessing metachromatic granules and showing Chinese letter arrangement are characteristic of:

- (a) *Mycobacterium tuberculosis*
- (b) *Corynebacterium diphtheriae*
- (c) *Bacillus anthracis*
- (d) *Clostridium perfringens*

Ans. (b) Refer to Q. No. 2 of morphology of bacteria.

Q. 2. What is the colour of colonies of *C. diphtheriae* on blood tellurite agar medium?

- (a) White
- (b) Grey to black
- (c) Cream
- (d) Yellow

Ans. (b) Blood tellurite agar contains potassium tellurite. When *Corynebacterium diphtheriae* grows on this medium it forms grey-to-black colonies because tellurite or tellurous ions are able to diffuse through the cell wall and membrane and are reduced to tellurium metal which is precipitated inside the cell.

Q. 3. Earliest growth of diphtheria bacilli can be detected on:

- (a) Blood agar
- (b) Blood tellurite agar
- (c) Loeffler's serum slope
- (d) Nutrient agar

Ans. (c) Diphtheria bacilli grow rapidly on Loeffler's serum slope, and colonies can be seen in 6–12 hours, long before other bacteria grow.

Q. 4. Which biotype of *Corynebacterium diphtheriae* is predominant in endemic areas?

- (a) Gravis
- (b) Intermedius
- (c) Mitis
- (d) Mitis and gravis

Ans. (c)

Q. 5. Which biotype/s of *Corynebacterium diphtheriae* ferment/s starch and glycogen?

- (a) Gravis
- (b) Intermedius
- (c) Mitis
- (d) All of the above

Ans. (a)

Q. 6. Which of the following properties is/are shown by diphtheria toxin?

- (a) It is a heat-labile protein
- (b) It inhibits protein synthesis
- (c) It is produced by *Corynebacterium diphtheriae* strains lysogenic for β -phage
- (d) All of the above

Ans. (d)

Q. 7. 'Daisy-head' appearance of colonies of *Corynebacterium diphtheriae* on blood tellurite agar is shown by:

- (a) Gravis biotype
- (b) Intermedius biotype
- (c) Mitis biotype
- (d) None of the above

Ans. (a)

Q. 8. Diphtheria toxin has a special affinity for which of the following tissue/s?

- (a) Heart muscles
- (b) Nerve endings
- (c) Adrenal glands
- (d) All of the above

Ans. (d) Diphtheria toxin has special affinity for certain tissues, notably heart muscles, nerve endings and adrenal glands. Death often results from cardiac failure. Therefore, the correct answer is (d).

Q. 9. Which of the following sites is most commonly affected by diphtheria bacilli?

- (a) Upper respiratory tract
- (b) Skin
- (c) Cornea
- (d) Conjunctiva

Ans. (a)

Q. 10. Which of the following bacteria can cause infection in immunocompetent patients?

- (a) *Corynebacterium ulcerans*
- (b) *C. minutissimum*

- (c) *C. pseudotuberculosis*
- (d) All of the above

Ans. (d)

Q. 11. *Corynebacterium diphtheriae* is known as:

- (a) Friedlander's bacillus
- (b) Klebs-Loeffler's bacillus
- (c) Koch-Weeks bacillus
- (d) Whitmore's bacillus

Ans. (b) *Corynebacterium diphtheriae* was observed and described by Klebs (1883) but was first cultured by Loeffler (1884). Therefore, it is known as Klebs-Loeffler bacillus.

Q. 12. Which of the following genetic materials is found in pathogenic *Corynebacterium diphtheriae* but not in non-pathogenic *C. diphtheriae*?

- (a) Plasmid
- (b) Transposon
- (c) Temperate phage
- (d) Highly repetitive bacterial DNA

Ans. (c)

Q. 13. In order to cause disease, *Corynebacterium diphtheriae* must:

- (a) Be infected with a lysogenic toxin-producing bacteriophage
- (b) Produce a haemolysin
- (c) Invade the bloodstream
- (d) Create a pseudomembrane

Ans. (a) Toxigenic *Corynebacterium diphtheriae* is lysogenic for β -phage or related temperate phage which carries tox gene. The latter codes for the production of diphtheria toxin.

BACILLUS

Q. 1. Koch's postulates were satisfied for the first time with:

- (a) *Bacillus anthracis*
- (b) *Clostridium tetani*
- (c) *Corynebacterium diphtheriae*
- (d) *Salmonella* serotype Typhi

Ans. (a)

Q. 2. McFadyean's reaction is employed for the presumptive diagnosis of:

- (a) Anthrax
- (b) Tetanus
- (c) Diphtheria
- (d) Typhoid

Ans. (a) *Bacillus anthracis* is surrounded by polypeptide capsule. When blood films containing anthrax bacilli are stained with polychrome methylene blue for a few seconds and

examined under microscope, an amorphous purplish material is noticed around the bacilli. This represents capsular material and is characteristic of anthrax bacilli.

Q. 3. 'Medusa head' appearance of the colonies is characteristic of:

- (a) *Proteus mirabilis* (b) *Clostridium tetani*
- (c) *Bacillus anthracis* (d) *Pseudomonas aeruginosa*

Ans. (c) When the edge of *Bacillus anthracis* colony on nutrient agar is examined under microscope, it is found to be composed of long, interlacing chains of bacilli, resembling curled hair lock. This is known as 'Medusa head' appearance.

Q. 4. Antibodies to which of the following antigen/s of *Bacillus anthracis* is/are protective?

- (a) Capsular polypeptide (b) Somatic polysaccharide
- (c) Protective antigen (d) None of the above

Ans. (c)

Q. 5. Malignant pustule is characteristic of:

- (a) Cutaneous anthrax (b) Pulmonary anthrax
- (c) Intestinal anthrax (d) All of the above

Ans. (a)

Q. 6. Ascoli's thermoprecipitin test helps in confirming the laboratory diagnosis of:

- (a) Anthrax (b) Tetanus (c) Typhoid (d) Cholera

Ans. (a)

Q. 7. *Bacillus cereus* causes:

- (a) Profuse diarrhoea
- (b) Meningitis
- (c) Sexually transmitted disease
- (d) Urinary tract infection

Ans. (a)

Q. 8. Which of the following bacteria is used to test the efficacy of autoclave?

- (a) *Bacillus stearothermophilus*
- (b) *B. polymyxa*
- (c) *B. brevis*
- (d) *B. megaterium*

Ans. (a) The spores of *Bacillus stearothermophilus* withstand 121°C for 12 minutes. Therefore, this has made the organism ideal for testing autoclave.

Q. 9. Which of the following foods is most often associated with emetic type of food poisoning caused by *Bacillus cereus*?

- (a) Meat
- (b) Milk
- (c) Eggs
- (d) Rice

Ans. (d) Most of the outbreaks of emetic syndrome have been associated with boiled or fried rice served in oriental restaurants. The spores of certain strains of *Bacillus cereus* found in raw rice survive on boiling. When boiled rice is stored at room temperature rather than in the refrigerator (to avoid clumping of grains), the spores germinate and produce heat-stable toxin within the rice prior to preparation of fried rice. Flash frying does not always destroy heat-stable toxin.

Q. 10. Which of the following tests can differentiate anthrax bacilli from anthracoid bacilli?

- (a) Presence of capsule
- (b) Susceptibility to gamma phage
- (c) Presence of 'medusa-head' colony
- (d) All of the above

Ans. (d)

Q. 11. Which of the following bacteria gives inverted fir tree appearance in gelatin stab culture?

- (a) *Bacillus anthracis*
- (b) *Yersinia pestis*
- (c) *Clostridium perfringens*
- (d) *Corynebacterium diphtheriae*

Ans. (a) In gelatin stab culture of *Bacillus anthracis*, there is growth down the stab line with lateral spikes that are longest near the surface, giving 'inverted fir tree' appearance with slow liquefaction commencing from the top.

Q. 12. An organism that can cause cutaneous infection and can be transmitted by spores is:

- (a) *Staphylococcus aureus*
- (b) *Streptococcus pyogenes*
- (c) *Yersinia pestis*
- (d) *Bacillus anthracis*

Ans. (d) *Staphylococcus aureus*, *Streptococcus pyogenes* and *Yersinia pestis* are non-sporing organisms. *Bacillus anthracis* is spore-forming bacillus and causes cutaneous, pulmonary and intestinal anthrax. Therefore, the correct answer is (d).

CLOSTRIDIUM

Q. 1. Which of the following species of *Clostridium* is/are predominantly saccharolytic?

- (a) *C. perfringens* (b) *C. septicum*
(c) *C. tertium* (d) All of the above

Ans. (d)

Q. 2. Reddening of meat in cooked meat broth is produced by:

- (a) *Clostridium perfringens* (b) *C. tetani*
(c) *C. histolyticum* (d) *C. sporogenes*

Ans. (a) When grown in cooked meat broth, *Clostridium perfringens* rapidly produces acid and gas and meat is often reddened.

Q. 3. Blackening of meat in cooked meat broth is produced by:

- (a) *Clostridium perfringens* (b) *C. septicum*
(c) *C. histolyticum* (d) All of the above

Ans. (c) When grown in cooked meat broth, *Clostridium histolyticum* digests protein and produces blackening of meat.

Q. 4. Which of the following types of *Clostridium perfringens* produces alpha toxin most abundantly?

- (a) Type A (b) Type B (c) Type C (d) Type D

Ans. (a)

Q. 5. Nagler's reaction is useful for the identification of:

- (a) *Clostridium tetani* (b) *C. perfringens*
(c) *C. botulinum* (d) *C. difficile*

Ans. (b) Nagler's reaction is *in vitro* toxin-antitoxin neutralization test. It is positive in *Clostridium perfringens* infection.

Q. 6. The causative agent/s of gas gangrene is/are:

- (a) *Clostridium perfringens* (b) *C. novyi*
(c) *C. septicum* (d) All of the above

Ans. (d)

Q. 7. Food poisoning strains of *Clostridium perfringens* belong to:

- (a) Type A (b) Type B (c) Type C (d) Type D

Ans. (a) Strains of *Clostridium perfringens* type A produce enterotoxin and are associated with mild form of food poisoning.

Q. 8. Invasion of healthy muscle tissue is characteristic of:

- (a) Wound contamination (b) Clostridial cellulitis
(c) Clostridial myonecrosis (d) All of the above

Ans. (c) Invasion of healthy muscle tissue is characteristic of clostridial myonecrosis or gas gangrene.

Q. 9. Stormy clot reaction is useful in identification of:

- (a) *Clostridium perfringens* (b) *C. tetani*
- (c) *C. botulinum* (d) *C. difficile*

Ans. (a) In litmus milk medium, *Clostridium perfringens* ferments lactose and produces acid and gas. The acid clots the milk and the gas breaks up the clot resulting in stormy clot reaction.

Q. 10. Which of the following antimicrobial agents is/are associated with pseudomembranous colitis?

- (a) Clindamycin (b) Ampicillin
- (c) Both of the above (d) None of the above

Ans. (c) Administration of clindamycin and ampicillin to a patient leads to killing of antibiotic-sensitive organisms and overgrowth of *Clostridium difficile* in the intestine leading to pseudomembranous colitis.

Q. 11. Contamination of umbilical cord at birth may lead to infection by:

- (a) *Clostridium difficile* (b) *C. tetani*
- (c) *C. botulinum* (d) *C. histolyticum*

Ans. (b) Tetanus neonatorum follows application of dung ash or soil to the umbilical stump which may contain spores of *Clostridium tetani*.

Q. 12. Which of the following properties is/are characteristic of tetanospasmin?

- (a) It is a heat-labile protein
- (b) It is a neurotoxin
- (c) It can be toxoided
- (d) All of the above

Ans. (d)

Q. 13. Drumstick appearance is characteristic of:

- (a) *Clostridium tetani* (b) *C. tetanomorphum*
- (c) *C. sphenoides* (d) All of the above

Ans. (d)

Q. 14. Which of the following exotoxins is most toxic?

- (a) Botulinum toxin (b) Tetanus toxin
- (c) Diphtheria toxin (d) Cholera toxin

Ans. (a) Botulinum toxin is the most toxic substance known to the mankind. Minimal lethal dose of this toxin, for a mouse, is 0.03 ng and that for humans may be 1 µg. Tetanus toxin is second in potency.

Q. 15. *Clostridium botulinum* food poisoning is due to:

- (a) Preformed toxin
- (b) Invasion of bacteria in the intestine
- (c) Both of the above
- (d) None of the above

Ans. (a)

Q. 16. Which of the following types of exotoxin is/are most commonly associated with botulism in man?

- (a) Type A
- (b) Type B
- (c) Type E
- (d) All of the above

Ans. (d)

Q. 17. Floppy child syndrome is associated with:

- (a) *Clostridium botulinum* infection
- (b) *C. tetani* infection
- (c) *C. perfringens* infection
- (d) All of the above

Ans. (a) Spores of *Clostridium botulinum* are present in the soil. Infants (3 weeks to 9 months in age) ingest spores but not preformed toxin from soil, household dust, honey, etc. Within the intestine, *C. botulinum* multiplies and elaborates toxin and the patient develops floppy child syndrome.

Q. 18. Which of the following bacteria may show swarming on blood agar?

- (a) *Clostridium perfringens*
- (b) *C. septicum*
- (c) *C. tetani*
- (d) *C. botulinum*

Ans. (c)

Q. 19. Which of the following exotoxins resembles strychnine in its effect?

- (a) Botulinum toxin
- (b) Tetanospasmin
- (c) Diphtheria toxin
- (d) None of the above

Ans. (b) Tetanospasmin resembles strychnine in its effect. It appears to act by interfering with the normal inhibition of motor impulses exercised by the upper motor neuron over the lower.

Q. 20. Antitoxic therapy is useful in:

- (a) Gas gangrene
- (b) Diphtheria
- (c) Both of the above
- (d) None of the above

Ans. (c) Administration of gas gangrene and diphtheria anti-toxins neutralizes gas gangrene and diphtheria toxins,

respectively. Administration of antibiotics kills the bacteria so that there is no further production of toxins. Therefore, the correct answer is (c).

Q. 21. A person is considered non-immune for tetanus if:

- (a) He has never had an injection of tetanus toxoid or if he had only one such injection.
- (b) More than 6 months have passed after a course of 2 injections.
- (c) Five to 10 years have passed after the planned course of three injections.
- (d) All of the above.

Ans. (d)

Q. 22. Nagler's reaction is mediated by:

- (a) Coagulase
- (b) Hyaluronidase
- (c) Deoxyribonuclease
- (d) Phospholipase

Ans. (d) Phospholipase is Ca^{2+} - or Mg^{2+} -dependent toxin produced by *Clostridium perfringens*. In the presence of free Ca^{2+} or Mg^{2+} , it produces opalescence (Nagler's reaction) in serum- or egg yolk-containing media by splitting phospholipid complexes.

Q. 23. Pseudomembranous colitis is caused by:

- (a) *Clostridium perfringens*
- (b) *C. difficile*
- (c) *C. tetani*
- (d) *C. botulinum*

Ans. (b) Refer to Q. No. 10 above.

Q. 24. Gas gangrene is caused by:

- (a) *Staphylococcus aureus*
- (b) *Streptococcus pneumoniae*
- (c) *Pseudomonas aeruginosa*
- (d) *Clostridium perfringens*

Ans. (d)

MYCOBACTERIUM TUBERCULOSIS

Q. 1. Which of the following bacteria cause/s tuberculosis in man?

- (a) *Mycobacterium tuberculosis*
- (b) *M. bovis*
- (c) *M. africanum*
- (d) All of the above

Ans. (d) Human tuberculosis is caused by *Mycobacterium tuberculosis* complex. *M. tuberculosis*, *M. bovis* and *M. africanum* are important members of this complex. Therefore, the correct answer is (d).

Q. 2. The causative agent of Buruli ulcer is:

- (a) *Mycobacterium ulcerans* (b) *M. marinum*
- (c) *M. chelonae* (d) *M. fortuitum*

Ans. (a)

Q. 3. Eugonic growth on Lowenstein-Jensen medium is produced by:

- (a) *Mycobacterium tuberculosis* (b) *M. bovis*
- (c) Both of the above (d) None of the above

Ans. (a) *Mycobacterium tuberculosis* grows well on LJ medium (eugonic growth). It grows as rough, tough and buff colonies. *M. bovis* grows poorly on LJ medium (dysgonic growth).

Q. 4. Nitrate reduction test is positive in:

- (a) *Mycobacterium tuberculosis* (b) *M. fortuitum*
- (c) *M. chelonae* (d) All of the above

Ans. (d)

Q. 5. Which of the following bacteria is/are sensitive to pyrazinamide?

- (a) *Mycobacterium tuberculosis*
- (b) *M. bovis*
- (c) Both of the above
- (d) None of the above

Ans. (a)

Q. 6. Which of the following bacteria is/are sensitive to thiophen-2-carboxylic acid hydrazide?

- (a) *Mycobacterium tuberculosis*
- (b) *M. bovis*
- (c) Both of the above
- (d) None of the above

Ans. (b)

Q. 7. Which of the following bacteria is/are microaerophilic on primary isolation?

- (a) *Mycobacterium tuberculosis*
- (b) *M. bovis*
- (c) Both of the above
- (d) None of the above

Ans. (b) *Mycobacterium tuberculosis* is an obligate aerobe while *M. bovis* is microaerophilic on primary isolation becoming aerobic on subculture.

Q. 8. Which of the following phage types of *Mycobacterium tuberculosis* occurs most frequently in India?

- (a) Type A (b) Type B (c) Type C (d) Type I

Ans. (d)

Q. 9. Humans become infected with *Mycobacterium tuberculosis* most frequently by:

- (a) Inhalation (b) Ingestion
(c) Contact (d) Inoculation

Ans. (a) Humans become infected with *Mycobacterium tuberculosis* most frequently by inhaling infective droplets coughed or sneezed into air by a patient with tuberculosis. Therefore, the correct answer is (a).

Q. 10. Usual dose of purified protein derivative in Mantoux test is:

- (a) 5 TU (b) 50 TU (c) 100 TU (d) 150 TU

Ans. (a) 0.1 ml of purified protein derivative containing 5 tuberculin units (TU) is injected intracutaneously into the skin of the volar aspect of the forearm. If the reaction is completely negative with 5 TU, test may be repeated with 100 TU.

Q. 11. A positive Mantoux test is indicated by an area of palpable, firm induration of:

- (a) 10 mm or more in diameter
(b) 5–9 mm in diameter
(c) 3–4 mm in diameter
(d) None of the above

Ans. (a) The development of an area of palpable, firm induration 10 mm or more in diameter is recorded as positive, and those between 5 and 9 mm in diameter as doubtful.

Q. 12. False negative Mantoux test is observed in:

- (a) Early tuberculosis (b) Advanced tuberculosis
(c) Miliary tuberculosis (d) All of the above

Ans. (d)

Q. 13. For direct detection of tubercle bacilli in sputum, by Ziehl-Neelsen method, there must be present:

- (a) 50–100 bacilli per ml
(b) 500–1,000 bacilli per ml
(c) 5,000–10,000 bacilli per ml
(d) 50,000–100,000 bacilli per ml

Ans. (d)

Q. 14. Culture of tubercle bacilli may be positive if the minimum number of bacteria in the specimen is:

- (a) As few as 1–4 per ml (b) As few as 5–9 per ml
(c) As few as 10–100 per ml (d) As few as 150–200 per ml

Ans. (c)

Q. 15. BCG vaccine is a:

- (a) Live attenuated preparation
(b) Killed preparation
(c) Toxoid preparation
(d) Recombinant preparation

Ans. (a)

Q. 16. 'Rough, tough and buff' colonies on LJ medium are characteristic of:

- (a) *Mycobacterium tuberculosis* (b) *M. bovis*
(c) Both of the above (d) None of the above

Ans. (a) Refer to Q. No. 3 above.

Q. 17. *Mycobacterium tuberculosis* is pathogenic for:

- (a) Rabbits (b) Guinea-pigs
(c) Both of the above (d) None of the above

Ans. (b) *Mycobacterium tuberculosis* is pathogenic for guinea-pigs, while *M. bovis* is pathogenic for both guinea-pigs and rabbits.

Q. 18. Members of the genus *Mycobacterium* are:

- (a) Gram-positive (b) Acid-fast
(c) Non-motile (d) All of the above

Ans. (d)

Q. 19. Which of the following bacteria is saprophytic?

- (a) *Mycobacterium chelonae* (b) *M. smegmatis*
(c) *M. xenopi* (d) *M. marinum*

Ans. (b) *Mycobacterium smegmatis* is a saprophytic mycobacterium. It is normally present in smegma, a whitish secretion around the orifice of urethra. It is a frequent contaminant of urine specimens.

Q. 20. Catalase-negative and INH-resistant strains, and most strains of *Mycobacterium tuberculosis* isolated from South India have:

- (a) Low virulence (b) Same virulence
(c) High virulence (d) None of the above

Ans. (a) Catalase-negative and INH-resistant strains, and most strains of *Mycobacterium tuberculosis* isolated from

South India have low virulence. The animal inoculated with strains of low virulence may have to be observed for 12 weeks or longer and sometimes the only lesion demonstrable may be an enlarged lymph node.

Q. 21. Acid-fastness of tubercle bacilli is attributed to the presence of:

- (a) Cord factor
- (b) Mycolic acid
- (c) Arabinogalactan
- (d) Peptidoglycan

Ans. (b) Acid-fastness of tubercle bacilli is attributed to the presence of high content of lipids, fatty acids and higher alcohols in acid-fast bacteria. Of the lipids, mycolic acid is most important. It is acid-fast even in free state.

Q. 22. Which of the following mycobacteria reduces nitrate to nitrite and is niacin-positive?

- (a) *Mycobacterium kansasii*
- (b) *M. xenopi*
- (c) *M. tuberculosis*
- (d) *M. avium* complex

Ans. (c)

Q. 23. Tuberculin test:

- (a) Detects antimicrobial antibodies.
- (b) Detects a cell-mediated immune response to antimicrobial antigens.
- (c) Uses a bacillus of Calmette-Guérin strain as the antigen.
- (d) Is useful for the treatment of tuberculosis.

Ans. (b) The principle of tuberculin test is type-IV or delayed hypersensitivity. Therefore, the correct answer is (b).

NON-TUBERCULOUS MYCOBACTERIA

Q. 1. Which of the following bacteria is a photochromogen?

- (a) *Mycobacterium kansasii*
- (b) *M. xenopi*
- (c) *M. avium*
- (d) *M. fortuitum*

Ans. (a)

Q. 2. Which of the following bacteria is a scotochromogen?

- (a) *Mycobacterium kansasii*
- (b) *M. scrofulaceum*
- (c) *M. xenopi*
- (d) *M. chelonae*

Ans. (b)

Q. 3. Which of the following bacteria is a non-chromogen?

- (a) *Mycobacterium marinum*
- (b) *M. gordonae*
- (c) *M. ulcerans*
- (d) *M. chelonae*

Ans. (c)

Q. 4. Which of the following bacteria is a rapid grower?

- (a) *Mycobacterium kansasii* (b) *M. gordonae*
(c) *M. ulcerans* (d) *M. chelonae*

Ans. (d)

Q. 5. Which of the following bacteria cause/s pulmonary disease?

- (a) *Mycobacterium avium-intracellulare*
(b) *M. kansasii*
(c) *M. xenopi*
(d) All of the above

Ans. (d)

Q. 6. Swimming pool granuloma is caused by:

- (a) *Mycobacterium marinum* (b) *M. ulcerans*
(c) *M. chelonae* (d) *M. fortuitum*

Ans. (a)

Q. 7. Chronic abscess formation is observed in infection with:

- (a) *Mycobacterium chelonae* (b) *M. fortuitum*
(c) Both of the above (d) None of the above

Ans. (c) Only two of the four rapid growers *Mycobacterium chelonae* and *M. fortuitum* are human pathogens. They are found in soil and lead to chronic abscess formation following injury. Therefore, the correct answer is (c).

Q. 8. Which of the following mycobacteria was known as Battey bacillus?

- (a) *Mycobacterium intracellulare* (b) *Mycobacterium kansasii*
(c) *Mycobacterium ulcerans* (d) *Mycobacterium marinum*

Ans. (a) *Mycobacterium intracellulare* was first detected in Battey State Hospital for tuberculosis in Georgia, USA. It is, therefore, also known as Battey bacillus.

Q. 9. Which of the following mycobacteria causes cervical lymphadenitis in children?

- (a) *Mycobacterium kansasii*
(b) *Mycobacterium ulcerans*
(c) *Mycobacterium scrofulaceum*
(d) *Mycobacterium fortuitum*

Ans. (c) *Mycobacterium scrofulaceum* causes scrofula (cervical lymphadenitis) in children.

Q. 10. Which of the following mycobacteria is often found in water?

- (a) *Mycobacterium kansasii* (b) *Mycobacterium gordonae*
(c) *Mycobacterium chelonae* (d) *Mycobacterium fortuitum*

Ans. (b) *Mycobacterium gordonae* is often found in water. It is a frequent contaminant of clinical specimens and is a rare cause of pulmonary disease.

Q. 11. Which of the following mycobacteria causes Buruli ulcer?

- (a) *Mycobacterium kansasii* (b) *Mycobacterium fortuitum*
(c) *Mycobacterium marinum* (d) *Mycobacterium ulcerans*

Ans. (d) *Mycobacterium ulcerans* is the causative agent of Buruli ulcer. The name Buruli ulcer is derived from the Buruli district of Uganda where a large outbreak of the disease was extensively investigated.

MYCOBACTERIUM LEPRAE

Q. 1. Concentration of sulphuric acid employed for decolourization in Ziehl-Neelsen staining for *Mycobacterium leprae* is:

- (a) 1% (b) 5% (c) 10% (d) 20%

Ans. (b) Refer to Q. No. 3 in identification of bacteria and taxonomy.

Q. 2. Which of the following animal models can be used for cultivation of *Mycobacterium leprae*?

- (a) Mice (b) Nine-banded armadillos
(c) Slender loris (d) All of the above

Ans. (d)

Q. 3. The generation time of *Mycobacterium leprae* is:

- (a) 12–13 minutes (b) 12–13 hours
(c) 12–13 days (d) 12–13 weeks

Ans. (c)

Q. 4. Leprosy may be acquired by a susceptible person by:

- (a) Skin-to-skin contact (b) Respiratory tract
(c) Both of the above (d) None of the above

Ans. (c) Leprosy is an exclusively human disease. Infection may be acquired by way of skin-to-skin contact or through respiratory tract. Therefore, the correct answer is (c).

Q. 5. Tuberculoid form of leprosy is seen in patients with:

- (a) Good cell-mediated immunity
(b) Good humoral immunity
(c) Poor cell-mediated immunity
(d) Poor humoral immunity

Ans. (a) Tuberculoid form of leprosy is seen in patients with high degree of resistance where cell-mediated immunity is intact. Lepromatous leprosy is seen in patients whose cell-mediated immunity is suppressed.

Q. 6. Which of the following types of leprosy is the most infectious?

- (a) Lepromatous leprosy
- (b) Tuberculoid leprosy
- (c) Borderline tuberculoid leprosy
- (d) Mid-borderline leprosy

Ans. (a) Lepromatous leprosy is multibacillary disease. It is more infectious than other types and has a poor prognosis.

Q. 7. Lesions are infiltrated with lymphocytes and epithelioid cells in:

- (a) Reversal reaction in leprosy
- (b) Erythema nodosum leprosum
- (c) Both of the above
- (d) None of the above

Ans. (a) Reversal reaction in leprosy occurs in borderline leprosy (BT, BB and BL) cases who develop cell-mediated immunity and consequently shift towards tuberculoid part of the spectrum. The skin lesions are infiltrated with lymphocytes and epithelioid cells with reduction in number of bacilli.

Q. 8. Intense neutrophilic infiltration of lesions is seen in:

- (a) Reversal reaction in leprosy
- (b) Erythema nodosum leprosum
- (c) Both of the above
- (d) None of the above

Ans. (b) Erythema nodosum leprosum is usually seen in lepromatous leprosy patients undergoing chemotherapy. Clinically, crops of red nodules appear in the skin, lasting for 1–2 days. The lesions show intense neutrophilic infiltration.

Q. 9. Mitsuda reaction in lepromin test appears after:

- (a) 24–48 hours
- (b) 3 days
- (c) 5 days
- (d) 1–2 weeks

Ans. (d) Mitsuda reaction is not a measure of pre-existing delayed type hypersensitivity, but it is the manifestation of cell-mediated immunity which the lepromin itself has induced. Therefore, it appears in 1–2 weeks after injection.

Q. 10. Fernandez reaction in lepromin test appears in:

- (a) 1–2 days
- (b) 3 days
- (c) 2 weeks
- (d) 3–4 weeks

Ans. (a) Fernandez reaction is like tuberculin reaction, a delayed type hypersensitivity. It appears in 1–2 days. This reaction indicates that the patient has been infected some time in the past.

Q. 11. As a result of chemotherapy lepra bacilli disappear more rapidly from:

- (a) Nose
- (b) Skin
- (c) Both of the above
- (d) None of the above

Ans. (a)

Q. 12. Nasal scrapings are positive in:

- (a) Lepromatous leprosy
- (b) Tuberculoid leprosy
- (c) Borderline tuberculoid leprosy
- (d) Mid-borderline leprosy

Ans. (a)

Q. 13. Serodiagnosis of leprosy may be carried out by:

- (a) Latex agglutination test
- (b) Particle agglutination test
- (c) ELISA test
- (d) All of the above

Ans. (d)

Q. 14. The first member of the genus *Mycobacterium* identified was:

- (a) *M. leprae*
- (b) *M. tuberculosis*
- (c) *M. phlei*
- (d) *M. africanum*

Ans. (a) The first member of the genus *Mycobacterium* identified was *M. leprae* by Hansen in 1874. Eight years later, Robert Koch (1882) discovered *M. tuberculosis*.

Q. 15. Cell-mediated immunity is suppressed in:

- (a) Tuberculoid leprosy
- (b) Lepromatous leprosy
- (c) Both of the above
- (d) None of the above

Ans. (b) Refer to Q. No. 5 above.

Q. 16. Lepromin test is clearly negative in:

- (a) Tuberculoid leprosy
- (b) Borderline tuberculoid leprosy
- (c) Borderline lepromatous leprosy
- (d) Lepromatous leprosy

Ans. (d) Lepromin test is strongly positive in tuberculoid type of leprosy, and because of the suppressed cell-mediated immunity in lepromatous leprosy lepromin test is clearly negative.

Q. 17. Leprosy lesions containing numerous acid-fast bacilli are seen in:

- (a) Tuberculoid leprosy (b) Lepromatous leprosy
- (c) Both of the above (d) None of the above

Ans. (b) Lepromatous leprosy is multibacillary disease, therefore, numerous acid-fast bacilli are seen in this disease.

Q. 18. Which of the following can be used for cultivation of *Mycobacterium leprae*?

- (a) Brain heart infusion agar
- (b) Chorioallantoic membrane of chick embryo
- (c) Footpad of mouse
- (d) All of the above

Ans. (c) *Mycobacterium leprae* has not been cultured so far in artificial culture media and in chick embryo. However, it has been cultivated in the footpad of the mouse.

Q. 19. Which of the following bacteria has capacity to enter into nerves?

- (a) *Clostridium tetani* (b) *Mycobacterium leprae*
- (c) *Corynebacterium diphtheriae* (d) *Clostridium botulinum*

Ans. (b) *Mycobacterium leprae* is the only bacterium which has capacity to enter into nerves.

Q. 20. Who discovered *Mycobacterium leprae*?

- (a) Robert Koch (b) Louis Pasteur
- (c) Hansen (d) Dharmendra

Ans. (c) Refer to Q. No. 14 above.

Q. 21. *Mycobacterium leprae*:

- (a) Is highly contagious
- (b) Readily grows on Lowenstein-Jensen medium
- (c) Grows best at 37°C
- (d) None of the above

Ans. (d)

Q. 22. Which of the following animals is highly susceptible to *Mycobacterium leprae*?

- (a) Mouse
- (b) Nine-banded armadillo
- (c) Guinea pig
- (d) Rabbit

Ans. (b) Nine-banded armadillo is highly susceptible to leprosy. This is presumably due to low body temperature.

NON-SPORING ANAEROBES

Q. 1. Which of the following bacteria are predominant flora of the human gut?

- (a) *Escherichia coli*
- (b) *Anaerobic bacteria*
- (c) *Enterococcus faecalis*
- (d) *Actinomyces*

Ans. (b) In the gut, the anaerobic bacteria outnumber the aerobes (*Escherichia coli*) by a ratio of 1000 : 1. Therefore, the correct answer is (b).

Q. 2. Which of the following bacteria is Gram-negative organism?

- (a) *Peptococcus*
- (b) *Peptostreptococcus*
- (c) *Bifidobacterium*
- (d) *Veillonella*

Ans. (d) *Peptococcus*, *Peptostreptococcus* and *Bifidobacterium* are Gram-positive and *Veillonella* is Gram-negative organism.

Q. 3. Which is the commonest anaerobic coccus associated with puerperal infection?

- (a) *Peptostreptococcus anaerobius*
- (b) *P. magnus*
- (c) *P. indolicus*
- (d) *P. productus*

Ans. (a) The genus *Peptostreptococcus* has nine species. Of these *P. anaerobius* and *P. magnus* are the commonest anaerobic Gram-positive cocci isolated from wound infections. *P. anaerobius* is the anaerobic coccus most commonly associated with puerperal infection.

Q. 4. Lactobacilli constitute the normal flora of:

- (a) Adult vagina
- (b) Prepubertal vagina
- (c) Post-menopausal vagina
- (d) None of the above

Ans. (a) Lactobacilli are normally present in mouth, gut and in adult vagina. In prepubertal and postmenopausal vagina, lactobacilli are scanty.

Q. 5. Which of the following genera is/are included in the family Bacteroidaceae?

- (a) *Bacteroides*
- (b) *Fusobacterium*
- (c) *Leptotrichia*
- (d) All of the above

Ans. (d) Family Bacteroidaceae possesses five genera, three of these are *Bacteroides*, *Fusobacterium* and *Leptotrichia*. Therefore, the correct answer is (d).

Q. 6. Which of the following bacterial colonies fluoresce brick-red in UV light?

- (a) *Bacteroides fragilis* (b) *B. melaninogenica*
- (c) *B. gingivalis* (d) *B. levii*

Ans. (b)

Q. 7. An atherosclerotic 85-year-old man develops a pelvic abscess following a ruptured appendix. What is/are the most likely causative agent(s)?

- (a) *Staphylococcus aureus*
- (b) *Bacteroides* species and microaerophilic streptococci
- (c) *Enterobacter aerogenes*
- (d) *Enterococcus faecalis*

Ans. (b)

SPIROCHAETES

Q. 1. Which of the following genus/genera belong/s to family Spirochaetaceae?

- (a) *Spirochaeta* (b) *Treponema*
- (c) *Borrelia* (d) All of the above

Ans. (d) Family Spirochaetaceae possesses four genera of which three are *Spirochaeta*, *Treponema* and *Borrelia*. Therefore, the correct answer is (d).

Q. 2. Which of the following genera does not belong to family Spirochaetaceae?

- (a) *Leptospira* (b) *Spirochaeta* (c) *Treponema* (d) *Borrelia*

Ans. (a) Genus *Leptospira* belongs to the family Leptospiraceae. *Spirochaeta*, *Treponema* and *Borrelia* belong to the family Spirochaetaceae. Therefore, the correct answer is (a).

Q. 3. Three or occasionally four endoflagella are present at each pole in:

- (a) *Treponema* (b) *Borrelia*
- (c) *Leptospira* (d) *Vibrio cholerae*

Ans. (a) *Treponema*, *Borrelia* and *Leptospira* possess 3 or occasionally 4, 15–20 and 1 endoflagella, respectively, at each pole. *Vibrio cholerae* possesses one polar flagellum. Therefore, the correct answer is (a).

Q. 4. A single endoflagellum is present at each pole in:

- (a) *Treponema* (b) *Borrelia*
- (c) *Leptospira* (d) None of the above

Ans. (c) Refer to Q. No. 3 above.

Q. 5. Spirochaetes exhibit:

- (a) Flexion and extension motility
- (b) Corkscrew-like rotatory movement
- (c) Translatory motion
- (d) All of the above

Ans. (d)

Q. 6. Which of the following staining techniques cannot be used for *T. pallidum*?

- (a) Gram staining
- (b) Giemsa staining
- (c) Silver impregnation staining
- (d) Immunofluorescence staining

Ans. (a) *Treponema pallidum* cannot be stained by Gram staining. It can be stained by Giemsa staining, silver impregnation staining and immunofluorescence staining.

Q. 7. *Treponema pallidum* can be cultivated in:

- (a) Rabbit testes
- (b) Blood agar medium
- (c) Chocolate agar medium
- (d) Thayer-Martin medium

Ans. (a) *Treponema pallidum* cannot be cultivated in artificial media. It can be grown in rabbit testes.

Q. 8. Which of the following techniques can be used for inactivation of *Treponema pallidum*?

- (a) Heating at 41.5°C for 1 hour
- (b) Storing at 5°C for 5 days
- (c) Lyophilization
- (d) All of the above

Ans. (d) *Treponema pallidum* is a delicate organism, therefore, it can be inactivated by all the methods listed in (a), (b) and (c). Therefore, the correct answer is (d).

Q. 9. Group-specific antigen of *Treponema* is chemically a:

- (a) Protein
- (b) Polysaccharide
- (c) Lipid
- (d) Nucleic acid

Ans. (a)

Q. 10. Species-specific antigen of *Treponema pallidum* is chemically a:

- (a) Protein
- (b) Polysaccharide
- (c) Lipid
- (d) Nucleic acid

Ans. (b)

Q. 11. Appearance of a hard chancre is characteristic of:

- (a) Primary syphilis
- (b) Secondary syphilis
- (c) Latent syphilis
- (d) Tertiary syphilis

Ans. (a)

Q. 12. Which of the following features is/are characteristic of secondary syphilis?

- (a) Mucous patches in oropharynx
- (b) Condylomata at mucocutaneous junctions
- (c) Diffuse erythematous cutaneous lesions
- (d) All of the above

Ans. (d)

Q. 13. *Treponema pallidum* cannot be demonstrated by microscopy in:

- (a) Primary syphilis
- (b) Secondary syphilis
- (c) Latent syphilis
- (d) All of the above

Ans. (c) After the secondary lesions disappear, the disease becomes latent. Causative organisms cannot be demonstrated by microscopy in latent syphilis. The diagnosis can be made only by serological tests.

Q. 14. Which of the following techniques is/are suitable for demonstration of *Treponema pallidum* in exudates?

- (a) Dark-ground microscopy
- (b) Direct fluorescent-antibody staining for *Treponema pallidum*
- (c) Both of the above
- (d) None of the above

Ans. (c)

Q. 15. Which of the following tests is performed most often for the serodiagnosis of syphilis?

- (a) VDRL test
- (b) Kahn test
- (c) Wassermann reaction
- (d) Reiter protein complement fixation test

Ans. (a) VDRL test is the most widely used simple and rapid test for the diagnosis of syphilis.

Q. 16. Which of the following serological tests is based upon the use of *Treponema pallidum* extract?

- (a) TPA test
- (b) TPIA test
- (c) TPHA test
- (d) TPI test

Ans. (c) In *Treponema pallidum*, haemagglutination (TPHA) test, *T. pallidum* antigen is adsorbed onto the surface of red

blood cells. When these red blood cells are mixed with patient serum, specific antibody causes haemagglutination.

Q. 17. Which of the following tests is performed to demonstrate congenital syphilis?

- (a) FTA-ABS test
- (b) IgM FTA-ABS test
- (c) TPI test
- (d) TPHA test

Ans. (b) The IgM FTA-ABS test can detect IgM antibodies produced by the infected foetus in congenital syphilis, thus, distinguishing it from seropositivity due to passively transferred maternal antibodies which are IgG in nature. IgM antibodies cannot cross the placental barrier, therefore, these have been produced by infected foetus (congenital syphilis).

Q. 18. Following antibiotic therapy, Jarisch-Herxheimer reaction may be observed in:

- (a) Syphilis
- (b) Relapsing fever
- (c) Lyme disease
- (d) All of the above

Ans. (d)

Q. 19. Which of the following diseases is/are non-venereal?

- (a) Endemic syphilis
- (b) Yaws
- (c) Pinta
- (d) All of the above

Ans. (d) Non-venereal treponemal diseases occur in several parts of the world, in communities with poor standards of hygiene. These diseases include endemic syphilis, yaws and pinta. Therefore, the correct answer is (d).

Q. 20. Which of the following bacteria has/have been blamed to cause Vincent's angina?

- (a) *Borrelia vincentii*
- (b) *Leptotrichia buccalis*
- (c) Both of the above
- (d) None of the above

Ans. (c) *Borrelia vincentii* is a normal commensal of the mouth but may, under predisposing conditions, such as malnutrition or viral infections, give rise to Vincent's angina. In this disease, *B. vincentii* is often associated with *Leptotrichia buccalis*. Therefore, the correct answer is (c).

Q. 21. Louse-borne relapsing fever is caused by:

- (a) *Borrelia recurrentis*
- (b) *B. duttoni*
- (c) *B. burgdorferi*
- (d) *B. parkeri*

Ans. (a) Louse-borne relapsing fever is caused by *Borrelia recurrentis*. It is transmitted by infected vector body louse (*Pediculus corporis*).

Q. 22. Relapses in relapsing fever occur due to:

- (a) Antigenic variation in bacteria
- (b) Increased toxin production by bacteria
- (c) Increased invasiveness of bacteria
- (d) Superinfection with viruses

Ans. (a) The borreliae readily undergo antigenic variation, particularly in outer membrane protein composition *in vivo*, and this is believed to be the reason for occurrence of relapses in disease.

Q. 23. Lyme disease is caused by:

- (a) *Borrelia recurrentis*
- (b) *B. duttoni*
- (c) *B. burgdorferi*
- (d) *B. hermsii*

Ans. (c)

Q. 24. Erythema chronicum migrans is observed in:

- (a) Lyme disease
- (b) Relapsing fever
- (c) Weil's disease
- (d) Syphilis

Ans. (a) *Borrelia burgdorferi* causes Lyme disease. It is widespread in the USA, where it is most common vector-borne infection. Wild and domestic animals are its natural hosts. Infection is transmitted to man by ixodid ticks that become infected whilst feeding on infected animals. Patient suffering from Lyme disease develops a small red macule or papule at the site of bite. It is known as erythema chronicum migrans.

Q. 25. Which of the following bacteria is/are pathogenic?

- (a) *Leptospira interrogans*
- (b) *L. biflexa*
- (c) *L. parva*
- (d) All of the above

Ans. (a) *Leptospira interrogans* is pathogenic, and *L. biflexa* and *L. parva* comprise the free-living saprophytic strains.

Q. 26. Which of the following serovars of *Leptospira interrogans* is/are responsible for causing Weil's disease?

- (a) *Icterohaemorrhagiae*
- (b) *Bataviae*
- (c) *Australis*
- (d) All of the above

Ans. (a) *Leptospira interrogans* serovar *icterohaemorrhagiae* produces a more severe illness. It is known as Weil's disease. It causes jaundice, purpuric haemorrhages and albuminuria. Serovars *bataviae* and *australis* may also cause spirochaetal jaundice.

Q. 27. Which of the following tests can be performed for the sero-diagnosis of leptospirosis?

- (a) Macroscopic agglutination test
- (b) Microscopic agglutination test
- (c) Complement fixation test
- (d) All of the above

Ans. (d)

Q. 28. A 22-year-old homosexual man feeling feverish and anorexic for the past few days presents with generalized lymphadenopathy. A diffuse maculopapular rash is present over his hand, neck, palms and soles. Which of the following organisms is the most likely cause of the disease?

- (a) *Human immunodeficiency virus*
- (b) *Neisseria meningitidis*
- (c) *Treponema pallidum*
- (d) *Coxiella burnetii*

Ans. (c) With the exception of lymphadenopathy, the clinical picture does not match with that caused by human immunodeficiency virus. *Neisseria meningitidis* causes acute meningitis. It may be accompanied by fever and maculopapular rash. *Coxiella burnetii* causes Q fever. This clinical picture resembles that of syphilis caused by *Treponema pallidum*.

Q. 29. Yaws is caused by:

- | | |
|-------------------------------|--------------------------------|
| (a) <i>Treponema pertanue</i> | (b) <i>Treponema pallidum</i> |
| (c) <i>Treponema carateum</i> | (d) <i>Treponema vincentii</i> |

Ans. (a)

Q. 30. Dark-field microscopy of material taken from penile chancre of a sexually active 30-year-old male reveals spiral-shaped organisms. Which of the following tests can be used to confirm the diagnosis?

- (a) VDRL test
- (b) RPR test
- (c) Fluorescent antibody test
- (d) Gram staining

Ans. (c) Spiral-shaped organism seen in the material taken from penile chancre may be *Treponema pallidum*. VDRL and RPR tests are positive in only 70% of primary syphilis. It cannot be stained with Gram staining. Fluorescent antibody test can detect treponemes in the material taken from penile chancre.

Q. 31. The spirochaete that causes Lyme disease is transmitted by:

- (a) Mosquitoes
- (b) Flies
- (c) Ixodid ticks
- (d) Lice

Ans. (c) Refer to Q. No. 24 above.

Q. 32. Which of the following is the most common zoonotic infection in the world?

- (a) Rat bite fever
- (b) Anthrax
- (c) Leptospirosis
- (d) Plague

Ans. (c)

Q. 33. Spirochaetal jaundice is caused by:

- (a) *Treponema pallidum*
- (b) *Borrelia burgdorferi*
- (c) *Leptospira interrogans*
- (d) All of the above

Ans. (c)

Q. 34. Which of the following tests detect/s antitreponemal antibodies in the cerebrospinal fluid?

- (a) VDRL test
- (b) FTA-ABS test
- (c) TPHA test
- (d) All of the above

Ans. (d)

ENTEROBACTERIACEAE: ESCHERICHIA, KLEBSIELLA AND OTHER GENERA

Q. 1. Which of the following bacteria does not belong to the family Enterobacteriaceae?

- (a) *Shigella*
- (b) *Salmonella*
- (c) *Yersinia*
- (d) *Acinetobacter*

Ans. (d)

Q. 2. Which of the following properties is/are shown by the organisms belonging to the family Enterobacteriaceae?

- (a) They are catalase-positive
- (b) They are oxidase-negative
- (c) They ferment glucose
- (d) All of the above

Ans. (d)

Q. 3. Which of the following properties is **not** seen in the members of family Enterobacteriaceae?

- (a) They are catalase-positive
- (b) They are oxidase-positive
- (c) They ferment glucose
- (d) They reduce nitrates to nitrites

Ans. (b) Family Enterobacteriaceae is catalase-positive and oxidase-negative. It ferments glucose and reduces nitrates to nitrites. Therefore, the correct answer is (b).

Q. 4. Which of the following bacteria is **not** known as coliform bacilli?

- (a) *Escherichia* (b) *Klebsiella*
- (c) *Enterobacter* (d) *Salmonella*

Ans. (d) Lactose fermenting enterobacteria, i.e. *Escherichia*, *Klebsiella* and *Enterobacter* are known as coliform bacteria. *Salmonella* does not ferment lactose, therefore, it is not known as coliform bacterium.

Q. 5. Which of the following reactions is **negative** in *Escherichia coli*?

- (a) Methyl red reaction (b) Indole production
- (c) Glucose fermentation (d) H₂S production

Ans. (d)

Q. 6. Which of the following techniques can be used for the assay of heat-labile enterotoxin produced by *Escherichia coli*?

- (a) Enzyme-linked immunosorbent assay
- (b) Morphological changes in Chinese hamster ovary cells
- (c) Steroid production in Y1 mouse adrenal cell culture
- (d) All of the above

Ans. (d)

Q. 7. Heat-labile enterotoxin of *Escherichia coli* activates:

- (a) Adenylate cyclase (b) Guanylate cyclase
- (c) Both of the above (d) None of the above

Ans. (a)

Q. 8. Heat-stable enterotoxin of *Escherichia coli* activates:

- (a) Adenylate cyclase (b) Guanylate cyclase
- (c) Both of the above (d) None of the above

Ans. (b) Heat-labile and heat-stable enterotoxins of *Escherichia coli* activate adenylate cyclase and guanylate cyclase, respectively.

Q. 9. Verocytotoxin 1 of *Escherichia coli* is similar to:

- (a) Shiga toxin
- (b) Cholera toxin
- (c) Heat-labile enterotoxin of *E. coli*
- (d) Heat-stable enterotoxin of *E. coli*

Ans. (a)

Q. 10. Which of the following O serotypes of *Escherichia coli* is/are most frequently encountered in urinary tract infections?

- (a) O1
- (b) O2
- (c) O4
- (d) All of the above

Ans. (d)

Q. 11. Traveller's diarrhoea is caused by:

- (a) Enteropathogenic *Escherichia coli*
- (b) Enterotoxigenic *E. coli*
- (c) Enteroinvasive *E. coli*
- (d) Verocytotoxigenic *E. coli*

Ans. (b) Enterotoxigenic *Escherichia coli* causes diarrhoeal disease known as traveller's diarrhoea. There is no fever and stool does not reveal any leucocytes or RBC.

Q. 12. Dysentery may be caused by:

- (a) enteropathogenic *Escherichia coli*
- (b) enterotoxigenic *E. coli*
- (c) enteroinvasive *E. coli*
- (d) enteroaggregative *E. coli*

Ans. (c) Enteroinvasive *Escherichia coli* invades the intestinal mucosa and may cause dysentery.

Q. 13. Haemolytic uraemic syndrome is caused by:

- (a) enteropathogenic *Escherichia coli*
- (b) enterotoxigenic *E. coli*
- (c) enteroaggregative *E. coli*
- (d) Verocytotoxigenic *E. coli* serovar O157:H7

Ans. (d) Verocytotoxigenic *Escherichia coli* serovar O157:H7 produces Shiga-like toxin and causes haemorrhagic colitis and haemolytic uraemic syndrome.

Q. 14. Sereny test is used for the detection of:

- (a) Enteropathogenic *Escherichia coli*
- (b) Enterotoxigenic *E. coli*
- (c) Enteroinvasive *E. coli*
- (d) Verocytotoxigenic *E. coli*

Ans. (c) Enteroinvasive *Escherichia coli* when instilled into the conjunctival sac of guinea-pig causes keratoconjunctivitis. This test is known as Sereny test.

Q. 15. Which of the following bacteria produce/s β -galactosidase?

- (a) *Citrobacter*
- (b) *Enterobacter*
- (c) *Serratia*
- (d) All of the above

Ans. (d)

Q. 16. Which of the following produces indole?

- (a) *K. pneumoniae* subspecies *aerogenes*
- (b) *K. oxytoca*
- (c) *K. pneumoniae* subspecies *pneumoniae*
- (d) *K. pneumoniae* subspecies *rhinoscleromatis*

Ans. (b) *Klebsiella oxytoca* is indole-positive while *K. pneumoniae* subspecies *aerogenes*, *K. pneumoniae* subspecies *pneumoniae* and *K. pneumoniae* subspecies *rhinoscleromatis* are indole-negative.

Q. 17. Enterobacter can be differentiated from *Klebsiella* by:

- (a) Motility
- (b) Ornithine positivity
- (c) Both of the above
- (d) None of the above

Ans. (c)

Q. 18. Prodigiosin (red pigment) is produced by members of genus:

- (a) *Serratia*
- (b) *Enterobacter*
- (c) *Hafnia*
- (d) *Citrobacter*

Ans. (a)

Q. 19. On the basis of capsular antigens, klebsiellae have been differentiated into:

- (a) 20 serotypes
- (b) 40 serotypes
- (c) 80 serotypes
- (d) 100 serotypes

Ans. (c)

Q. 20. An American visitor was admitted to the hospital with a 3-day history of vomiting and diarrhoea. He did not have fever and microscopic examination of stool did not reveal any leucocyte or RBC. On stool culture examination, growth of *Escherichia coli* was obtained. Which of the following strains could be suspected?

- (a) Enterotoxigenic *E. coli*
- (b) Enteropathogenic *E. coli*
- (c) Enterohaemorrhagic *E. coli*
- (d) Enteroinvasive *E. coli*

Ans. (a) Refer to Q. No. 11 above.

Q. 21. An elderly hospitalized patient has developed lobar pneumonia. Which of the following organisms could be suspected?

- (a) *Klebsiella pneumoniae* subspecies *pneumoniae*
- (b) *Escherichia coli*
- (c) *Proteus mirabilis*
- (d) *Enterobacter aerogenes*

Ans. (a)

Q. 22. A Gram-negative, oxidase-negative bacillus was isolated from cerebrospinal fluid from an infant in the newborn nursery. The organism produced dark pink colonies on MacConkey agar. It was indole positive, MR positive, VP negative, citrate negative, urease negative and fermented glucose with the production of acid and gas. The most probable identity of this organism is:

- (a) *Escherichia coli* (b) *Enterobacter aerogenes*
- (c) *Proteus vulgaris* (d) *Shigella species*

Ans. (a)

Q. 23. The most common cause of urinary tract infection in the community is:

- (a) *Klebsiella pneumoniae* subspecies *aerogenes*
- (b) *Escherichia coli*
- (c) *Proteus vulgaris*
- (d) *Citrobacter freundii*

Ans. (b)

Q. 24. A laboratory has isolated *Escherichia coli* serovar O157:H7 in the bloody stool of a 4-year-old child. This child is in an increased risk of developing:

- (a) Bubos
- (b) Haemolytic uraemic syndrome
- (c) Renal stones
- (d) Infant botulism

Ans. (b) Refer to Q. No. 13 above.

Q. 25. Which of the following organisms produces a potent toxin similar to Shiga-toxin?

- (a) *Escherichia coli* O157:H7 (b) *Salmonella Typhi*
- (c) *Campylobacter jejuni* (d) *Clostridium perfringens*

Ans. (a)

Q. 26. The microorganism that is mainly used as an indicator of faecal pollution of water is:

- (a) *Escherichia coli* (b) *Clostridium perfringens*
- (c) *Clostridium tetani* (d) *Serratia marcescens*

Ans. (a) *Escherichia coli* forms normal flora of intestine of man and animals, therefore, it is used as indicator organism of faecal pollution.

Q. 27. How many tribes are there in the family Enterobacteriaceae?

- (a) 5 (b) 6 (c) 7 (d) 8

Ans. (d)

PROTEUS, MORGANELLA AND PROVIDENCIA

Q. 1. Which of the following bacteria is **not** included in the tribe Proteeae?

- (a) *Proteus* (b) *Morganella*
(c) *Providencia* (d) *Edwardsiella*

Ans. (d) *Edwardsiella* belongs to the tribe Edwardsiellae. It is not included in the tribe Proteeae. *Proteus*, *Morganella* and *Providencia* are included in the tribe Proteeae.

Q. 2. Which of the following species is **not** included in the genus *Proteus*?

- (a) *Mirabilis* (b) *Vulgaris* (c) *Penneri* (d) *Morganii*

Ans. (d)

Q. 3. Phenylalanine deaminase test is positive in:

- (a) *Proteus* (b) *Morganella*
(c) *Providencia* (d) All of the above

Ans. (d) *Proteus*, *Morganella* and *Providencia* are the genera of family Enterobacteriaceae. They can be differentiated from the other genera of the family Enterobacteriaceae by being phenylalanine deaminase positive. Therefore, the correct answer is (d).

Q. 4. Dienes phenomenon is used to determine the identity or non-identity of strains of:

- (a) *Proteus* (b) *Salmonella* (c) *Shigella* (d) *Klebsiella*

Ans. (a)

Q. 5. Swarming of *Proteus* strains on solid media can be inhibited by:

- (a) Increasing the concentration of agar in the medium
(b) Incorporation of chloral hydrate in the medium
(c) Incorporation of sodium azide in the medium
(d) All of the above methods

Ans. (d)

Q. 6. Urinary tract infection caused by *Proteus* is more severe as compared to that caused by other bacteria due to:

- (a) Production of urease (b) Production of H_2S
(c) Production of lipase (d) Production of haemolysin

Ans. (a) Urinary tract infection caused by *Proteus* tends to be more severe than that caused by *Escherichia coli* and other coliforms, because these organisms are usually confined to the bladder whereas *Proteus* has the predilection for the

upper urinary tract. It produces urease which liberates ammonia from urea. Ammonia inactivates complement and damages renal epithelium.

Q. 7. Which of the following species of bacteria is/are included in the genus *Providencia*?

- (a) *Rettgeri* (b) *Alcalifaciens*
- (c) *Stuartii* (d) All of the above

Ans. (d)

Q. 8. Which of the following bacteria shows swarming on blood agar?

- (a) *Proteus mirabilis*
- (b) *Morganella morganii*
- (c) *Providencia rettgeri*
- (d) *P. stuartii*

Ans. (a)

SHIGELLA

Q. 1. Selective medium/media for the isolation of *Shigella* is/are:

- (a) Xylose lysine deoxycholate agar
- (b) *Salmonella-Shigella* agar
- (c) Hektoen enteric agar
- (d) All of the above

Ans. (d)

Q. 2. Which of the following media is an enrichment medium for the isolation of *Shigella*?

- (a) Selenite F broth
- (b) Glucose broth
- (c) Alkaline peptone water
- (d) Taurocholate peptone transport and enrichment medium

Ans. (a) Selenite F broth is an enrichment medium for isolation of *Shigella*. Alkaline peptone water is enrichment medium for *Vibrio cholerae* and taurocholate peptone is transport and enrichment medium for *Vibrio cholerae*. Glucose broth is not an enrichment medium.

Q. 3. Which of the following bacteria is more resistant to adverse environmental conditions?

- (a) *Shigella dysenteriae* (b) *S. flexneri*
- (c) *S. boydii* (d) *S. sonnei*

Ans. (d) *Shigella sonnei* can survive for many days on lavatory seats, particularly in conditions of low temperature and

high humidity. It is the most prevalent species of *Shigella* in the United States.

Q. 4. Which of the following bacteria is/are always indole-negative?

- (a) *Shigella dysenteriae* serotype 1
- (b) *S. flexneri* serotype 6
- (c) *S. sonnei*
- (d) All of the above

Ans. (d)

Q. 5. Which of the following bacteria is negative for fermentation of mannitol?

- (a) *Shigella dysenteriae*
- (b) *S. flexneri*
- (c) *S. boydii*
- (d) *S. sonnei*

Ans. (a)

Q. 6. Verocytotoxin is produced by:

- (a) *Shigella dysenteriae* serotype 1
- (b) *S. dysenteriae* serotype 2
- (c) *S. dysenteriae* serotype 8
- (d) *S. dysenteriae* serotype 10

Ans. (a)

Q. 7. Which of the following features is/are characteristic of infection with *Shigella dysenteriae*?

- (a) Abdominal pain
- (b) Tenesmus
- (c) Pyrexia
- (d) All of the above

Ans. (d)

Q. 8. Which of the following species of *Shigella* is predominant in India?

- (a) *S. dysenteriae*
- (b) *S. flexneri*
- (c) *S. boydii*
- (d) *S. sonnei*

Ans. (b) In India, *Shigella flexneri* has always been the predominant species (50–85%) followed by *S. dysenteriae* (8–25%), *S. sonnei* (2–24%) and *S. boydii* (0–8%).

Q. 9. Which of the following complications can be associated with *Shigella dysenteriae* serotype 1 infection?

- (a) Arthritis
- (b) Toxic neuritis
- (c) Haemolytic uraemic syndrome
- (d) All of the above

Ans. (d)

Q. 10. Which of the following members of the family Enterobacteriaceae is catalase-negative?

- (a) *Salmonella* serotype Typhi
- (b) *Proteus vulgaris*
- (c) *Shigella dysenteriae* serotype 1
- (d) *Escherichia coli*

Ans. (c) All the members of family Enterobacteriaceae are catalase-positive (with the exception of *Shigella dysenteriae* serotype 1 which is catalase-negative).

SALMONELLA

Q. 1. Which of the following media is selective for *Salmonella*?

- (a) Wilson and Blair's brilliant-green bismuth sulphite agar medium
- (b) Bile salt agar
- (c) Thiosulphate citrate bile salt agar
- (d) Lowenstein-Jensen medium

Ans. (a) Wilson and Blair's brilliant-green bismuth sulphite agar medium is selective medium for *Salmonella*. Bile salt agar and thiosulphate citrate bile salt agar are selective media for isolation of *Vibrio cholerae* and Lowenstein-Jensen medium is selective medium for the isolation of tubercle bacilli.

Q. 2. Which of the following media **does not** serve as enrichment medium for *Salmonella*?

- (a) Tetrathionate broth
- (b) Brilliant green tetrathionate broth
- (c) Selenite-F broth
- (d) Alkaline peptone water

Ans. (d) Alkaline peptone water is enrichment medium for *Vibrio cholerae*, and not for *Salmonella*. Tetrathionate broth, brilliant green tetrathionate broth and selenite-F broth are enrichment media for *Salmonella*.

Q. 3. Which of the following serotypes of *Salmonella* **does/do not** produce H_2S ?

- (a) *S.* serotype Paratyphi A
- (b) *S.* serotype Choleraesuis
- (c) Both of the above
- (d) None of the above

Ans. (c)

Q. 4. Which of the following serotypes of *Salmonella* is/are anaerogenic?

- (a) *S. serotype Typhi* (b) *S. serotype Paratyphi A*
- (c) *S. serotype Enteritidis* (d) All of the above

Ans. (a)

Q. 5. Which of the following serotypes of *Salmonella* is diphasic?

- (a) *S. serotype Typhi* (b) *S. serotype Paratyphi A*
- (c) *S. serotype Enteritidis* (d) *S. serotype Choleraesuis*

Ans. (d)

Q. 6. *S* → *R* variation in *Salmonella* is associated with:

- (a) Change of colonial morphology
- (b) Loss of O antigen
- (c) Loss of virulence
- (d) All of the above

Ans. (d)

Q. 7. *Salmonella serotype Anatum* is converted by phage 15 into:

- (a) *S. serotype Newton* (b) *S. serotype Minneapolis*
- (c) *S. serotype Typhimurium* (d) *S. serotype Enteritidis*

Ans. (a)

Q. 8. Which of the following bacteria is primarily animal pathogen?

- (a) *Salmonella serotype Typhi* (b) *S. serotype Paratyphi A*
- (c) *S. serotype Paratyphi B* (d) *S. serotype Enteritidis*

Ans. (d) *S. serotype Enteritidis* is primarily animal pathogen, while *Salmonella serotype Typhi*, *S. serotypes Paratyphi A* and *S. serotype Paratyphi B* are primarily human pathogens.

Q. 9. Most important complication/s of enteric fever is/are:

- (a) Intestinal perforation (b) Haemorrhage
- (c) Circulatory collapse (d) All of the above

Ans. (d)

Q. 10. Which of the following specimens is/are most appropriate for culture of bacteria in first week of enteric fever?

- (a) Blood (b) Urine
- (c) Faeces (d) None of these

Ans. (a) In enteric fever, blood and faeces cultures, during first week of illness, are positive in 90% and 50% cases, respectively. Urine cultures are generally positive only in the second week in about 25% of cases. Therefore, the correct answer is (a).

Q. 11. Which of the following media is used for blood culture in cases of enteric fever?

- (a) Bile broth
- (b) Tetrathionate broth
- (c) Selenite-F broth
- (d) Alkaline peptone water

Ans. (a) Tetrathionate broth and selenite-F broth are enrichment media for isolation of salmonellae from faeces. Alkaline peptone water is enrichment medium for isolation of *Vibrio cholerae*. Bile broth is used for blood culture in cases of enteric fever.

Q. 12. Which of the following serotypes of *Salmonella* is non-motile?

- (a) *S. serotype Gallinarum*
- (b) *S. serotype Typhimurium*
- (c) *S. serotype Typhi*
- (d) *S. serotype Choleraesuis*

Ans. (a) Most strains of *Salmonella* are motile by means of peritrichous flagella except *S. serotype Gallinarum* and *S. serotype Pullorum* which are non-motile. Therefore, the correct answer is (a).

Q. 13. Enteric fever is caused by which of the following serotypes of *Salmonella*?

- (a) *S. serotype Typhi*
- (b) *S. serotype Paratyphi A*
- (c) *S. serotype Paratyphi B*
- (d) All of the above

Ans. (d) Enteric fever is caused by *Salmonella* serotype Typhi and *S. serotypes Paratyphi A, B and C*. Therefore, the correct answer is (d).

Q. 14. Identity of *S. serotype Typhi* in cultures is established by agglutination with:

- (a) Factor 9 antiserum
- (b) Anti-d serum
- (c) Both of the above
- (d) None of the above

Ans. (c) *Salmonella* serotype Typhi possesses factor 9 O antigen and d phase 1 antigen. Identity of *S. serotype Typhi* in culture is established by agglutination with factor 9 antiserum, and anti-d serum. Therefore, the correct answer is (c).

Q. 15. In enteric fever, *Salmonella* may be isolated from:

- (a) Urine
- (b) Faeces
- (c) Blood
- (d) All of the above

Ans. (d) Refer to Q. No. 10 above.

Q. 16. In Widal test, the significant titre for O agglutinins is generally:

- (a) 1 : 50 or more
- (b) 1 : 100 or more
- (c) 1 : 200 or more
- (d) 1 : 400 or more

Ans. (b)

Q. 17. In Widal test, the significant titres for H agglutinins is:

- (a) 1 : 50 or more (b) 1 : 100 or more
(c) 1 : 200 or more (d) 1 : 400 or more

Ans. (c)

Q. 18. For determining the serotype of infecting organism, detection of which agglutinins is more important in Widal test?

- (a) O (b) H (c) Fimbrial (d) M

Ans. (b) For determining the serotype of infecting organism, H agglutinin is more reliable than O agglutinin because different serotypes have some O antigens in common.

Q. 19. For detection of carriers in enteric fever, which of the following specimens is most important?

- (a) Faeces (b) Urine (c) Blood (d) Sputum

Ans. (a) Carriers in enteric fever harbour the organisms in gall bladder, biliary tract and rarely in intestine. Therefore, for detection of carriers, faeces culture is most important.

Q. 20. Which of the following vaccines can be used for prophylaxis against enteric fever?

- (a) Killed whole cell vaccine (b) Purified Vi antigen vaccine
(c) Oral vaccine (d) All of the above

Ans. (d)

Q. 21. Which of the following serotypes of *Salmonella* can cause gastroenteritis?

- (a) *S. serotype Enteritidis* (b) *S. serotype Newport*
(c) *S. serotype Typhimurium* (d) All of the above

Ans. (d)

Q. 22. In the first week, typhoid is diagnosed by:

- (a) Stool culture (b) Urine culture
(c) Blood culture (d) Widal test

Ans. (c) Refer to Q. No. 10 above.

Q. 23. The reservoir of *Salmonella* serotype Typhi is:

- (a) Dog (b) Hen's egg (c) Man (d) Water

Ans. (c)

Q. 24. A patient complains of persistent high fever, malaise and constipation for the last one week. A physical examination reveals an enlarged spleen and tender abdomen with rose-coloured spots. Laboratory has isolated a bacterium which is motile, Gram-negative bacillus, and produces H_2S . Which of the following organisms is most likely cause of illness?

- (a) Enterotoxigenic *Escherichia coli*
- (b) *Salmonella* serotype Enteritidis
- (c) *S. serotype Typhi*
- (d) *Shigella dysenteriae*

Ans. (c)

Q. 25. Hens may lay infected eggs if they are infected with:

- (a) *Clostridium prefringens*
- (b) *Staphylococcus aureus*
- (c) *Escherichia coli*
- (d) *Salmonella* serotype Pullorum

Ans. (d)

YERSINIA

Q. 1. In *Yersinia pestis*, capsule is best demonstrated in cultures grown at:

- (a) 22°C
- (b) 27°C
- (c) 37°C
- (d) 42°C

Ans. (c)

Q. 2. Bipolar staining is characteristic of:

- (a) *Yersinia pestis*
- (b) *Proteus mirabilis*
- (c) *Pseudomonas aeruginosa*
- (d) *Corynebacterium diphtheriae*

Ans. (a) In smears from the tissues stained with Giemsa or methylene blue, *Yersinia pestis* shows characteristic bipolar staining (safety pin appearance) in which the ends of the bacilli stain darker than the central part.

Q. 3. Which of the following determine/s the pathogenicity of *Yersinia pestis*?

- (a) V and W antigens
- (b) F1 envelope antigen
- (c) Production of pigmented colonies on haemin-containing media
- (d) All of the above

Ans. (d)

Q. 4. Which of the following agents can cause plague?

- (a) *Yersinia pestis*
- (b) *Y. pseudotuberculosis*
- (c) *Y. enterocolitica*
- (d) *Pasteurella multocida*

Ans. (a)

Q. 5. Plague is transmitted by:

- (a) Sandflies (b) Rat fleas (c) Mites (d) Ticks

Ans. (b)

Q. 6. Sylvatic plague occurs in:

- (a) Mice (b) Squirrels
(c) Chipmunks (d) All of the above

Ans. (d)

Q. 7. Bubonic plague is transmitted by:

- (a) Rat flea (b) Inhalation
(c) Ingestion (d) All of the above routes

Ans. (a)

Q. 8. Pneumonic plague can be transmitted from man-to-man by:

- (a) Droplet infection (b) Inoculation
(c) Ingestion (d) All of the above routes

Ans. (a)

Q. 9. The name 'black death' is given to which of the following diseases?

- (a) Tuberculosis (b) Black water fever
(c) Plague (d) AIDS

Ans. (c)

Q. 10. First pandemic of bubonic plague occurred in:

- (a) 542 AD (b) 642 AD (c) 742 AD (d) 842 AD

Ans. (a)

Q. 11. Bubonic plague can be diagnosed in the laboratory by:

- (a) Demonstration of Gram-negative coccobacilli
(b) Culture on blood agar
(c) Inoculation in guinea-pigs
(d) All of the above

Ans. (d)

Q. 12. Which of the following vaccines is/are recommended for immunization against plague?

- (a) Live (b) Killed
(c) Subunit (d) All of the above

Ans. (b)

Q. 13. *Yersinia enterocolitica* and *Y. pestis* can be differentiated on the basis of which of the following test/s?

- (a) Motility at 22°C
(b) Fermentation of sucrose

- (c) Decarboxylation of ornithine
- (d) All of the above

Ans. (d)

Q. 14. Which of the following diseases is/are caused by *Yersinia enterocolitica* in man?

- (a) Gastroenteritis
- (b) Mesenteric lymphadenitis
- (c) Septicaemia
- (d) All of the above

Ans. (d)

Q. 15. Which of the following vectors transmits plague?

- (a) *Aedes aegypti*
- (b) *Xenopsylla cheopis*
- (c) *Anopheles culifacies*
- (d) *Phlebotomus argentipes*

Ans. (b)

Q. 16. *Yersinia pestis* is a natural pathogen of:

- (a) Rabbits
- (b) Guinea pigs
- (c) Rats
- (d) Nine-banded armadillos

Ans. (c)

Q. 17. A 30-year-old man develops high fever, swelling in the axilla and inguinal region. Aspirate from the lymph node reveals Gram-negative rods and with methylene blue staining they show bipolar staining. The patient is most likely suffering from:

- (a) Chancroid
- (b) Bubonic plague
- (c) Tuberculosis
- (d) Nocardiosis

Ans. (b) Clinical features (fever, swelling in the axilla and inguinal region) and aspirate from the lymph node reveals Gram-negative bacilli, and with methylene blue staining they show bipolar staining. The patient is most likely suffering from bubonic plague.

Q. 18. The epidemic that infected Europe, North Africa, and the Middle East and killed tens of millions was known as Black Death. The disease was caused by:

- (a) Smallpox
- (b) Bubonic plague
- (c) Anthrax
- (d) Tuberculosis

Ans. (b)

VIBRIO, AEROMONAS AND PLESIOMONAS

Q. 1. Which of the following media can serve as transport medium for *Vibrio cholerae*?

- (a) Selenite F broth
- (b) Tetrathionate broth

- (c) Venkatraman-Ramakrishnan medium
- (d) Brilliant green tetrathionate broth

Ans. (c) Selenite F broth, tetrathionate broth and brilliant green tetrathionate broth are enrichment media for *Salmonella* and *Shigella*, Venkatraman-Ramakrishnan medium is transport medium of *Vibrio cholerae*.

Q. 2. The colonies of *Vibrio cholerae* and *V. parahaemolyticus* can be differentiated on:

- (a) Thiosulphate-citrate-bile-sucrose agar
- (b) Alkaline bile salt agar
- (c) MacConkey medium
- (d) Lowenstein-Jensen medium

Ans. (a) Thiosulphate-citrate-bile-sucrose agar contains sucrose and bromothymol blue (indicator) in addition to other ingredients. Sucrose-fermenting vibrios, such as *Vibrio cholerae* form yellow colonies, and non-sucrose-fermenters, such as *V. parahaemolyticus* form blue-green ones. Therefore, the correct answer is (a).

Q. 3. Which of the following tests can differentiate between classical and El Tor biotypes of *Vibrio cholerae*?

- (a) Sensitivity to polymyxin B
- (b) Agglutination of fowl RBCs
- (c) Sensitivity to Mukherjee's group IV phage
- (d) All of the above

Ans. (d)

Q. 4. The DNA coding for the production of cholera toxin in *Vibrio cholerae* is on the:

- (a) Plasmid
- (b) Phage
- (c) Transposon
- (d) None of the above

Ans. (b) The DNA coding for the production of enterotoxin by *Vibrio cholerae* and *Escherichia coli* is on phage and plasmid, respectively. Therefore, the correct answer is (b).

Q. 5. Cholera toxin resembles which of the following toxins?

- (a) Labile toxin of *Escherichia coli*
- (b) Stable toxin of *E. coli*
- (c) Diphtheria toxin
- (d) Tetanus toxin

Ans. (a) Cholera toxin resembles labile toxin of *Escherichia coli* chemically, antigenically and mechanism of action.

Q. 6. Which of the following tests can be used for the assay of cholera toxin?

- (a) Enzyme-linked immunosorbent assay
- (b) Radioimmunoassay
- (c) Morphological changes in Chinese hamster ovary cells
- (d) All of the above

Ans. (d)

Q. 7. Which of the following biotypes of *Vibrio cholerae* is/are prevalent in India?

- (a) El Tor
- (b) Classical
- (c) Both of the above
- (d) None of the above

Ans. (a) El Tor *Vibrio* is hardier and more capable of surviving in the environment. Therefore, it is more prevalent in India.

Q. 8. Stools from suspected cholera cases can be transported to the laboratory in:

- (a) Venkatraman-Ramakrishnan medium
- (b) Cary-Blair medium
- (c) Thick blotting paper
- (d) All of the above

Ans. (d)

Q. 9. Which of the following vaccines is/are available for prophylaxis against cholera?

- (a) Killed whole organism vaccine
- (b) Non-living oral B subunit-whole cell vaccine
- (c) Live vaccine
- (d) All of the above

Ans. (d)

Q. 10. Which of the following bacteria is/are halophilic?

- (a) *Vibrio parahaemolyticus*
- (b) *V. alginolyticus*
- (c) *V. vulnificus*
- (d) All of the above

Ans. (d)

Q. 11. Which of the following bacteria is associated with food poisoning due to consumption of improperly cooked sea fish?

- (a) *Vibrio parahaemolyticus*
- (b) *V. alginolyticus*
- (c) *V. vulnificus*
- (d) *V. cholerae*

Ans. (a) *Vibrio parahaemolyticus* is halophilic *Vibrio*. It is a causative agent of food poisoning due to consumption of sea fish.

Q. 12. Wound infection following exposure to sea water or infected shellfish is caused by all, **except**:

- (a) *Vibrio vulnificus* (b) *V. alginolyticus*
- (c) *V. cholerae* (d) *Aeromonas*

Ans. (c)

Q. 13. Acute diarrhoeal disease resembling cholera can be caused by:

- (a) *Aeromonas hydrophila* (b) *Vibrio vulnificus*
- (c) *V. alginolyticus* (d) All of the above

Ans. (a) *Aeromonas hydrophila* produces acute diarrhoeal disease resembling cholera due to the production of enterotoxin, which like cholera enterotoxin stimulates cAMP and produces diarrhoea.

Q. 14. Which of the following conditions can be caused by *Plesiomonas*?

- (a) Gastroenteritis (b) Septicaemia
- (c) Cellulitis (d) All of the above

Ans. (d)

Q. 15. A 43-year-old man has developed wound infection and cellulitis following exposure to sea water. Which of the following organisms is the most likely cause of this disease?

- (a) *Pasteurella multocida* (b) *Yersinia pestis*
- (c) *Vibrio vulnificus* (d) *Marinococcus halopticus*

Ans. (c) *Vibrio vulnificus* is a halophilic *Vibrio*. Its natural habitat is sea water and marine life. It may cause wound infection and cellulitis following exposure of wounds to sea water or infected shellfish.

Q. 16. Darting motility is shown by:

- (a) *Proteus mirabilis* (b) *Vibrio cholerae*
- (c) *Escherichia coli* (d) *Salmonella* serotype Typhi

Ans. (b)

Q. 17. *Vibrio cholerae* shows darting motility mediated by:

- (a) Peritrichous flagella
- (b) Lophotrichous flagella
- (c) Amphitrichous flagella
- (d) Single polar flagellum

Ans. (d) *Vibrio cholerae* shows darting motility by means of a single polar flagellum, while *Proteus mirabilis*, *Escherichia coli* and *Salmonella* serotype Typhi are actively motile by means of peritrichous flagella.

Q. 18. On the basis of which of the following antigens *Vibrio cholerae* is divided into various serogroups or serovars?

- (a) O antigen (b) H antigen (c) Vi antigen (d) K antigen

Ans. (a) *Vibrio cholerae* possesses at least 139 different O (somatic) antigens on the basis of which it has been divided into corresponding number of serogroups and serovars. All strains share a common, heat-labile flagellar (H) antigen.

Q. 19. pH of alkaline peptone water used for enrichment of *Vibrio cholerae* is:

- (a) 7.6 (b) 8.6 (c) 9.6 (d) 10.6

Ans. (b)

Q. 20. Kanagawa phenomenon is seen with:

- (a) *Vibrio parahaemolyticus* (b) *Vibrio cholerae*
(c) *Vibrio alginolyticus* (d) *Vibrio vulnificus*

Ans. (a) Strains of *Vibrioparahaemolyticus* associated with gastroenteritis lyse human erythrocytes in Wagatsuma's agar, a special high salt mannitol medium. This haemolysis is known as Kanagawa phenomenon.

Q. 21. Which of the following is the end product of the cholera red reaction?

- (a) Nitrites (b) Indole
(c) Nitrosoindole (d) Ammonia

Ans. (c) *Vibrio cholerae* is strongly indole-positive and reduces nitrates to nitrites. These two properties contribute to the 'cholera red reaction', the development of red colour when concentrated sulphuric acid is added to a 4-day-old culture at 37°C in peptone water. It is due to the formation of nitrosoindole which is red in colour.

CAMPYLOBACTER, HELICOBACTER AND SPIRILLUM

Q. 1. *Helicobacter pylori* can be differentiated from *Campylobacter* on the basis of:

- (a) Multiple sheathed flagella (b) Strong hydrolysis of urea
(c) Both of the above (d) None of the above

Ans. (c) *Helicobacter pylori* is motile by means of a tuft of up to 7 sheathed flagella at one pole (lophotrichous) while campylobacters have a single unsheathed flagellum at one or both poles (amphitrichous). *H. pylori* is strongly urease-positive and campylobacters are urease-negative. Therefore, the correct answer is (c).

Q. 2. Which of the following species of *Campylobacter* is/are thermophilic?

- (a) *C. jejuni* (b) *C. coli*
- (c) *C. lari* (d) All of the above

Ans. (d)

Q. 3. *Campylobacter jejuni* subspecies *jejuni* produces diarrhoea by which of the following mechanism/s?

- (a) By production of a heat-labile enterotoxin
- (b) By invasive property of the bacterium
- (c) Both of the above mechanisms
- (d) None of the above mechanisms

Ans. (c) *Campylobacter jejuni* subsp. *jejuni* produces heat-labile enterotoxin resembling cholera enterotoxin. Like *Shigella* and *Salmonella*, it penetrates gut mucosa leading to oedematous exudative enteritis of jejunum, ileum and colon, and ulceration of the mucosa. This, along with enterotoxin, produces diarrhoea. Therefore, the correct answer is (c).

Q. 4. Which of the following bacteria/viruses rank as major cause/s of diarrhoeal disease in man particularly in the developing world?

- (a) Enterotoxigenic *Escherichia coli*
- (b) *Campylobacter jejuni*
- (c) Rotaviruses
- (d) All of the above

Ans. (d)

Q. 5. Which species of *Campylobacter* has the ability of hydrolyze sodium hippurate?

- (a) *C. jejuni* (b) *C. coli* (c) *C. fetus* (d) *C. concisus*

Ans. (a)

Q. 6. Which of the following bacteria is/are microaerophilic?

- (a) *Campylobacter jejuni* (b) *Helicobacter pylori*
- (c) *Mycobacterium bovis* (d) All of the above

Ans. (d)

Q. 7. Which of the following conditions is/are blamed to be caused by *Helicobacter pylori*?

- (a) Chronic active gastritis (b) Duodenitis
- (c) Peptic ulceration (d) All of the above

Ans. (d)

Q. 8. Which of the following tests is/are useful in identification of *Helicobacter pylori*?

- (a) Warthin-Starry silver staining
- (b) Biopsy urease test
- (c) Urea breath test
- (d) All of the above

Ans. (d)

Q. 9. Which of the following bacteria is **urease negative**?

- (a) *Proteus mirabilis*
- (b) *Klebsiella pneumoniae*
- (c) *Helicobacter pylori*
- (d) *Escherichia coli*

Ans. (d)

Q. 10. Which of the following bacteria is/are blamed to cause bacterial vaginosis?

- (a) *Gardnerella vaginalis*
- (b) *Bacteroides* spp.
- (c) *Mobiluncus* spp.
- (d) All of the above

Ans. (d)

Q. 11. The causative agent of rat-bite fever is:

- (a) *Spirillum minus*
- (b) *Campylobacter fetus*
- (c) *Mobiluncus mulieris*
- (d) *Helicobacter cinaedi*

Ans. (a) *Spirillum minus* is a natural parasite of rats. In man it causes rat-bite fever. Transmission is, as the name implies, by rat-bite.

Q. 12. Which of the following bacteria has a single polar flagellum at one or both poles?

- (a) *Campylobacter jejuni*
- (b) *Helicobacter pylori*
- (c) *Mobiluncus curtisii*
- (d) *Proteus vulgaris*

Ans. (a)

Q. 13. *Helicobacter pylori* is able to survive the acidic conditions of the stomach by producing which of the following enzymes?

- (a) β -galactosidase
- (b) Amylase
- (c) Urease
- (d) Coagulase

Ans. (c) *Helicobacter pylori* colonizes the surface of the gastric mucosa. Urease released by *H. pylori* produces ammonia ions that neutralize gastric acid in the vicinity of the organism, thus favouring bacterial multiplication.

Q. 14. Which of the following bacteria produces maximum amount of urease enzyme?

- (a) *Proteus mirabilis*
- (b) *Klebsiella pneumoniae*
- (c) *Ureaplasma urealyticum*
- (d) *Helicobacter pylori*

Ans. (d) All the organisms listed at (a), (b), (c) and (d) produce urease enzyme. Of these, *Helicobacter pylori* produces maximum amount of urease enzyme.

PSEUDOMONAS AND BURKHOLDERIA

Q. 1. Which of the following bacteria is/are human pathogen/s?

- (a) *Pseudomonas aeruginosa*
- (b) *Burkholderia mallei*
- (c) *B. pseudomallei*
- (d) All of the above

Ans. (d)

Q. 2. Which of the following pigments is diagnostic of *Pseudomonas aeruginosa*?

- (a) Pyocyanin
- (b) Pyoverdin
- (c) Pyomelanin
- (d) Pyorubrin

Ans. (a) *Pseudomonas aeruginosa* produces a number of pigments which diffuse into the medium. However, pyocyanin is produced only by *P. aeruginosa* and not by other species of *Pseudomonas*. Therefore, it is diagnostic of *P. aeruginosa*.

Q. 3. Which of the following biochemical reactions is/are characteristic of *Pseudomonas aeruginosa*?

- (a) Oxidative utilization of glucose
- (b) Oxidase production
- (c) Production of pyocyanin
- (d) All of the above

Ans. (d)

Q. 4. Which of the following substances can be produced by strains of *Pseudomonas aeruginosa*?

- (a) Haemolysins
- (b) Elastase
- (c) Exotoxins A and S
- (d) All of the above

Ans. (d)

Q. 5. Which is the most popular method for typing of *Pseudomonas aeruginosa*?

- (a) Pyocin typing
- (b) Serotyping
- (c) Bacteriophage typing
- (d) Antibiotogram typing

Ans. (a) Typing of *Pseudomonas aeruginosa* based on pyocin production is the most popular for typing of *P. aeruginosa*. Therefore, the correct answer is (a).

Q. 6. Which of the following infections can be caused by *Pseudomonas aeruginosa*?

- (a) Urinary tract infection (b) Wound and burn infection
- (c) Respiratory tract infection (d) All of the above

Ans. (d)

Q. 7. Many strains of *Pseudomonas aeruginosa* are susceptible to:

- (a) Ceftazidime (b) Tobramycin
- (c) Ticarcillin (d) All of the above

Ans. (d) *Pseudomonas aeruginosa* is intrinsically resistant to most commonly employed antimicrobial agents. Many strains are, however, susceptible to ceftazidime, tobramycin and ticarcillin. Therefore, the correct answer is (d).

Q. 8. The route of infection of *Burkholderia mallei* in humans is via:

- (a) Respiratory tract (b) Skin
- (c) Gastrointestinal tract (d) All of the above

Ans. (b) *Burkholderia mallei* is an obligate animal (horse) parasite. Humans may become infected via skin abrasions or wounds which come in contact with the discharges of a sick animal. Therefore, the correct answer is (b).

Q. 9. Melioidosis occurs in human beings through:

- (a) Inhalation (b) Inoculation
- (c) Ingestion (d) All of the above

Ans. (d)

Q. 10. Human melioidosis manifests as:

- (a) Benign pulmonary infection
- (b) Multiple abscesses in various organs and tissues
- (c) A fulminating septicaemia
- (d) All of the above

Ans. (d)

LEGIONELLA

Q. 1. Legionnaires' disease is caused by:

- (a) *Legionella pneumophila* (b) *L. anisa*
- (c) *L. jordanis* (d) All of the above

Ans. (a)

Q. 2. Which of the following products is an important virulence determinant of *Legionella pneumophila*?

- (a) Haemolysin (b) Cytotoxin
- (c) Protease (d) Endotoxin

Ans. (c)

Q. 3. Route/s of infection in Legionnaires' disease is/are:

- (a) Respiratory tract
- (b) Gastrointestinal tract
- (c) Skin
- (d) All of the above

Ans. (a)

Q. 4. Which of the following drugs can be used for treatment of *Legionella* infections?

- (a) Erythromycin
- (b) Cephalosporins
- (c) Penicillins
- (d) All of the above

Ans. (a)

Q. 5. A 60-year-old man is diagnosed to be suffering from Legionnaires' disease after he returns home from attending a convention. He could have acquired it:

- (a) From a person suffering from the infection while travelling in the aeroplane.
- (b) From a chronic carrier in the convention centre.
- (c) From inhalation of the aerosols of water from convention building's air-conditioning system.
- (d) By sharing an infected towel with a fellow delegate at the convention.

Ans. (c) Natural habitat of *Legionella pneumophila* is water. It is believed that humans acquire infection by inhaling mist, containing *Legionella*, from air-conditioning cooling towers, cooling water systems, domestic hot water systems in hotels and hospitals, whirlpool spa baths and showers, shower heads, industrial coolants and respiratory ventilators. Therefore, the correct answers for Q. Nos. 3 and 5 are (a) and (c), respectively.

HAEMOPHILUS

Q. 1. Which of the following infections is/are caused by *Haemophilus influenzae*?

- (a) Meningitis
- (b) Epiglottitis
- (c) Pneumonia
- (d) All of the above

Ans. (d)

Q. 2. For growth, *Haemophilus influenzae* requires:

- (a) X factor alone
- (b) V factor alone
- (c) Both X and V factors
- (d) Neither X nor V factor

Ans. (c)

Q. 3. *Haemophilus influenzae* shows the phenomenon of satellitism on:

- (a) Blood agar
- (b) Loeffler's serum slope
- (c) Nutrient agar
- (d) Dorset egg medium

Ans. (a)

Q. 4. Most *Haemophilus influenzae* infections are caused by:

- (a) Capsular serotype a strains
- (b) Capsular serotype b strains
- (c) Capsular serotype c strains
- (d) Capsular serotype d strains

Ans. (b)

Q. 5. Which of the following determine/s the virulence of *Haemophilus influenzae*?

- (a) Capsular polysaccharide
- (b) Pili
- (c) Outer membrane proteins
- (d) All of the above

Ans. (d)

Q. 6. Which of the following techniques can be used for laboratory diagnosis of meningitis caused by *Haemophilus influenzae*?

- (a) Detection of capsular antigen in CSF or serum by coagglutination
- (b) Culture of CSF
- (c) Immunofluorescence
- (d) All of the above

Ans. (d)

Q. 7. Conjunctivitis is caused by:

- (a) *Haemophilus influenzae*
- (b) *H. influenzae* biotype *aegyptius*
- (c) *H. ducreyi*
- (d) *H. parainfluenzae*

Ans. (b)

Q. 8. Chancroid is caused by:

- (a) *Haemophilus influenzae*
- (b) *H. aphrophilus*
- (c) *H. ducreyi*
- (d) *H. parainfluenzae*

Ans. (c)

Q. 9. Which of the following features can differentiate chancroid from primary lesion of syphilis (chancre)?

- (a) Nonindurated irregular ulcers
- (b) Presence of Gram-negative coccobacilli

- (c) Culture on heated blood agar with 1% Iso Vitalex and vancomycin 3 mg/l
- (d) All of the above

Ans. (d)

Q. 10. Which of the following bacteria is commensal in the throat?

- (a) *Haemophilus haemolyticus*
- (b) *H. ducreyi*
- (c) *H. influenzae* biogroup *aegyptius*
- (d) *Mycobacterium tuberculosis*

Ans. (a)

Q. 11. A 2-year-old unvaccinated child was seen in the emergency room with headache and fever. The spinal fluid was sent to the laboratory for culture and sensitivity. The Gram stain showed many white blood cells and many Gram-negative rods. The spinal fluid should be inoculated on which of the following media?

- (a) Chocolate agar
- (b) Thayer-Martin medium
- (c) Lowenstein-Jensen medium
- (d) Loeffler's serum slope

Ans. (a)

Q. 12. The most common biotype and serotype of *Haemophilus influenzae* causing meningitis is:

- (a) Biotype III; serotype a
- (b) Biotype I; serotype b
- (c) Biotype II; serotype c
- (d) Biotype I; serotype d

Ans. (b)

Q. 13. Refrigeration of cerebrospinal fluid is not recommended because it may kill:

- (a) *Haemophilus influenzae*
- (b) *Naegleria fowleri*
- (c) Both of the above
- (d) Neither of the above

Ans. (c)

BORDETELLA

Q. 1. Which of the following species of *Bordetella* is the most important human pathogen?

- (a) *Bordetella pertussis*
- (b) *B. parapertussis*
- (c) *B. bronchiseptica*
- (d) *B. avium*

Ans. (a) *Bordetella pertussis* causes syndrome called pertussis or whooping cough. It is the most important human

pathogen of the genus *Bordetella*. *B. parapertussis* causes milder disease. *B. bronchiseptica* and *B. avium* cause infection in domestic and wild animals, and turkey, respectively. *B. parapertussis* may occasionally produce infection resembling whooping cough in man.

Q. 2. Which of the following media is employed most frequently for the isolation of *Bordetella pertussis*?

- (a) Blood agar
- (b) Chocolate agar
- (c) Charcoal blood agar
- (d) Nutrient agar

Ans. (c)

Q. 3. Which of the following bacteria is/are motile?

- (a) *Bordetella pertussis*
- (b) *B. parapertussis*
- (c) *B. bronchiseptica*
- (d) All of the above

Ans. (c)

Q. 4. Pertussis toxin is produced by:

- (a) *Bordetella pertussis*
- (b) *B. parapertussis*
- (c) *B. bronchiseptica*
- (d) All of the above

Ans. (a)

Q. 5. Which phase of *Bordetella pertussis* is used for vaccine preparation?

- (a) Phase I
- (b) Phase II
- (c) Phase III
- (d) Phase IV

Ans. (a)

Q. 6. The most infective stage in whooping cough is:

- (a) Catarrhal stage
- (b) Paroxysmal stage
- (c) Convalescent stage
- (d) When the patient develops complications

Ans. (a) The most infective stage in whooping cough is catarrhal stage, because at this stage a large number of organisms are present in the upper respiratory tract. Susceptible individuals acquire infection after infectious aerosols are inhaled.

Q. 7. Which of the following methods is most suitable for culture of *Bordetella pertussis*?

- (a) Nasopharyngeal aspirate culture
- (b) Postnasal swab culture
- (c) Cough plate method
- (d) Sputum culture

Ans. (a) Nasopharyngeal aspirate collected through a rubber catheter is the optimal diagnostic specimen. Postnasal

swab employed to collect posterior pharyngeal wall secretion through oral cavity may be contaminated with saliva. Similarly, cough plate and sputum may contain normal flora of the upper respiratory tract.

Q. 8. Which of the following factors act/s as virulence determinant/s for *Bordetella pertussis*?

- (a) Pertussis toxin
- (b) Tracheal cytotoxin
- (c) Filamentous hemagglutinin
- (d) All of the above

Ans. (d)

Q. 9. Agglutinogens 1–6 are specific for:

- (a) *Bordetella pertussis*
- (b) *B. paraptussis*
- (c) *B. bronchiseptica*
- (d) *B. avium*

Ans. (a) Mammalian bordetellae possess 14 agglutinogens (AGGs) of which AGGs 1–6 are specific for *Bordetella pertussis*.

Q. 10. The antimicrobial agent of choice for the treatment of pertussis is:

- (a) Ampicillin
- (b) Amoxicillin
- (c) Erythromycin
- (d) Penicillin

Ans. (c)

BRUCELLA

Q. 1. Which of the following *Brucella* spp. is capnophilic?

- (a) *B. abortus*
- (b) *B. melitensis*
- (c) *B. suis*
- (d) *B. canis*

Ans. (a)

Q. 2. Common reservoir hosts of *Brucella melitensis* are:

- (a) Sheep and goats
- (b) Cattle
- (c) Pigs
- (d) Rats

Ans. (a)

Q. 3. Which of the following *Brucella* spp. is most pathogenic for man?

- (a) *B. melitensis*
- (b) *B. abortus*
- (c) *B. suis*
- (d) *B. canis*

Ans. (a)

Q. 4. Brucellae are transmitted to humans by:

- (a) Direct contact with animal tissues
- (b) Ingestion of contaminated meat

- (c) Ingestion of raw infected milk
- (d) All of the above

Ans. (d)

Q. 5. Which of the following media is used for culturing *Brucella* spp. from blood?

- (a) Trypticase soy broth
- (b) Glucose broth
- (c) Bile broth
- (d) Meat infusion broth

Ans. (a) For culturing *Brucella* spp. from blood, trypticase soy broth or serum dextrose broth is employed.

Q. 6. Agglutination test for *Brucella* mainly identifies which class of antibodies?

- (a) IgG
- (b) IgM
- (c) IgA
- (d) IgE

Ans. (b) Agglutination test identifies mainly IgM antibodies while both IgM and IgG can fix complement.

Q. 7. 2ME agglutination test for brucellosis is used to identify:

- (a) IgG
- (b) IgM
- (c) IgA
- (d) IgE

Ans. (a) 2ME agglutination test for brucellosis is used to identify IgG (2ME-resistant) agglutinins. 2ME reduces the disulphide bonds that link IgM molecules to release the subunits.

Q. 8. Milk ring test is used to identify which of the following infections?

- (a) Brucellosis
- (b) Salmonellosis
- (c) Bovine tuberculosis
- (d) Bubonic plague

Ans. (a) Milk ring test is used to identify brucellosis in animals. Pooled milk samples are tested for antibodies by milk ring test.

Q. 9. Vaccination of cattle against brucellosis is done by:

- (a) Attenuated *Brucella abortus* vaccine
- (b) Attenuated *B. melitensis* vaccine
- (c) Attenuated *B. ovis* vaccine
- (d) Attenuated *B. neotomae* vaccine

Ans. (a)

Q. 10. A pathogen of both humans and cattle that causes undulant fever is a member of the genus:

- (a) *Bordetella*
- (b) *Brucella*
- (c) *Haemophilus*
- (d) *Legionella*

Ans. (b)

MYCOPLASMA AND UREAPLASMA

Q. 1. Which of the following genera can synthesize carotenol?

- (a) *Mycoplasma* (b) *Ureaplasma*
- (c) *Acholeplasma* (d) *Anaeroplasma*

Ans. (c) *Acholeplasma* synthesizes carotenol as a substitute for cholesterol, but will incorporate cholesterol if it is provided.

Q. 2. Which of the following genera can hydrolyze urea?

- (a) *Mycoplasma* (b) *Ureaplasma*
- (c) *Acholeplasma* (d) All of the above

Ans. (b) The organisms of the genus *Ureaplasma* can hydrolyze urea while *Mycoplasma* and *Acholeplasma* cannot do so.

Q. 3. Colonies with 'fried egg' appearance are seen in:

- (a) *Mycoplasma* (b) *Pseudomonas*
- (c) *Haemophilus* (d) *Bordetella*

Ans. (a) *Mycoplasma* is cell wall-deficient organism. When grown on suitable solid medium, the *Mycoplasma* cells initially multiply within the agar to form an opaque ball-shaped colony that grows up to the surface of the agar and spreads around it forming a translucent peripheral zone. Such a colony presents a fried-egg appearance.

Q. 4. What is the usual site for isolation of *Ureaplasma urealyticum*?

- (a) Skin (b) Genital tract
- (c) Respiratory tract (d) Gastrointestinal tract

Ans. (b) The usual site of isolation of *Ureaplasma urealyticum* is genital tract because it may cause non-chlamydial and non-gonococcal urethritis, epididymitis, vaginitis and cervicitis.

Q. 5. Which of the following tests can help in the laboratory diagnosis of primary atypical pneumonia?

- (a) Cold agglutinin test
- (b) *Streptococcus* MG agglutination test
- (c) Culture in *Mycoplasma* broth medium
- (d) All of the above

Ans. (d)

Q. 6. Which of the following drugs is most suitable for the treatment of *Mycoplasma* and *Ureaplasma* infections?

- (a) Penicillins (b) Cephalosporins
- (c) Tetracyclines (d) Nalidixic acid

Ans. (c) Cell wall-deficient mycoplasmas and ureaplasmas are resistant to penicillins and cephalosporins which act on cell wall. They are sensitive to tetracyclines and

erythromycin which inhibit protein synthesis. Therefore, tetracyclines and erythromycin are drugs of choice for the treatment of *Mycoplasma* and *Ureaplasma* infections.

Q. 7. Which of the following genera are found in rumens of cattle and sheep?

- | | |
|-------------------------|------------------------|
| (a) <i>Mycoplasma</i> | (b) <i>Ureaplasma</i> |
| (c) <i>Anaeroplasma</i> | (d) <i>Spiroplasma</i> |

Ans. (c)

Q. 8. Cell wall is lacking in:

- | | |
|----------------------------|------------------------|
| (a) <i>Mycoplasma</i> | (b) <i>Actinomyces</i> |
| (c) <i>Corynebacterium</i> | (d) <i>Brucella</i> |

Ans. (a) Refer to Q. Nos. 3 and 6 above.

Q. 9. Colonies of *Mycoplasma pneumoniae* can be identified by:

- (a) Haemadsorption test
- (b) Tetrazolium reduction test
- (c) Fluorescence of colonies treated with specific antiserum labelled with a fluorochrome
- (d) All of the above

Ans. (d)

Q. 10. What is/are the shape/s of *Mycoplasma* cells?

- | | |
|-------------------|----------------------|
| (a) Coccoid | (b) Filamentous |
| (c) Bizarre forms | (d) All of the above |

Ans. (d) Bacterial cell wall is a complex rigid structure which gives bacteria their definite shape. But *Mycoplasma* cells are cell wall-deficient. Therefore, they occur in coccoid, filamentous and bizarre forms.

Q. 11. Penicillins have no effect on *Mycoplasma pneumoniae* because the latter:

- | | |
|----------------------------------|--------------------|
| (a) Possesses β -lactamase | (b) Lack cell wall |
| (c) Is too small | (d) Is eukaryote |

Ans. (b) Refer to Q. Nos. 3 and 6 above.

RICKETTSIA, ORIENTIA, EHRLICHIA, ANAPLASMA, NEORICKETTSIA, COXIELLA AND BARTONELLA

Q. 1. Which of the following bacteria **does not** require an arthropod vector for its transmission?

- | | |
|------------------------------|--------------------------------|
| (a) <i>Coxiella burnetii</i> | (b) <i>Rickettsia akari</i> |
| (c) <i>R. prowazekii</i> | (d) <i>Bartonella quintana</i> |

Ans. (a)

Q. 2. The causative agent of Q fever is:

- (a) *Rickettsia prowazekii* (b) *R. akari*
- (c) *Coxiella burnetii* (d) *Orientia tsutsugamushi*

Ans. (c)

Q. 3. The causative agent of epidemic typhus is:

- (a) *Rickettsia prowazekii* (b) *R. rickettsii*
- (c) *R. akari* (d) *Coxiella burnetii*

Ans. (a)

Q. 4. Human body louse is responsible for transmission of which of the following diseases?

- (a) Epidemic typhus (b) Murine typhus
- (c) Rickettsialpox (d) Q fever

Ans. (a)

Q. 5. Mites are responsible for transmission of which of the following diseases?

- (a) Epidemic typhus (b) Murine typhus
- (c) Scrub typhus (d) Trench fever

Ans. (c)

Q. 6. The causative agent of cat-scratch disease is:

- (a) *Bartonella henselae* (b) *B. quintana*
- (c) *Coxiella burnetii* (d) *Rickettsia prowazekii*

Ans. (a)

Q. 7. Which of the following bacteria can be grown on artificial media?

- (a) *Bartonella quintana* (b) *Coxiella burnetii*
- (c) *Rickettsia prowazekii* (d) *R. typhi*

Ans. (a)

Q. 8. Human infections due to *Coxiella* can be acquired by:

- (a) Consumption of infected milk
- (b) Handling of infected wool or hides
- (c) Soil contaminated with faeces of infected animals
- (d) All of the above

Ans. (d)

Q. 9. Fever and tunica reaction are seen in guinea-pigs inoculated with:

- (a) *Rickettsia typhi* (b) *Chlamydia trachomatis*
- (c) *C. pneumoniae* (d) *Rickettsia prowazekii*

Ans. (a) When a male guinea-pig is inoculated with a culture of *Rickettsia typhi*, it develops fever and a characteristic scrotal inflammation. The scrotum becomes enlarged

and the testis cannot be pushed back into the abdomen because of the inflammatory adhesions between the layers of tunica vaginalis. This is known as Neil-Mooser or tunica reaction. It is negative with *Chlamydia trachomatis*, *C. pneumoniae* and *Rickettsia prowazekii*.

Q. 10. Weil-Felix test is negative in:

- (a) Epidemic typhus
- (b) Endemic typhus
- (c) Spotted fevers
- (d) Q fever

Ans. (d)

Q. 11. In scrub typhus agglutination is seen with:

- (a) OX19 antigen
- (b) OX2 antigen
- (c) OXK antigen
- (d) All of the above

Ans. (c)

Q. 12. Agglutination with OX19 and OX2 antigens is seen in:

- (a) Epidemic typhus
- (b) Scrub typhus
- (c) Trench fever
- (d) Q fever

Ans. (a)

Q. 13. Which of the following diseases can be spread by ixodid ticks?

- (a) Rocky Mountain spotted fever
- (b) Epidemic typhus
- (c) Trench fever
- (d) All of the above

Ans. (a)

Q. 14. Which of the following stains is/are commonly used for staining *Rickettsia*?

- (a) Gram stain
- (b) Acid-fast stain
- (c) Giemsa stain
- (d) All of the above

Ans. (c) Stains commonly used for staining *Rickettsia* are Giemsa, Gimenez and Macchiavello.

Q. 15. Which disease/s was/were responsible for ruin and misery during Irish famine of 1845–59?

- (a) Epidemic typhus
- (b) Relapsing fever
- (c) Dysentery
- (d) All of the above

Ans. (d)

Q. 16. Which disease was a major factor in Napoleon's defeat in Russia in 1812?

- (a) Epidemic typhus
- (b) Relapsing fever
- (c) Dysentery
- (d) Plague

Ans. (a)

CHLAMYDIA AND CHLAMYDOPHILA

Q. 1. Which of the following characters is/are shown by Chlamydiaeae?

- (a) Lack of peptidoglycan
- (b) Lack of ability to produce their own ATP
- (c) Production of inclusion bodies
- (d) All of the above

Ans. (d)

Q. 2. Which of the serovars of *Chlamydia trachomatis* cause trachoma?

- (a) A, B, Ba, C
- (b) D–K
- (c) L1–L3
- (d) All of the above

Ans. (a)

Q. 3. Which of the serovars of *Chlamydia trachomatis* cause genital tract infections?

- (a) A, B, Ba, C
- (b) D–K
- (c) Both of the above
- (d) None of the above

Ans. (b)

Q. 4. Man acquires psittacosis from:

- (a) Parrots
- (b) Ducks
- (c) Pigeons
- (d) Domestic fowl

Ans. (a) Psittacosis is a disease of the birds of the psittacine (parrot) family. Man acquires infection from parrots. The disease acquired by contact with non-psittacine birds is known as ornithosis.

Q. 5. Reniform inclusion bodies can be demonstrated in which of the following infections?

- (a) *Chlamydia trachomatis* infection
- (b) Rickettsial infection
- (c) Candidal infection
- (d) *Acanthamoeba* infection

Ans. (a) Chlamydia trachomatis causes infection of conjunctiva, urethra and cervix. It may be diagnosed by demonstrating typical reniform inclusion bodies surrounding the nucleus in the conjunctival, urethral and cervical smears stained with Giemsa, Castanada and Macchiavello methods.

Q. 6. Which of the following tests can aid in the laboratory diagnosis of chlamydiaeal infections?

- (a) Light microscopy
- (b) Immunofluorescence test

- (c) ELISA for detection of antigen
- (d) All of the above

Ans. (d)

Q. 7. What is the drug of choice for treatment of chlamydiaeal infections in babies?

- (a) Erythromycin
- (b) Penicillin
- (c) Streptomycin
- (d) Doxycycline

Ans. (a) Drug of choice for the treatment of chlamydiaeal infections in babies is erythromycin, and doxycycline in adults.

Q. 8. Which of the following serovars of *Chlamydia trachomatis* are responsible for inclusion conjunctivitis?

- (a) A, B, Ba, C
- (b) D–K
- (c) L1–L3
- (d) None of the above

Ans. (b)

Q. 9. Which of the following techniques can be used for isolation of Chlamydiaceae?

- (a) Inoculation into mice
- (b) Inoculation in yolk sac of chick embryo
- (c) Inoculation in cell cultures
- (d) All of the above

Ans. (d)

Q. 10. Which of the following techniques can be used for detection of chlamydiaeal antibody?

- (a) Complement fixation test
- (b) ELISA test
- (c) Microimmunofluorescence
- (d) All of the above

Ans. (d)

ACTINOMYCETES

Q. 1. Which of the following bacteria is acid-fast to 1% sulphuric acid?

- (a) *Actinomyces*
- (b) *Nocardia*
- (c) *Streptomyces*
- (d) *Corynebacterium*

Ans. (b) *Nocardia*, *Mycobacterium leprae*, tubercle bacilli and non-tuberculous mycobacteria resist 1%, 5%, 20% and 20% sulphuric acid, respectively. *Actinomyces* is non-acid-fast. Therefore, the correct answer is (b).

Q. 2. Which of the following bacteria is the commonest cause of cervicofacial actinomycosis?

- (a) *Actinomyces israelii* (b) *A. naeslundii*
- (c) *A. viscosus* (d) *A. meyeri*

Ans. (a) Cervicofacial actinomycosis is caused by all the actinomycetes listed at (a), (b), (c) and (d). However, the commonest cause of cervicofacial actinomycosis is *Actinomyces israelii*. All the species listed are commensals of mouth, therefore, endogenous source of disease.

Q. 3. Which part of the body is most commonly involved in nocardiosis?

- (a) Lungs (b) Skin
- (c) Eye (d) Liver

Ans. (a) Nocardiosis is a systemic bacterial disease. The most important part of the body involved in nocardiosis is the lungs.

Q. 4. Paraffin bait technique is used for the isolation of *Nocardia* from:

- (a) Soil
- (b) Sputum
- (c) Both of the above
- (d) None of the above

Ans. (c) *Nocardia* can utilize paraffin as sole source of carbon. Paraffin bait technique can be used for isolation of *Nocardia* from soil and sputum.

Q. 5. Colonies resembling molar teeth are produced by:

- (a) *Actinomyces israelii*
- (b) *Nocardia brasiliensis*
- (c) *N. asteroides*
- (d) *Actinomadura madurae*

Ans. (a)

MISCELLANEOUS BACTERIA

Q. 1. Which of the following organisms is more likely to be associated with human disease?

- (a) *Listeria monocytogenes*
- (b) *L. grayi*
- (c) *L. murayi*
- (d) *L. innocua*

Ans. (a)

Q. 2. In adults, listeriosis may lead to:

- (a) Meningitis
- (b) Brain abscess
- (c) Encephalitis
- (d) All of the above

Ans. (d)

Q. 3. In erysipeloid, the portal of entry of the causative agent is:

- (a) Skin
- (b) Respiratory tract
- (c) Gastrointestinal tract
- (d) All of the above

Ans. (a)

Q. 4. Donovan bodies are seen in infection caused by which of the following bacteria?

- (a) *Streptobacillus moniliformis*
- (b) *Klebsiella granulomatis*
- (c) *Eikenella corrodens*
- (d) *Neisseria gonorrhoeae*

Ans. (b) *Klebsiella granulomatis* causes a sexually transmitted disease known as donovanosis, granuloma venereum or granuloma inguinale. In infected tissues, it can be best stained by Wright-Giemsa method, which stains body of the bacillus blue and the capsule pink. They are contained within the cytoplasmic vacuoles (phagosomes) of large macrophages and are known as Donovan bodies.

Q. 5. Corroding of blood agar by the colonies of *Eikenella corrodens* is due to:

- (a) Twitching motility of bacteria
- (b) Production of phospholipases
- (c) Anaerobic nature of bacteria
- (d) All of the above

Ans. (a)

Q. 6. Which of the following characteristics is important in the virulence of *Listeria monocytogenes*?

- (a) Production of haemolysin
- (b) Production of urease
- (c) Presence of fimbriae
- (d) Presence of capsule

Ans. (a)

Q. 7. End-over-end tumbling motility is seen in:

- (a) *Listeria monocytogenes*
- (b) *Proteus mirabilis*
- (c) *Escherichia coli*
- (d) *Salmonella* serotype Typhi

Ans. (a) *Listeria monocytogenes* exhibits a characteristic end-over-end tumbling motility when a drop of broth culture is examined under microscope. Organisms listed at (b), (c) and (d) are actively motile.

Q. 8. Which of the following organisms is non-pigmented?

- (a) *Chromobacterium violaceum*
- (b) *Flavobacterium meningosepticum*
- (c) *Listeria monocytogenes*
- (d) *Pseudomonas aeruginosa*

Ans. (c)

Q. 9. Which of the following bacteria can be transmitted by contact with rats?

- (a) *Streptobacillus moniliformis*
- (b) *Spirillum minus*
- (c) *Yersinia pestis*
- (d) All of the above

Ans. (d)

Q. 10. Which of the following organisms shows α -haemolysis around their colonies?

- (a) *Listeria monocytogenes*
- (b) *Erysipelothrix rhusiopathiae*
- (c) *Flavobacterium meningosepticum*
- (d) *Chromobacterium violaceum*

Ans. (b)

Q. 11. In which of the following organisms category 3 containment is required for all manipulations and animal work?

- (a) *Streptobacillus moniliformis*
- (b) *Eikenella corrodens*
- (c) *Neisseria gonorrhoeae*
- (d) *Francisella tularensis*

Ans. (d) *Francisella tularensis* is extremely dangerous to handle in the laboratory, therefore, category 3 containment is required for all manipulations and animal work.

Q. 12. Which of the following bacteria lacks flagella and shows jerking or twitching motility?

- (a) *Listeria monocytogenes*
- (b) *Eikenella corrodens*
- (c) *Erysipelothrix rhusiopathiae*
- (d) *Gardnerella vaginalis*

Ans. (b) *Eikenella corrodens* lacks flagella, but it shows twitching motility mediated by fimbria-like filamentous appendages. After 48-hour incubation at 37°C on blood agar or chocolate agar, the colonies are small (0.5–1 mm in diameter) with characteristic pitting or cordoning of blood agar, hence the species name *corrodens*.

Q. 13. Which disease is diagnosed by finding Donovan bodies in scrapings from lesions?

- (a) Syphilis
- (b) Granuloma inguinale
- (c) Chancroid
- (d) Genital warts

Ans. (b) Refer to Q. No. 4 above.

Virology

GENERAL PROPERTIES OF VIRUSES

Q. 1. The function/s of a viral capsid is/are:

- (a) It protects the viral genome from physical and enzymatic destruction.
- (b) It provides binding sites that enable the virus to attach to specific receptor sites on the host cell.
- (c) It serves as a vehicle of transmission from one host to another.
- (d) All of the above

Ans. (d)

Q. 2. What is the symmetry of poxviruses?

- (a) Icosahedral
- (b) Helical
- (c) Complex
- (d) None of the above

Ans. (c)

Q. 3. Which of the following viruses is/are enveloped?

- (a) Herpes
- (b) Polio
- (c) Adeno
- (d) All of the above

Ans. (a) Herpes viruses are enveloped, and polio and adeno-viruses are naked viruses.

Q. 4. Which of the following viruses is relatively thermostable?

- (a) Hepatitis A virus
- (b) Human immunodeficiency virus
- (c) Rubella virus
- (d) Influenza virus

Ans. (a) Hepatitis A virus is relatively thermostable, and human immunodeficiency virus, rubella virus and influenza virus are delicate viruses.

Q. 5. Enzyme neuraminidase is carried by which of the following viruses?

- (a) Influenza virus
- (b) Human immunodeficiency virus
- (c) Epstein-Barr virus
- (d) Adenovirus

Ans. (a) Enzyme neuraminidase is carried in the neuraminidase peplomers of influenza virus. Peplomers of human immunodeficiency virus carry glycoprotein peplomers which possess binding avidity for CD4 receptors of host cell. Epstein-Barr virus and adenovirus do not possess peplomers.

Q. 6. Which of the following viruses can haemagglutinate erythrocytes of various animal species?

- (a) Influenza
- (b) Toga
- (c) Rubella
- (d) All of the above

Ans. (d)

Q. 7. Which of the following disinfectants is/are effective against viruses?

- (a) Hypochlorite
- (b) Hydrogen peroxide
- (c) Formaldehyde
- (d) All of the above

Ans. (d)

Q. 8. Which of the following viruses is/are susceptible to chloroform?

- (a) Herpes
- (b) Influenza
- (c) Measles
- (d) All of the above

Ans. (d)

Q. 9. The envelope of which of the following viruses is derived from the host cell nucleus?

- (a) Herpesviruses
- (b) Retroviruses
- (c) Orthomyxoviruses
- (d) Paramyxoviruses

Ans. (a) In case of enveloped viruses, the envelope is derived from the nuclear membrane if they assemble in nucleus (herpesviruses), and from plasma membrane if they assemble in the cytoplasm of the host cell. Therefore, the correct answer is (a).

Q. 10. Suckling mice are used for the isolation of:

- (a) Arboviruses
- (b) Poxviruses

- (c) Herpesviruses
- (d) Human immunodeficiency virus

Ans. (a)

Q. 11. Lesions on chorioallantoic membrane are produced by which of the following viruses?

- (a) Vaccinia virus
- (b) Herpes simplex virus
- (c) Variola virus
- (d) All of the above

Ans. (d)

Q. 12. Which of the following is diploid cell culture?

- (a) WI-38
- (b) HeLa
- (c) HEp-2
- (d) KB

Ans. (a) WI-38 is semi-continuous (diploid) cell strain, and HeLa, HEp-2 and KB are continuous cell cultures.

Q. 13. Which of the following is/are continuous cell line/s?

- (a) HeLa
- (b) HEp-2
- (c) KB
- (d) All of the above

Ans. (d)

Q. 14. In cell culture, measles virus leads to:

- (a) Nuclear pyknosis
- (b) Syncytium formation
- (c) Transformation of cells
- (d) Rounding and aggregation of cells

Ans. (b)

Q. 15. Inclusion bodies of rabies virus are:

- (a) Intracytoplasmic
- (b) Intranuclear
- (c) Both of the above
- (d) None of the above

Ans. (a)

Q. 16. Inclusion bodies of measles virus are:

- (a) Intracytoplasmic
- (b) Intranuclear
- (c) Both of the above
- (d) None of the above

Ans. (c)

Q. 17. Haemadsorption of infected cells is observed with:

- (a) Parainfluenza viruses
- (b) Measles virus
- (c) Mumps virus
- (d) All of the above

Ans. (d)

Q. 18. Which of the following agents is/are prions?

- (a) Agent causing scrapie
- (b) Agent causing kuru

- (c) Agent causing Creutzfeldt-Jakob disease
- (d) All of the above

Ans. (d)

Q. 19. Which of the following viruses belong/s to family Flaviviridae?

- (a) Rubella virus
- (b) Yellow fever virus
- (c) Hepatitis C virus
- (d) All of the above

Ans. (d)

Q. 20. Which of the following viruses belong/s to family Hepadnaviridae?

- (a) Hepatitis A virus
- (b) Hepatitis B virus
- (c) Hepatitis D virus
- (d) All of the above

Ans. (b) Hepatitis B virus belongs to family Hepadnaviridae. Hepatitis A virus belongs to the family Picornaviridae. Hepatitis D virus is unclassified.

Q. 21. Which of the following viruses belong/s to family Caliciviridae?

- (a) Hepatitis B virus
- (b) Hepatitis D virus
- (c) Hepatitis E virus
- (d) All of the above

Ans. (c) Hepatitis E virus belongs to family Caliciviridae.

Q. 22. Which of the following is RNA virus?

- (a) Papilloma virus
- (b) Influenza virus
- (c) Hepatitis B virus
- (d) Epstein-Barr virus

Ans. (b) Influenza virus is a RNA virus. Papilloma virus, hepatitis B virus and Epstein-Barr virus are DNA viruses.

Q. 23. Which of the following is DNA virus?

- (a) Polio virus
- (b) Rubella virus
- (c) Vaccinia virus
- (d) Human immunodeficiency virus

Ans. (c) Vaccinia virus is a DNA virus. Polio virus, rubella virus and human immunodeficiency virus are RNA viruses.

Q. 24. A chemical component that is found in all viruses is:

- (a) Protein
- (b) RNA
- (c) DNA
- (d) Lipid

Ans. (a) Protein component (capsid) is present in all viruses. RNA or DNA is present in RNA or DNA viruses, respectively and never both. Lipid is present in enveloped viruses.

Q. 25. Which of the following is not RNA virus?

- (a) Retrovirus
- (b) Enterovirus
- (c) Rhabdovirus
- (d) Adenovirus

Ans. (d) Adenovirus is a DNA virus and not RNA virus. Retrovirus, enterovirus and rhabdovirus are RNA viruses.

Q. 26. Viruses range in size from:

- (a) 1 to 100 nm
- (b) 10 to 300 nm
- (c) 300 to 500 nm
- (d) 500 to 750 nm

Ans. (b)

VIRUS-HOST INTERACTIONS, LABORATORY DIAGNOSIS OF VIRAL INFECTIONS, AND VIRAL VACCINES

Q. 1. Negri bodies are found in cells infected with:

- (a) Rabies virus
- (b) Vaccinia virus
- (c) Fowlpox virus
- (d) Paramyxoviruses

Ans. (a) Rabies virus, vaccinia virus and fowlpox virus form intracytoplasmic inclusion bodies. Of these, inclusion bodies formed by rabies virus are known as Negri bodies. Paramyxoviruses do not form inclusion bodies.

Q. 2. Intracytoplasmic inclusion bodies are found in cells infected with:

- (a) Rabies virus
- (b) Vaccinia virus
- (c) Fowlpox virus
- (d) All of the above

Ans. (d) Refer to Q. No. 1 above.

Q. 3. All of the following viruses are transmitted by respiratory route, except:

- (a) Coronavirus
- (b) Rubella virus
- (c) Measles virus
- (d) Norwalk virus

Ans. (d) Norwalk virus is acquired by faecal contamination of water or food and not by respiratory route. On the other hand, coronavirus, rubella virus and measles virus are transmitted by respiratory route.

Q. 4. Which of the following viruses lead/s to transformation of infected cells?

- (a) Hepatitis C virus
- (b) Human T cell leukaemia virus type 1
- (c) Epstein-Barr virus
- (d) All of the above

Ans. (d) Hepatitis C virus, human T cell leukaemia virus type 1 and Epstein-Barr virus are oncogenic viruses, therefore all these cause transformation of infected cells.

Q. 5. Which of the following viruses is/are transmitted by the respiratory route?

- (a) *Coronavirus* (b) *Rhinovirus*
- (c) Measles virus (d) All of the above

Ans. (d)

Q. 6. Which of the following viruses is/are transmitted by genital route?

- (a) Papillomaviruses
- (b) Herpes simplex virus type 2
- (c) Hepatitis B virus
- (d) All of the above

Ans. (d)

Q. 7. What is the route of transmission of rubella virus?

- (a) Respiratory tract (b) Alimentary tract
- (c) Genital tract (d) Conjunctiva

Ans. (a)

Q. 8. Which type/s of interferon is/are produced by T lymphocytes?

- (a) α (b) β (c) γ (d) γ and β

Ans. (c)

Q. 9. Which type/s of interferon is/are produced by virus-infected cells?

- (a) α (b) β
- (c) Both of the above (d) None of the above

Ans. (c)

Q. 10. Fluorescence microscopy can be used for the laboratory diagnosis of:

- (a) Herpes simplex encephalitis
- (b) Subacute sclerosing panencephalitis
- (c) Rabies
- (d) All of the above

Ans. (d)

Q. 11. Polymerase chain reaction is useful in the diagnosis of which of the following infections?

- (a) HIV (b) Hepatitis B virus
- (c) Human papilloma virus (d) All of the above

Ans. (d)

Q. 12. Which of the following vaccines is/are live?

- (a) Measles vaccine
- (b) Mumps vaccine
- (c) Rubella vaccine
- (d) All of the above

Ans. (d)

Q. 13. Which of the following vaccines is/are nonreplicating?

- (a) Hepatitis B virus vaccine
- (b) Measles vaccine
- (c) Yellow fever vaccine
- (d) All of the above

Ans. (a) Measles vaccine and yellow fever vaccine are live attenuated vaccines and hepatitis B vaccine is nonreplicating vaccine. Therefore, the correct answer is (a).

Q. 14. Acyclovir is used for the treatment of which of the following infections?

- (a) Herpes simplex
- (b) Hepatitis B
- (c) AIDS
- (d) Influenza

Ans. (a)

Q. 15. Amantadine is used for the treatment of:

- (a) Varicella-zoster
- (b) AIDS
- (c) *Influenzavirus A*
- (d) Hepatitis B

Ans. (c)

Q. 16. Which of the following drugs is/are effective against HIV?

- (a) Zidovudine
- (b) Acyclovir
- (c) Ganciclovir
- (d) All of the above

Ans. (a)

BACTERIOPHAGE

Q. 1. T-even phages possess:

- (a) Double-stranded DNA
- (b) Single-stranded DNA
- (c) Double-stranded RNA
- (d) Single-stranded RNA

Ans. (a)

Q. 2. Which capsid symmetry is exhibited by T-even phages?

- (a) Hexagonal
- (b) Helical
- (c) Complex
- (d) All of the above

Ans. (a)

Q. 3. Contractile sheath of the tail is present in which of the following phages?

- (a) T2
- (b) T3
- (c) P22
- (d) None of the above

Ans. (a)

Q. 4. Which of the following properties is/are due to lysogenic conversion by phages?

- (a) Toxin production in *Corynebacterium diphtheriae*
- (b) Toxin production in *Clostridium botulinum* types C & D
- (c) Antigenic variation in *Salmonella* serotype Anatum
- (d) All of the above

Ans. (d)

Q. 5. Which of the following bacteria can be typed by phage typing method?

- (a) *Staphylococcus aureus*
- (b) *Salmonella* serotype Typhi
- (c) *Vibrio cholerae*
- (d) All of the above

Ans. (d)

Q. 6. Area of lysis on a bacterial lawn culture produced by a phage is known as:

- (a) Plaque
- (b) Pock
- (c) Pox
- (d) None of the above

Ans. (a) Area of lysis on a bacterial lawn culture produced by a phage is known as plaque. Visible lesions produced on chorioallantoic membrane of hen's egg by variola, vaccinia and herpes simplex virus are known as pocks. Lesions produced on the skin of man and animals by poxviruses are known as poxes.

Q. 7. Bacteriophages are readily counted by:

- (a) Plaque assay
- (b) ELISA
- (c) Cell culture
- (d) Radioimmunoassay

Ans. (a)

POXVIRUSES

Q. 1. World's last naturally occurring case of smallpox was recorded in:

- (a) 1957
- (b) 1967
- (c) 1977
- (d) 1987

Ans. (c)

Q. 2. Which of the following viruses was used for vaccination against smallpox?

- (a) Vaccinia
- (b) Variola
- (c) Cowpox
- (d) Buffalopox

Ans. (a)

Q. 3. Which of the following diseases can be caused by the viruses of the genus *Orthopoxvirus*?

- (a) Smallpox
- (b) Vaccinia
- (c) Cowpox
- (d) All of the above

Ans. (d)

Q. 4. What is the symmetry of nucleocapsid of poxviruses?

- (a) Icosahedral
- (b) Helical
- (c) Complex
- (d) None of the above

Ans. (c) Viruses which do not show either icosahedral or helical symmetry due to complexity of their structure are referred to have complex symmetry. Poxviruses have complex symmetry.

HERPESVIRUSES

Q. 1. Which of the following infections is/are caused by herpes simplex virus type 1?

- (a) Acute gingivostomatitis
- (b) Keratoconjunctivitis
- (c) Encephalitis
- (d) All of the above

Ans. (d)

Q. 2. Which of the following viruses has/have been blamed to cause cervical carcinoma?

- (a) Cytomegalovirus
- (b) Epstein-Barr virus
- (c) Herpes simplex virus type 2
- (d) All of the above

Ans. (c)

Q. 3. Which of the following methods can be used for laboratory diagnosis of infections caused by herpes simplex virus type 1?

- (a) Fluorescence microscopy
- (b) Production of intranuclear inclusions
- (c) Production of characteristic cytopathic changes in human fibroblast cultures
- (d) All of the above

Ans. (d)

Q. 4. Which of the following drugs can be used for the treatment of herpes simplex virus infections?

- (a) Acyclovir
- (b) Azidothymidine
- (c) Ribavirin
- (d) All of the above

Ans. (a)

Q. 5. Shingles is caused by:

- (a) Varicella-zoster virus
- (b) Cytomegalovirus
- (c) Epstein-Barr virus
- (d) Herpes simplex virus type 1

Ans. (a)

Q. 6. Which of the following malignancies is/are associated with Epstein-Barr virus?

- (a) Burkitt's lymphoma
- (b) Nasopharyngeal carcinoma
- (c) B cell lymphoma
- (d) All of the above

Ans. (d) Epstein-Barr virus is an oncogenic virus. It can cause Burkitt's lymphoma, nasopharyngeal carcinoma and B cell lymphoma. Therefore, the correct answer is (d).

Q. 7. Paul-Bunnell heterophile antibody test aids in the diagnosis of:

- (a) Infectious mononucleosis
- (b) Chickenpox
- (c) Genital herpes
- (d) Acute gingivostomatitis

Ans. (a) Infectious mononucleosis is accompanied by production of heterophile agglutinins. These are IgM in nature. These antibodies may be readily detected by agglutination of sheep or horse red cells by patient serum.

Q. 8. Which of the following secretions may carry cytomegalovirus in infected individuals?

- (a) Saliva
- (b) Semen
- (c) Urine
- (d) All of the above

Ans. (d) An individual infected with cytomegalovirus carries the virus for life and may shed it intermittently in saliva, urine, semen, cervical secretions and breast milk. Therefore, the correct answer is (d).

Q. 9. Which of the following agents can lead to congenital abnormalities?

- (a) *Toxoplasma gondii*
- (b) Cytomegalovirus
- (c) Rubella virus
- (d) All of the above

Ans. (d)

Q. 10. Which of the following viruses result/s in production of intranuclear as well as intracytoplasmic inclusion bodies?

- (a) Cytomegalovirus
- (b) Herpes simplex virus types 1 and 2
- (c) Varicella-zoster virus
- (d) All of the above

Ans. (a) Herpes simplex virus types 1 and 2 and varicella-zoster virus produce intranuclear inclusion bodies, while cytomegalovirus produces intranuclear as well as intracytoplasmic inclusion bodies.

Q. 11. Which of the following viruses belongs to subfamily Gamma-herpesvirinae?

- (a) Varicella-zoster virus
- (b) Epstein-Barr virus
- (c) Human cytomegalovirus
- (d) Herpes simplex virus type 1

Ans. (b)

Q. 12. Viruses that can remain latent in ganglia for many years are:

- (a) Rhinoviruses
- (b) Retroviruses
- (c) Enteroviruses
- (d) Herpesviruses

Ans. (d)

Q. 13. The disease shingles is caused by the same virus that causes:

- (a) Measles
- (b) smallpox
- (c) Rubella
- (d) Chickenpox

Ans. (d) Varicella-zoster virus causes varicella (chickenpox) in children and shingles (herpes zoster) in adults and immunocompromised patients. Therefore, the correct answer is (d).

Q. 14. Which of the following viruses cannot be cultivated in cell cultures?

- (a) Herpes simplex virus
- (b) Varicella-zoster virus
- (c) Epstein-Barr virus
- (d) Human cytomegalovirus

Ans. (c)

Q. 15. Which of the following is the largest virus in the family Herpesviridae?

- (a) Herpes simplex virus
- (b) Varicella-zoster virus
- (c) Epstein-Barr virus
- (d) Cytomegalovirus

Ans. (d)

**ADENOVIRUSES, PARVOVIRUSES, PAPILLOMAVIRUSES
AND POLYOMAVIRUSES**

Q. 1. What is the symmetry of adenoviruses?

- (a) Icosahedral
- (b) Helical
- (c) Complex
- (d) None of the above

Ans. (a)

Q. 2. Which of the following cell lines can be used for the growth of adenoviruses?

- (a) HeLa
- (b) HEp-2
- (c) KB
- (d) All of the above

Ans. (d)

Q. 3. Which of the following serotypes of adenoviruses are associated with acute respiratory disease?

- (a) Serotypes 4, 7, 14 and 21
- (b) Serotypes 19 and 37
- (c) Serotypes 40 and 41
- (d) All of the above

Ans. (a)

Q. 4. Which of the following serotypes of adenoviruses are most often associated with infantile gastroenteritis?

- (a) Serotypes 1–7
- (b) Serotypes 19 and 37
- (c) Serotypes 40 and 41
- (d) All of the above

Ans. (c)

Q. 5. Which of the following techniques can be used for the laboratory diagnosis of adenovirus infections?

- (a) Immunoelectron microscopy
- (b) Detection of viral antigen by immunofluorescence
- (c) Detection of viral antigen by ELISA
- (d) All of the above

Ans. (d)

Q. 6. How many serotypes of adenoviruses are known?

- (a) 29
- (b) 37
- (c) 52
- (d) 60

Ans. (c)

Q. 7. Which of the following viruses is also known as 'adeno-associated virus'?

- (a) *Parvovirus*
- (b) *Erythrovirus*
- (c) *Dependovirus*
- (d) JC polyomavirus

Ans. (c) Members of the genus *Dependovirus* are defective and require co-infection with a helper virus for their own replication. They are usually found in association with an adenovirus and are known as adeno-associated viruses.

Q. 8. Which of the following viruses is associated with erythematous eruption of the cheeks (slapped cheek)?

- (a) *Parvovirus* (b) *Erythrovirus*
- (c) *Dependovirus* (d) JC polyomavirus

Ans. (b)

Q. 9. What is/are the route/s of transmission of *Erythrovirus* infection?

- (a) Respiratory (b) Transplacental
- (c) Blood transfusion (d) All of the above

Ans. (d)

Q. 10. Which of the following human papillomaviruses may cause oral carcinomas?

- (a) HPV-16 (b) HPV-18 (c) HPV-32 (d) HPV-40

Ans. (a)

Q. 11. Which of the following human papillomaviruses are most often associated with genital warts?

- (a) HPV-3, 4 and 7 (b) HPV-6 and 11
- (c) HPV-14 and 32 (d) HPV-40 and 46

Ans. (b)

Q. 12. Which of the following techniques can be used for the laboratory diagnosis of *Papillomavirus* infections?

- (a) Immunocytochemistry
- (b) Electron microscopy
- (c) Detection of viral nucleic acid by PCR
- (d) All of the above

Ans. (d)

Q. 13. Which of the following viruses is associated with progressive multifocal leukoencephalopathy in immunosuppressed patients?

- (a) Simian virus 40 (b) JC polyomavirus
- (c) BK polyomavirus (d) Mouse polyomavirus

Ans. (b)

Q. 14. What is the preferred clinical specimen for detection of BK polyomavirus by electron microscopy?

- (a) Brain tissue (b) Urine
- (c) Blood (d) None of the above

Ans. (b) BK polyomavirus persists for life in kidneys. Therefore, urine is the preferred specimen for detection of BK polyomavirus by electron microscopy.

Q. 15. Human papillomavirus causes:

- (a) Molluscum contagiosum (b) Warts
- (c) Cowpox (d) Chickenpox

Ans. (b)

Q. 16. Genital warts are caused by:

- (a) *Neisseria gonorrhoeae*
- (b) *Treponema pallidum*
- (c) Herpes simplex virus type 2
- (d) Human papillomaviruses

Ans. (d) Human papillomaviruses cause genital warts. *Neisseria gonorrhoeae* causes genital discharge. *Treponema pallidum* and Herpes simplex virus type 2 cause painless and painful genital ulcers, respectively.

Q. 17. Human papillomavirus is thought to play a role in which of the following diseases?

- (a) Cervical cancer (b) Deafness
- (c) Blindness (d) Diarrhoea

Ans. (a) Human papillomavirus is thought to play a role in the causation of cervical cancer. It has nothing to do with deafness, blindness and diarrhoea.

PICORNAVIRUSES

Q. 1. Which of the following genera is/are included in the family Picornaviridae?

- (a) *Enterovirus* (b) *Rhinovirus*
- (c) *Hepatovirus* (d) All of the above

Ans. (d)

Q. 2. Which of the following viruses can cause aseptic meningitis?

- (a) Polioviruses (b) Coxsackieviruses
- (c) Echoviruses (d) All of the above

Ans. (d)

Q. 3. Which of the following serotypes is/are usually associated with endemic polio infections?

- (a) Type 1 (b) Type 2
- (c) Type 3 (d) All of the above

Ans. (b)

Q. 4. Paralytic poliomyelitis is seen in:

- (a) 90–95% of poliovirus infections
- (b) 4–8% of poliovirus infections

- (c) 1–2% of poliovirus infections
- (d) 0.1–2% of poliovirus infections

Ans. (d) Following infection with poliovirus, 0.1–2% develop paralytic poliomyelitis. 90–95% develop asymptomatic illness, 4–8% develop minor illness, and 1–2% develop aseptic meningitis.

Q. 5. Which of the following cell lines can support the growth of polioviruses?

- (a) Monkey kidney
- (b) Human amnion
- (c) HeLa
- (d) All of the above

Ans. (d)

Q. 6. Which of the following polio vaccines induce/s production of local secretory IgA antibodies?

- (a) Salk
- (b) Sabin
- (c) Both of the above
- (d) None of the above

Ans. (b) Sabin (oral polio vaccine) stimulates production of local secretory IgA antibody in the pharynx and alimentary tract. It also stimulates the production of humoral IgG antibodies. Salk vaccine stimulates the production of IgG antibodies.

Q. 7. Which of the coxsackieviruses can cause herpangina?

- (a) Group A
- (b) Group B
- (c) Both of the above
- (d) None of the above

Ans. (a)

Q. 8. Which of the following syndromes is/are associated with echovirus infection?

- (a) Aseptic meningitis
- (b) Fever with rash
- (c) Pneumonia
- (d) All of the above

Ans. (d)

Q. 9. Which of the following serotypes of enteroviruses was associated with a pandemic of acute haemorrhagic conjunctivitis in 1969?

- (a) Type 68
- (b) Type 69
- (c) Type 70
- (d) Type 71

Ans. (c)

Q. 10. Which of the following viruses are acid-labile?

- (a) Rhinoviruses
- (b) Echoviruses
- (c) Polioviruses
- (d) Coxsackieviruses

Ans. (a)

Q. 11. How many serotypes of rhinoviruses are there?

- (a) More than ten
- (b) More than twenty
- (c) More than sixty
- (d) More than one hundred

Ans. (d)

Q. 12. Development of a vaccine against rhinoviruses is difficult because:

- (a) They cannot be cultured in the laboratory
- (b) They replicate at very high rate
- (c) There are many different antigenically diverse strains
- (d) None of the above

Ans. (c)

Q. 13. Common cold is caused by:

- (a) rhinoviruses
- (b) Coxsackieviruses A21 and A24
- (c) Echoviruses 11 and 20
- (d) All of the above

Ans. (d)

RHABDOVIRUSES

Q. 1. What is the shape of rabies virus?

- (a) Spherical
- (b) Polygonal
- (c) Bullet-shaped
- (d) Tubular

Ans. (c)

Q. 2. Which of the following species of animals is most susceptible to rabies infection?

- (a) Skunk
- (b) Dog
- (c) Cat
- (d) Fowl

Ans. (c) Cat is most susceptible to rabies virus. Skunk and fowls are relatively resistant. Dog occupies intermittent position.

Q. 3. Negri bodies can be demonstrated in the brain of animal dying of infection with:

- (a) Fixed rabies virus
- (b) Street rabies virus
- (c) Vaccinia virus
- (d) Herpes simplex virus

Ans. (b) Negri bodies can be demonstrated in the brain of animal dying of street virus infection. Negri bodies are usually not demonstrable in the brain of animal dying of fixed virus infection.

Q. 4. Which of the following viral infections is associated with development of hydrophobia?

- (a) Influenza
- (b) Polio
- (c) Rabies
- (d) Hepatitis

Ans. (c)

Q. 5. Which of the following clinical specimens can be used for the demonstration of rabies antigen by direct immunofluorescence antemortem?

- (a) Salivary smears
- (b) Corneal smears
- (c) Conjunctival smears
- (d) All of the above

Ans. (d)

Q. 6. Which of the following rabies vaccines is a cell culture vaccine?

- (a) Duck egg vaccine
- (b) Semple vaccine
- (c) Suckling mouse brain vaccine
- (d) Purified chick embryo cell vaccine

Ans. (d) Purified chick embryo cell vaccine is a cell culture vaccine.

Q. 7. For prevention of development of rabies, what is the route of administration of human diploid cell vaccine?

- (a) Subcutaneous
- (b) Intramuscular
- (c) Intravenous
- (d) Intradermal

Ans. (b) Cell culture rabies vaccines are injected intramuscularly in the deltoid region. These should not be injected in gluteal region because high fat content in this region retards the absorption of vaccine.

Q. 8. Cell culture vaccines for rabies should be administered intramuscularly in:

- (a) Deltoid region
- (b) Gluteal region
- (c) Anterior abdominal wall
- (d) Ventral aspect of forearm

Ans. (a) Refer to Q. No. 7 above.

ORTHOMYXOVIRUSES

Q. 1. Which of the following genera is not included in family Orthomyxoviridae?

- (a) *Influenzavirus A*
- (b) *Influenzavirus B*
- (c) *Influenzavirus C*
- (d) Parainfluenza virus

Ans. (d)

Q. 2. Antigenic variation has not been demonstrated in:

- (a) *Influenzavirus A*
- (b) *Influenzavirus B*
- (c) *Influenzavirus C*
- (d) Human immunodeficiency virus

Ans. (c) The incidence of antigenic variation is highest in *Influenzavirus A*, less in *B*, and it has not been demonstrated in *Influenzavirus C*. Human immunodeficiency virus (HIV) can mutate rapidly and there is a possibility of recombination between different (HIV) strains.

Q. 3. Which of the following viruses cannot be cultivated in allantoic cavity of hen's egg?

- (a) *Influenzavirus A*
- (b) *Influenzavirus B*
- (c) *Influenzavirus C*
- (d) All of the above

Ans. (c) *Influenzavirus A* and *B* grow well in allantoic cavity. *Influenzavirus C* cannot grow in allantoic cavity. It can grow only in amniotic cavity.

Q. 4. Which of the following vaccines against influenza stimulates production of IgA antibodies?

- (a) Inactivated vaccine
- (b) Live attenuated vaccine
- (c) Both of the above
- (d) None of the above

Ans. (b) Live attenuated vaccine stimulates the production of local IgA antibodies. Inactivated vaccine induces the formation of circulating antibodies.

Q. 5. Which of the following drugs can be used for chemoprophylaxis of *Influenzavirus A* infection?

- (a) Rimantadine
- (b) Acyclovir
- (c) 5-fluorocytosine
- (d) All of the above

Ans. (a)

Q. 6. Which of the following cell lines can be used for the isolation of influenza viruses?

- (a) Primary monkey kidney cell line
- (b) Human embryo kidney cell line
- (c) Madin-Darby canine kidney cell line
- (d) All of the above

Ans. (d)

Q. 7. Neuraminidase peplomers are absent in:

- (a) *Influenzavirus A*
- (b) *Influenzavirus B*
- (c) *Influenzavirus C*
- (d) All of the above

Ans. (c) Attached to the lipid envelope of *Influenzavirus A* and *B* are two types of peplomers or spikes, the haemagglutinin and the neuraminidase. However, neuraminidase peplomers are not present in *Influenzavirus C*.

PARAMYXOVIRUSES

Q. 1. Measles virus belongs to which of the following genera?

- (a) *Rubulavirus* (b) *Morbillivirus*
- (c) *Pneumovirus* (d) *Paramyxovirus*

Ans. (b)

Q. 2. Surface spikes of which of the following viruses possess/es haemagglutinin but no neuraminidase?

- (a) Parainfluenza viruses (b) Measles virus
- (c) Mumps virus (d) All of the above

Ans. (b) Parainfluenza and mumps viruses possess HN and F glycoprotein peplomers. The former carries both haemagglutinating and neuraminidase functions. Measles virus envelope carries a haemagglutinin but not a neuraminidase.

Q. 3. Which of the following conditions can be caused by infection with mumps virus?

- (a) Swelling of parotid glands (b) Orchitis
- (c) Meningoencephalitis (d) All of the above

Ans. (d)

Q. 4. Koplik's spots are characteristic of which of the following infections?

- (a) Mumps (b) Measles (c) Herpes (d) Rubella

Ans. (b)

Q. 5. Subacute sclerosing panencephalitis is a complication of:

- (a) Mumps
- (b) Measles
- (c) Influenza
- (d) Respiratory syncytial virus

Ans. (b)

Q. 6. Which of the following viruses possesses a membrane fusion protein and lacks both haemagglutinin and neuraminidase activities?

- (a) Mumps virus (b) Measles virus
- (c) Respiratory syncytial virus (d) Parainfluenza virus

Ans. (c) Respiratory syncytial virus possesses a membrane fusion protein and lacks both haemagglutinating and neuraminidase activity. Mumps virus, measles virus and parainfluenza virus possess both haemagglutinating and neuraminidase activity, and fusion protein.

Q. 7. MMR vaccine is a:

- (a) Live attenuated vaccine
- (b) Killed vaccine
- (c) Subunit vaccine
- (d) Synthetic peptide vaccine

Ans. (a)

CALICIVIRUSES, ASTROVIRUSES AND CORONAVIRUSES

Q. 1. Which of the following viral agents can cause diarrhoea?

- (a) Norwalk virus
- (b) Astroviruses
- (c) Rotaviruses
- (d) All of the above

Ans. (d)

Q. 2. Which of the following characters is/are suggestive of human caliciviruses?

- (a) Cup-shaped surface depressions
- (b) Single-stranded positive sense RNA genome
- (c) Non-enveloped spherical virion
- (d) All of the above

Ans. (d)

Q. 3. Clinically, hepatitis E virus infection resembles:

- (a) hepatitis A virus infection
- (b) hepatitis B virus infection
- (c) hepatitis C virus infection
- (d) hepatitis D virus infection

Ans. (a)

Q. 4. What is the mode of transmission of hepatitis E?

- (a) Faecally contaminated drinking water
- (b) Infected syringes and needles
- (c) Sexual intercourse
- (d) None of the above

Ans. (a) Hepatitis E and hepatitis A are transmitted through faecally contaminated drinking water. Hepatitis B, C, D and G are transmitted through parenteral and sexual route. Therefore, the correct answer is (a).

Q. 5. Which of the following viruses is star-shaped in outline and transmitted by the faecal–oral route?

- (a) Hepatitis E virus
- (b) *Astrovirus*
- (c) *Calicivirus*
- (d) Hepatitis D virus

Ans. (b)

Q. 6. Which of the following viruses has club-shaped peplomers and infects the respiratory tract?

- (a) Astroviruses
- (b) *Coronavirus*
- (c) Norwalk agent
- (d) None of the above

Ans. (b)

Q. 7. Which of the following tests is most reliable for detection of hepatitis E infection?

- (a) Polymerase chain reaction for detection of HEV RNA
- (b) ELISA test for IgM anti-HEV
- (c) Western blot assay for IgM anti-HEV
- (d) ELISA test for IgG anti-HEV

Ans. (a)

ARBOVIRUSES, TOGAVIRIDAE, FLAVIVIRIDAE AND BUNYAVIRIDAE

Q. 1. Which of the following viral genera is/are not arthropod-borne?

- (a) *Alphavirus*
- (b) *Flavivirus*
- (c) *Rubivirus*
- (d) *Orthobunyavirus*

Ans. (c)

Q. 2. Which of the following mosquitoes acts as the vector of chikungunya virus?

- (a) *Aedes*
- (b) *Anopheles*
- (c) *Culex*
- (d) *Culiseta*

Ans. (a)

Q. 3. Which of the following mosquitoes act/s as the vector of sindbis virus?

- (a) *Culex*
- (b) *Culiseta*
- (c) *Aedes*
- (d) All of the above

Ans. (d)

Q. 4. Which of the following congenital abnormalities is/are seen in infants born to women infected with rubella?

- (a) Neurosensory deafness
- (b) Congenital heart disease
- (c) Retinopathy
- (d) All of the above

Ans. (d)

Q. 5. Which of the following viruses has not been reported from India?

- (a) Sindbis
- (b) Chikungunya
- (c) West Nile
- (d) Yellow fever

Ans. (d)

Q. 6. Which of the following manifestations is/are characteristic of dengue?

- (a) Fever
- (b) Pain in back, muscles and joints
- (c) Maculopapular rash
- (d) All of the above

Ans. (d)

Q. 7. How many serotypes of dengue virus are there?

- (a) Four
- (b) Five
- (c) Six
- (d) Ten

Ans. (a)

Q. 8. Which of the following mosquitoes act/s as vector for Japanese encephalitis virus?

- (a) *Culex*
- (b) *Aedes*
- (c) *Anopheles*
- (d) *Mansonia*

Ans. (a)

Q. 9. Which of the following act as amplifying hosts of Japanese encephalitis virus?

- (a) Water birds and man
- (b) Pigs and man
- (c) Water birds and pigs
- (d) Cows and goats

Ans. (c)

Q. 10. Which of the following diseases is tick-borne?

- (a) Kyasanur Forest disease
- (b) Yellow fever
- (c) Dengue
- (d) Japanese encephalitis

Ans. (a) Yellow fever and dengue are transmitted by *Aedes* and Japanese encephalitis is transmitted by *Culex* mosquitoes. Kyasanur Forest disease is transmitted by tick (*Haemaphysalis spinigera*). Therefore, correct answer is (a).

Q. 11. Vaccine/s is/are available for:

- (a) Japanese encephalitis
- (b) Yellow fever
- (c) Rubella
- (d) All of the above

Ans. (d)

Q. 12. Which age group/s is/are usually affected by classical dengue?

- (a) Older children and adults (b) Younger children
(c) Neonates (d) All of the above

Ans. (a)

Q. 13. Which is the vector for West Nile virus?

- (a) *Culex* (b) *Anopheles*
(c) *Aedes* (d) *Culiseta*

Ans. (a)

FILOVIRUSES, ARENAVIRUSES AND REOVIRIDAE

Q. 1. Which of the following animals is/are responsible for transmission of filoviruses to human beings?

- (a) Primates (b) Rodents
(c) Poultry (d) All of the above

Ans. (a)

Q. 2. While attempting to isolate filoviruses what should be the Biosafety Level?

- (a) Level 1 (b) Level 2
(c) Level 3 (d) Level 4

Ans. (d)

Q. 3. Which of the following filoviruses shows maximum mortality rate?

- (a) Marburg (b) Ebola-S
(c) Ebola-Z (d) Ebola-Reston

Ans. (c)

Q. 4. Which of the following viruses has/have rodents as their natural hosts and have a sand-sprinkled appearance when viewed in the electron microscope?

- (a) Filoviruses
(b) *Arenavirus*
(c) Rotaviruses
(d) Lymphocytic choriomeningitis virus

Ans. (b)

Q. 5. Which of the following viruses can cause South American *Arenavirus* haemorrhagic fevers?

- (a) Junin (b) Machupo
(c) Guanarito (d) All of the above

Ans. (d)

Q. 6. Which of the following viruses can produce diarrhoea?

- (a) Rotaviruses
- (b) Caliciviruses
- (c) Astroviruses
- (d) All of the above

Ans. (d)

Q. 7. Which of the following techniques can be used for detecting rotavirus infection?

- (a) Latex agglutination test
- (b) ELISA
- (c) Immunoelectron microscopy
- (d) All of the above

Ans. (d)

Q. 8. Most human rotaviruses fall in:

- (a) Serogroup A
- (b) Serogroup B
- (c) Serogroup E
- (d) Serogroup F

Ans. (a)

Q. 9. Biosafety Level 4 containment is required for the diagnosis of infection caused by:

- (a) Polioviruses
- (b) Arenaviruses
- (c) Varicella-zoster virus
- (d) Parainfluenza viruses

Ans. (b)

HUMAN IMMUNODEFICIENCY VIRUS: AIDS

Q. 1. HIV belongs to the family Retroviridae and subfamily:

- (a) Onchovirinae
- (b) Lentivirinae
- (c) Spumaretrovirinae
- (d) None of the above

Ans. (b)

Q. 2. Which is the spike antigen of HIV-1?

- (a) gp120
- (b) gp140
- (c) gp41
- (d) gp36.

Ans. (a)

Q. 3. Which is the transmembrane pedicle antigen of HIV-1?

- (a) gp120
- (b) gp140
- (c) gp41
- (d) gp36

Ans. (c)

Q. 4. Which is the commonest mode of transmission of HIV?

- (a) Sexual
- (b) Parenteral
- (c) Perinatal
- (d) Oral

Ans. (a)

Q. 5. What is the efficiency of transmission of HIV by blood transfusion?

- (a) >90% (b) 13–40% (c) 2.5% (d) 0.5–1%

Ans. (a)

Q. 6. What is the efficiency of transmission of HIV by the sexual route?

- (a) 0.1–1% per episode (b) 2–10% per episode
(c) 15–50% per episode (d) 80–90% per episode

Ans. (a)

Q. 7. What is/are the cause/s of death in AIDS patients?

- (a) Opportunistic infections (b) Malignancies
(c) Cachexia-like state (d) All of the above

Ans. (d)

Q. 8. Which cells are infected by HIV most often?

- (a) CD4+ T lymphocytes (b) CD8+ T lymphocytes
(c) Null cells (d) B cells

Ans. (a) HIV infects cells expressing CD4+ antigen, which is primary HIV receptor. Therefore, CD4+ T lymphocytes are infected most often.

Q. 9. What is/are the pathogenic mechanism/s of HIV infection?

- (a) Viral cytolysis of CD4+ T cells
(b) Syncytium formation between infected and uninfected CD4+ T cells
(c) Immune cytolysis of CD4+ T cells
(d) All of the above

Ans. (d)

Q. 10. HIV can infect:

- (a) CD4+ T lymphocytes (b) Monocytes
(c) Macrophages (d) All of the above

Ans. (d)

Q. 11. According to the CDC classification of HIV infection and AIDS, persistent generalized lymphadenopathy is included in:

- (a) Group I (b) group II (c) Group III (d) Group IV

Ans. (c) According to CDC classification of HIV infection and AIDS, clinical course of HIV infection is classified into four groups—group I acute HIV infection, group II asymptomatic infection, group III persistent generalized lymphadenopathy, and group IV symptomatic HIV infection.

Q. 12. What is the average incubation period for development of AIDS in adults living in developing countries?

- (a) One year
- (b) Five years
- (c) Ten years
- (d) Fifteen years

Ans. (c)

Q. 13. Which is the commonest bacterial infection in HIV disease?

- (a) Mycobacterial infection
- (b) *Salmonella* infection
- (c) *Bartonella* infection
- (d) *Klebsiella* infection

Ans. (a)

Q. 14. Viral infection/s frequently observed in HIV disease is/are:

- (a) Herpes simplex
- (b) Varicella-zoster
- (c) Cytomegalovirus
- (d) All of the above

Ans. (d)

Q. 15. Fungal infection/s frequently observed in HIV disease is/are:

- (a) Candidiasis
- (b) Cryptococcosis
- (c) Aspergillosis
- (d) All of the above

Ans. (d)

Q. 16. Parasitic infection/s frequently observed in HIV disease is/are:

- (a) Cytoisosporiasis
- (b) Toxoplasmosis
- (c) Cryptosporidiosis
- (d) All of the above

Ans. (d)

Q. 17. Which is the commonest opportunistic infection in AIDS patients in India?

- (a) Tuberculosis
- (b) Toxoplasmosis
- (c) Cryptosporidiosis
- (d) Cryptococcosis

Ans. (a) Tuberculosis is the commonest opportunistic infection in HIV-infected persons. It is estimated that 50–60% of HIV-infected persons in India will develop tuberculosis in their life time.

Q. 18. Which of the following tests is/are screening test/s for diagnosis of HIV infection?

- (a) ELISA
- (b) Latex agglutination
- (c) Dot blot assay
- (d) All of the above

Ans. (d) For the diagnosis of HIV infection, ELISA and rapid (latex agglutination and dot blot assay) tests are the

screening tests. These tests detect HIV antibodies (indirect evidence). Therefore, the correct answer is (d).

Q. 19. Which of the following tests is/are confirmatory test/s for HIV infection?

- (a) Virus isolation
- (b) Detection of p24 antigen
- (c) Detection of viral nucleic acid
- (d) All of the above

Ans. (d) Virus isolation, detection of viral p24 antigen and viral nucleic acid are the direct evidences of HIV infection. Therefore, all these tests are confirmatory tests for the diagnosis of HIV infection.

Q. 20. Which HIV testing strategy is used for blood transfusion safety?

- (a) I
- (b) IIA
- (c) IIB
- (d) III

Ans. (a) In the blood bank, serum of the donor is tested with one highly sensitive ELISA or rapid test. If reactive, the sample is considered positive, and if non-reactive, it is considered negative. This is termed strategy I.

Q. 21. Which HIV testing strategy is used for HIV sentinel surveillance?

- (a) I
- (b) IIA
- (c) IIB
- (d) III

Ans. (b) For sentinel surveillance, the serum reactive with one ELISA or rapid test is tested with a second ELISA or rapid test with higher specificity. If found reactive on second ELISA or rapid test also, it is reported as positive. In case the second ELISA or rapid test is non-reactive, it is reported as negative. This is termed strategy IIA.

Q. 22. Viruses that contain two complete copies of positive strand RNA and the enzyme reverse transcriptase are:

- (a) Retroviruses
- (b) Orthoreoviruses
- (c) Enteroviruses
- (d) Togaviruses

Ans. (a) Retroviruses contain two copies of positive strand RNA and an enzyme reverse transcriptase. Orthoreoviruses possess a genome of 10 segments of dsRNA. Enteroviruses have a single strand of positive sense RNA. The genome of togaviruses consists of a molecule of single-stranded positive sense RNA. Orthoreoviruses, enteroviruses and togaviruses do not have any enzyme.

Q. 23. Which of the following is false about human immunodeficiency virus (HIV)?

- (a) It is a DNA virus
- (b) It invades CD4+ lymphocytes
- (c) HIV can mutate rapidly
- (d) It reverses CD4 : CD8 ratio

Ans. (a) Human immunodeficiency virus is a RNA virus.

Q. 24. What is/are the problem/s associated with development of a vaccine against HIV?

- (a) Rapid mutation of HIV
- (b) Antibody alone may be insufficient
- (c) Virus can spread from cell-to-cell by fusion to produce syncytia
- (d) All of the above

Ans. (d)

Q. 25. An HIV-infected individual has developed fever, headache, seizures and hemiparesis. Which of the following parasites is the most probable cause?

- (a) *Cryptosporidium parvum*
- (b) *Cytoisospora belli*
- (c) *Toxoplasma gondii*
- (d) *Enterocytozoon bienersi*

Ans. (c) *Toxoplasma gondii* is a major cause of morbidity and mortality in patients with HIV infection causing encephalitis or focal neurological deficits. Seizures in HIV infections are more often due to toxoplasmosis than to any other opportunistic infection. *Cryptosporidium parvum*, *Cytoisospora belli* and *Enterocytozoon bienersi* lead to diarrhoea in AIDS cases.

Q. 26. A 45-year-old HIV-positive woman has developed an ulcerative lesion on the side of her tongue. Culture of the specimen on Sabouraud dextrose agar at 25°C produces hyphae and on brain heart infusion agar at 37°C produces budding yeast cells 2–5 µm in diameter that bud on a narrow base. The most likely causative agent is:

- (a) *Coccidioides immitis*
- (b) *Candida albicans*
- (c) *Histoplasma capsulatum*
- (d) *Blastomyces dermatitidis*

Ans. (c) *Coccidioides immitis* does not form budding yeast cells. *Candida albicans* forms pseudomembranes, not ulcers, on tongue and buccal mucosa. *Blastomyces dermatitidis* forms yeast-like cells 8–15 µm in diameter that bud on a broad base. *Histoplasma capsulatum* causes ulcerative

or vegetative lesions on tongue, buccal mucosa, gingiva, palate or lips. In culture on brain heart infusion agar at 37°C, it forms yeast cells (2–5 µm in diameter) that bud on a narrow base. Therefore, the correct answer is (c).

Q. 27. All of the following are common cause of CNS infection in persons with HIV infection, **except**:

- (a) *Toxoplasma gondii* (b) *Pneumocystis jirovecii*
(c) Cytomegalovirus (d) *Cryptococcus neoformans*

Ans. (b) *Toxoplasma gondii*, cytomegalovirus and *Cryptococcus neoformans* are common causes of CNS infection in persons with HIV infection. *Pneumocystis jirovecii*, causes pneumonia in persons with HIV infection. It does not cause CNS infection.

Q. 28. Most common cause of chorioretinitis in persons with HIV infection is:

- (a) *Toxoplasma gondii* (b) *Cryptococcus neoformans*
(c) Herpes simplex virus (d) Cytomegalovirus

Ans. (d)

Q. 29. Most prevalent subtype of group M of HIV-1 in India is:

- (a) A (b) B (c) C (d) D

Ans. (c) Subtype C is the most prevalent in India and China. The common subtypes in Africa are A, C and D. In Asia, the common subtypes are B, C and E.

Q. 30. Average duration of window period in HIV infection is:

- (a) 1–2 weeks (b) 4–12 weeks
(c) 6 months to 1 year (d) 1–2 years

Ans. (b)

Q. 31. Risk of acquisition of HIV infection from needle-stick injury from HIV-positive person is:

- (a) 0.3% (b) 5% (c) 10% (d) 15%

Ans. (a)

Q. 32. Who was awarded Nobel Prize for isolation of AIDS virus?

- (a) Robert Gallo (b) Luc Montagniers
(c) Macfarlane Burnet (d) Peter Bria Medawar

Ans. (b) Isolation of aetiological agent of AIDS was first reported in May 1983 by Luc Montagnier and colleagues from Pasteur Institute, Paris. On this pioneering work, Luc Montagniers was awarded Nobel Prize in medicine in 2008. In March 1984, Robert Gallo and colleagues from

National Institute of Health, Bethesda (USA), reported isolation of retroviruses and called it HTLV-3. In 1986, it was named HIV.

Q. 33. Blood bank screening for HIV was initiated in:

- (a) 1983 (b) 1984 (c) 1985 (d) 1986

Ans. (c)

HEPATITIS VIRUSES

Q. 1. All of the following hepatitis viruses are RNA viruses, except:

- (a) Hepatitis A virus (b) Hepatitis B virus
(c) Hepatitis E virus (d) Hepatitis G virus

Ans. (b) Of the six human hepatitis viruses, hepatitis B is a DNA virus. Remaining five hepatitis viruses, A, C, D, E and G, are RNA viruses. Therefore, the correct answer is (b).

Q. 2. Hepatocellular carcinoma may be caused by:

- (a) Hepatitis B virus (b) Hepatitis C virus
(c) Both of the above (d) None of the above

Ans. (c) Of the six human hepatitis viruses, hepatitis B and C viruses may cause hepatocellular carcinoma. Therefore, the correct answer is (c).

Q. 3. Vertical transmission may be seen in case of which of the following viruses?

- (a) Hepatitis B virus (b) Hepatitis C virus
(c) Hepatitis D virus (d) All of the above

Ans. (d) Vertical transmission of human hepatitis viruses B, C, D, E and G may occur. However, vertical transmission has not been reported with hepatitis A virus. Therefore, the correct answer is (d).

Q. 4. All of the following viruses are enveloped, except:

- (a) Hepatitis A virus
(b) Hepatitis B virus
(c) Hepatitis C virus
(d) Human immunodeficiency virus

Ans. (a) Hepatitis B virus, hepatitis C virus and human immunodeficiency virus are enveloped viruses, whereas hepatitis A virus is a naked virus.

Q. 5. Which of the following viruses is/are transmitted by parenteral and sexual routes?

- (a) Hepatitis B virus (b) Hepatitis C virus
(c) Hepatitis G virus (d) All of the above

Ans. (d) Hepatitis B virus, hepatitis C virus, hepatitis G virus and hepatitis D virus may be transmitted by parenteral and sexual routes. Hepatitis A virus and hepatitis E virus are transmitted by faecal–oral route and not by parenteral and sexual routes. Therefore, the correct answer is (d).

Q. 6. Which of the following is the method of choice for the diagnosis of hepatitis A virus infection?

- (a) Aminotransferase levels
- (b) Detection of faecal HAV by immunoelectron microscopy
- (c) Detection of IgG anti-HAV by ELISA
- (d) Detection of IgM anti-HAV by ELISA

Ans. (d)

Q. 7. How many serotype/s is/are there in hepatitis A virus?

- (a) One
- (b) Two
- (c) Five
- (d) Seven

Ans. (a)

Q. 8. Which of the following statements is **not** correct for hepatitis A virus?

- (a) It has only one serotype
- (b) It is one of the most stable viruses infecting humans
- (c) It can be grown in cell cultures of primate and human cells
- (d) It may cause hepatocellular carcinoma

Ans. (d) For hepatitis A virus, statements (a), (b) and (c) are correct. It does not cause hepatocellular carcinoma.

Q. 9. Which of the following is a defective satellite virus?

- (a) Hepatitis B virus
- (b) Hepatitis C virus
- (c) Hepatitis D virus
- (d) Hepatitis E virus

Ans. (c) Hepatitis D virus is a defective satellite virus. Its genome (HDAg) is enclosed with hepatitis B surface coat. Hepatitis B virus, hepatitis C virus and hepatitis E virus are complete viruses.

Q. 10. Which of the following viruses is/are associated with the development of hepatocellular carcinoma?

- (a) Hepatitis B virus
- (b) Woodchuck hepatitis virus

- (c) Ground squirrel hepatitis virus
- (d) All of the above

Ans. (d)

Q. 11. What type of nucleic acid is present in hepatitis B virus?

- (a) ssDNA
- (b) dsDNA
- (c) ssRNA
- (d) dsRNA

Ans. (b)

Q. 12. Which of the following antigens of hepatitis B virus is present in the envelope?

- (a) HBsAg
- (b) HBcAg
- (c) HBeAg
- (d) HBxAg

Ans. (a)

Q. 13. Which of the following antigenic types of hepatitis B virus is most prevalent in India?

- (a) *adw*
- (b) *ayw*
- (c) *adr*
- (d) *ayr*

Ans. (b)

Q. 14. Which of the following specimens contain/s hepatitis B virus in an infected person?

- (a) Blood
- (b) Semen
- (c) Saliva
- (d) All of the above

Ans. (d)

Q. 15. Which of the following serological markers is/are positive in super carriers of hepatitis B?

- (a) HBeAg
- (b) HBsAg
- (c) DNA polymerase
- (d) All of the above

Ans. (d)

Q. 16. Which of the following serological markers is/are positive in simple carriers of hepatitis B?

- (a) HBeAg
- (b) HBsAg
- (c) DNA polymerase
- (d) All of the above

Ans. (b)

Q. 17. Which of the following hepatitis viruses can be cultured in cell cultures?

- (a) Hepatitis A virus
- (b) Hepatitis B virus
- (c) Hepatitis C virus
- (d) Hepatitis D virus

Ans. (a) Hepatitis A virus is the only one of the six human hepatitis viruses that can be cultured in cell culture.

Q. 18. Which of the following viruses has been used for preparing hybrid virus vaccine for hepatitis B?

- (a) Vaccinia virus
- (b) Adenovirus
- (c) Herpes simplex virus type 1
- (d) Papilloma virus

Ans. (a) Vaccinia virus is being used as a vector for incorporating genes for several different pathogens. Many genes have been inserted, including those coding for the antigens of hepatitis B virus, HIV and rabies virus. Because the large vaccinia genome can accommodate at least a dozen foreign genes, it is theoretically possible to construct a single recombinant virus as a vaccine capable of protecting against most of the common viral and non-viral infectious diseases of childhood.

Q. 19. Which of the following infections is most serious?

- (a) Infection with HBV alone
- (b) Coinfection of HBV and HDV
- (c) Superinfection of an HBsAg carrier by HDV
- (d) Infection with HDV alone

Ans. (c) Superinfection of an HBsAg carrier by HDV is more serious because a large number of hepatocytes are already producing HBsAg, and HDV can replicate without delay with a relatively short incubation period.

Q. 20. Which of the following viruses can be transmitted by the parenteral route?

- (a) HBV
- (b) HCV
- (c) HDV
- (d) All of the above

Ans. (d) Refer to Q. No. 5 above.

Q. 21. Which of the following viral infections can result in chronic carrier state?

- (a) HBV
- (b) HCV
- (c) HDV
- (d) All of the above

Ans. (d)

Q. 22. Clinically, hepatitis E virus infection closely resembles:

- (a) Hepatitis A infection
- (b) Hepatitis B infection

- (c) Hepatitis C infection
- (d) Hepatitis D infection

Ans. (a)

Q. 23. What is the mode of transmission of hepatitis E virus?

- (a) Faecally contaminated drinking water
- (b) Infected syringes and needles
- (c) Sexual intercourse
- (d) None of the above

Ans. (a)

Q. 24. Hepatitis G virus belongs to the family:

- (a) Caliciviridae
- (b) Flaviviridae
- (c) Hepadnaviridae
- (d) Coronaviridae

Ans. (b)

Q. 25. Hepatitis G virus is transmitted:

- (a) Parenterally
- (b) Sexually
- (c) From mother to child
- (d) By all of the above

Ans. (d) Refer to Q. Nos. 3 and 5 above.

Q. 26. A 29-year-old patient with jaundice is positive for hepatitis B surface antigen (HBsAg), HBeAg, IgM anti-HBc and IgG anti-HBc but negative for anti-HBs and anti-HBe. The probable diagnosis is:

- (a) Acute hepatitis B
- (b) Past infection with HBV
- (c) Immunization with hepatitis B vaccine without infection
- (d) Asymptomatic carrier state

Ans. (a)

Q. 27. Serologic test results from a hepatitis patient reveal—anti-HBc-positive, HBsAg-positive, and anti-HBs-negative. The correct interpretation of the patient's status is:

- (a) No longer contagious
- (b) Immune to hepatitis B virus
- (c) Evidence of receiving hepatitis B vaccination
- (d) Hepatitis B virus chronic carrier

Ans. (d)

Q. 28. Serologic test results from a hepatitis patient reveal—HBsAg-positive, anti-HBs-negative, anti-HBc-positive, HBeAg-positive and anti-HBe-negative. What is the HBV status of the patient?

- (a) Acute infection
- (b) Chronic infection
- (c) Fulminant infection
- (d) Immune

Ans. (a)

Q. 29. Which of the following virus/es possess/es DNA genome?

- (a) Hepatitis B virus
- (b) SEN virus
- (c) Transfusion transmitted virus
- (d) All of the above

Ans. (d)

Q. 30. Which of the following hepatitis viruses is transmitted by faecal–oral route?

- (a) Hepatitis B virus
- (b) Hepatitis C virus
- (c) hepatitis D virus
- (d) Hepatitis E virus

Ans. (d)

ONCOGENIC (TUMOUR) VIRUSES

Q. 1. Which of the following oncogenic viruses was first detected?

- (a) Herpes simplex virus type 2
- (b) Epstein-Barr virus
- (c) Rous sarcoma virus
- (d) Human T cell leukaemia virus

Ans. (c)

Q. 2. Which of the following changes is/are associated with transformed cells?

- (a) Alterations in cell growth patterns
- (b) Alterations in cell surface
- (c) Tumourogenicity
- (d) All of the above

Ans. (d)

Q. 3. Which of the following statements is correct?

- (a) Up to 10% of human tumours have a viral risk factor
- (b) Up to 20% of human tumours have a viral risk factor
- (c) Up to 30% of human tumours have a viral risk factor
- (d) Up to 40% of human tumours have a viral risk factor

Ans. (b)

Q. 4. Which of the following viruses has not been associated with human cancer?

- (a) Varicella-zoster virus
- (b) Hepatitis B virus
- (c) Hepatitis C virus
- (d) Herpes simplex virus type 2

Ans. (a)

SLOW VIRUS INFECTIONS AND PRIONS

Q. 1. Which of the following is/are slow virus infection/s?

- (a) Visna
- (b) Subacute sclerosing panencephalitis
- (c) Progressive multifocal leukoencephalopathy
- (d) All of the above

Ans. (d)

Q. 2. Subacute sclerosing panencephalitis is a late complication of:

- (a) Measles
- (b) Mumps
- (c) Varicella-zoster
- (d) Hepatitis B

Ans. (a)

Q. 3. Which of the following statements is **not** true about subacute sclerosing panencephalitis (SSPE)?

- (a) Large number of viral nucleocapsid structures are visible in neurons and glial cells.
- (b) Defective measles virus may be recovered from brains of patients with SSPE.
- (c) Patients with SSPE have high titres of measles antibody in cerebrospinal fluid.
- (d) Incidence of SSPE has increased following widespread immunization of children with measles vaccine.

Ans. (d)

Q. 4. Which of the following statements is **not** true about prions?

- (a) They are small, proteinaceous infectious particles.
- (b) They contain a nucleic acid genome that codes for their progeny.
- (c) The prion protein is encoded by the host's chromosomal gene.
- (d) They cause spongiform encephalopathies of humans and animals.

Ans. (b)

Q. 5. Infectivity of prions is resistant to inactivation by:

- (a) Nucleases and UV-irradiation
- (b) Formalin and mild proteolysis
- (c) Boiling
- (d) All of the above

Ans. (d)

Q. 6. Prions can be inactivated by:

- (a) Sodium hypochlorite (25% available chlorine) treatment at room temperature for one hour
- (b) 90% phenol
- (c) Iodine disinfectant
- (d) All of the above

Ans. (d)

Q. 7. Which of the following spongiform encephalopathies **does not occur in man?**

- (a) Scrapie
- (b) Creutzfeldt-Jakob disease
- (c) Gerstmann-Sträussler-Scheinker syndrome
- (d) Kuru

Ans. (a)

Medical Mycology

Q. 1. *Cryptococcus neoformans* is:

- (a) Dimorphic fungus
- (b) Mold
- (c) Yeast-like
- (d) Yeast

Ans. (d)

Q. 2. Which of the following fungi is **not** a mold?

- (a) *Aspergillus*
- (b) *Penicillium*
- (c) *Mucor*
- (d) *Candida*

Ans. (d)

Q. 3. Which of the following fungi is/are dimorphic?

- (a) *Histoplasma*
- (b) *Sporothrix*
- (c) *Blastomyces*
- (d) All of the above

Ans. (d)

Q. 4. The causative agent of pityriasis versicolor is:

- (a) *Malassezia* species
- (b) *Exophiala werneckii*
- (c) *Piedraia hortae*
- (d) *Trichosporon beigeli*

Ans. (a)

Q. 5. Which of the following dermatophytes is geophilic?

- (a) *Microsporum gypseum*
- (b) *Trichophyton rubrum*
- (c) *Microsporum canis*
- (d) *Epidermophyton floccosum*

Ans. (a)

Q. 6. Which of the following dermatophytes is/are anthropophilic?

- (a) *Trichophyton rubrum*
- (b) *Microsporum audouinii*
- (c) *Epidermophyton floccosum*
- (d) All of the above

Ans. (d)

Q. 7. The causative agent of favus is:

- (a) *Microsporum audouinii*
- (b) *Microsporum canis*
- (c) *Trichophyton mentagrophytes*
- (d) *Trichophyton schoenleinii*

Ans. (d)

Q. 8. Which of the following dermatophytes is the most common species infecting man?

- (a) *Trichophyton rubrum*
- (b) *Trichophyton schoenleinii*
- (c) *Trichophyton mentagrophytes*
- (d) *Microsporum canis*

Ans. (a)

Q. 9. Microconidia are absent in:

- (a) *Trichophyton*
- (b) *Microsporum*
- (c) *Epidermophyton*
- (d) None of the above

Ans. (c)

Q. 10. Which of the following dermatophytes can infect skin, hair and nails?

- (a) *Trichophyton*
- (b) *Microsporum*
- (c) *Epidermophyton*
- (d) None of the above

Ans. (a)

Q. 11. The colour of granules in *Madurella mycetomatis* is:

- (a) Black
- (b) Red
- (c) Yellow
- (d) White

Ans. (a)

Q. 12. The colour of granules in *Actinomadura madurae* is:

- (a) White to yellow
- (b) Red
- (c) Black
- (d) Green

Ans. (a)

Q. 13. Sclerotic bodies are seen in:

- (a) Mycetoma
- (b) Chromoblastomycosis
- (c) Sporotrichosis
- (d) Rhinosporidiosis

Ans. (b)

Q. 14. Which of the following cannot be cultured?

- (a) *Sporothrix*
- (b) *Rhinosporidium*
- (c) *Madurella*
- (d) *Phialophora*

Ans. (b)

Q. 15. Asteroid bodies may be seen in:

- (a) Sporotrichosis
- (b) Rhinosporidiosis
- (c) Chromoblastomycosis
- (d) Mycetoma

Ans. (a)

Q. 16. Which of the following fungi infects phagocytic cells?

- (a) *Sporotrichum*
- (b) *Aspergillus*
- (c) *Histoplasma*
- (d) *Cryptococcus neoformans*

Ans. (c)

Q. 17. Histoplasmosis is acquired from:

- (a) Soil (b) Animals (c) Man (d) Water

Ans. (a) *Histoplasma capsulatum* grows in soil with high nitrogen content. Therefore, histoplasmosis is acquired through soil.

Q. 18. Blastomycosis is usually a chronic infection of:

- (a) Lungs (b) Intestine
(c) Heart (d) All of the above

Ans. (a)

Q. 19. Paracoccidioidomycosis may involve:

- (a) Lungs (b) Gastrointestinal tract
(c) Lymphatic system (d) All of the above

Ans. (d)

Q. 20. Which of the following fungal infections primarily involve/s the lungs?

- (a) Blastomycosis (b) Paracoccidioidomycosis
(c) Coccidioidomycosis (d) All of the above

Ans. (d)

Q. 21. Which of the following species of *Candida* is most frequently associated with human infections?

- (a) *C. albicans* (b) *C. tropicalis*
(c) *C. glabrata* (d) *C. rugosa*

Ans. (a)

Q. 22. Which of the following tests can differentiate *C. albicans* from other species of *Candida*?

- (a) Germ tube formation.
(b) Chlamydospore formation on corn meal agar.
(c) Sugar fermentation and assimilation tests.
(d) All of the above.

Ans. (d)

Q. 23. Which of the following species of *Aspergillus* is most often implicated in human disease?

- (a) *A. niger* (b) *A. flavus*
(c) *A. fumigatus* (d) *A. nidulans*

Ans. (c)

Q. 24. Which of the following conditions can be caused by *Aspergillus* spp.?

- (a) Allergic bronchopulmonary disease
(b) Fungus ball

- (c) Invasive lung disease
- (d) All of the above

Ans. (d)

Q. 25. Which of the following fungi is/are responsible for mucormycosis?

- (a) *Mucor*
- (b) *Rhizopus*
- (c) *Lichtheimia*
- (d) All of the above

Ans. (d)

Q. 26. Non-septate hyphae and absence of rhizoids is characteristic of:

- (a) *Mucor*
- (b) *Rhizopus*
- (c) *Lichtheimia*
- (d) None of the above

Ans. (a)

Q. 27. Which of the following fungi can cause otomycosis?

- (a) *Aspergillus niger*
- (b) *A. fumigatus*
- (c) *Penicillium*
- (d) All of the above

Ans. (d)

Q. 28. Keratomycosis may be caused by:

- (a) *Aspergillus niger*
- (b) *A. fumigatus*
- (c) *Fusarium*
- (d) All of the above

Ans. (d)

Q. 29. Presence of blastoconidia, pseudohyphae, true hyphae and chlamydospores is characteristic of:

- (a) *Candida*
- (b) *Geotrichum*
- (c) *Trichosporon*
- (d) *Rhodotorula*

Ans. (a)

Q. 30. Presence of blastoconidia and **absence** of arthroconidia, pseudohyphae, true hyphae and chlamydospores is characteristic of:

- (a) *Cryptococcus*
- (b) *Torulopsis*
- (c) *Pityrosporum*
- (d) All of the above

Ans. (d)

Q. 31. True hyphae are formed by:

- (a) *Candida albicans*
- (b) *C. dubliniensis*
- (c) *C. tropicalis*
- (d) All of the above

Ans. (d)

Clinical Microbiology

EMERGING AND RE-EMERGING INFECTIOUS DISEASES

Q. 1. Infectious diseases that have recently appeared within a population or those whose incidence or geographic range is rapidly increasing or threatens to increase in near future, are known as:

- (a) Emerging infections
- (b) Re-emerging infections
- (c) Both of the above
- (d) None of the above

Ans. (a)

Q. 2. Infectious diseases that once were major health problems globally or in a particular country, then declined dramatically, but are again becoming health problem for a significant proportion of the population are known as:

- (a) Emerging infections
- (b) Re-emerging infections
- (c) Both of the above
- (d) None of the above

Ans. (b)

Q. 3. Factor/s responsible for the emergence and re-emergence of communicable diseases is/are:

- (a) Unhygienic living conditions
- (b) Encroachment by humans to areas so far uninhabited leading to ecological changes
- (c) Development of insecticide resistance in vectors
- (d) All of the above

Ans. (d)

Q. 4. The problem of drug resistance has assumed alarming proportions in:

- (a) Tubercle bacilli
- (b) *Pseudomonas aeruginosa*
- (c) *Klebsiella pneumoniae*
- (d) All of the above

Ans. (d)

Q. 5. Following are the examples of re-emerging infections, **except**:

- (a) Malaria
- (b) Plague
- (c) AIDS
- (d) Typhoid fever

Ans. (c)

INFECTIVE SYNDROMES

Q. 1. Which of the following organisms may lead to pseudomembrane formation in the throat?

- (a) *Corynebacterium diphtheriae*
- (b) *Streptococcus pyogenes*
- (c) *Candida albicans*
- (d) All of the above

Ans. (d)

Q. 2. Which of the following organisms can be found normally in the throat?

- (a) α -haemolytic streptococci
- (b) Coagulase-negative staphylococci
- (c) *Haemophilus haemolyticus*
- (d) All of the above

Ans. (d)

Q. 3. Which of the following bacteria is the commonest cause of urinary tract infection?

- (a) *Escherichia coli*
- (b) *Pseudomonas aeruginosa*
- (c) *Staphylococcus aureus*
- (d) *Staphylococcus saprophyticus*

Ans. (a)

Q. 4. In which of the following sexually transmitted diseases, genital ulcer/s is/are painless?

- (a) Syphilis
- (b) Chancroid
- (c) Herpes genitalis
- (d) All of the above

Ans. (a) Syphilis causes painless genital ulcers. Chancroid and herpes genitalis cause painful genital ulcers.

Q. 5. Genital ulcer is painful in:

- (a) Syphilis
- (b) Chancroid
- (c) Lymphogranuloma venereum
- (d) Donovanosis

Ans. (b)

Q. 6. Which of the following bacteria is/are implicated as causative agent/s of non-gonococcal urethritis?

- (a) *Chlamydia trachomatis* (b) *Ureaplasma urealyticum*
- (c) *Mycoplasma hominis* (d) All of the above

Ans. (d)

Q. 7. Genital discharge is present in:

- (a) Chancroid
- (b) Gonorrhoea
- (c) Herpes genitalis
- (d) Lymphogranuloma venereum

Ans. (b) Gonorrhoea causes genital discharge. Chancroid and herpes genitalis cause painful genital ulcers, and lymphogranuloma venereum causes painless genital ulcers.

Q. 8. Which of the following bacteria can cause purulent meningitis?

- (a) *Haemophilus influenzae*
- (b) *Streptococcus pneumoniae*
- (c) *Neisseria meningitidis*
- (d) All of the above

Ans. (d)

Q. 9. Which of the following agents may cause aseptic meningitis in immunocompromised hosts?

- (a) Herpes simplex (b) Enteroviruses
- (c) Arboviruses (d) All of the above

Ans. (d)

Q. 10. Which of the following agents may cause aseptic meningitis in immunocompromised hosts?

- (a) *Cryptococcus neoformans*
- (b) *Escherichia coli*
- (c) *Haemophilus influenzae*
- (d) *Streptococcus pneumoniae*

Ans. (a) *Cryptococcus neoformans* causes aseptic meningitis in immunocompromised hosts. *Escherichia coli*, *Haemophilus influenzae* and *Streptococcus pneumoniae* cause purulent meningitis in immunocompetent hosts.

Q. 11. Which of the following conditions can result in PUO?

- (a) Urinary tract infection (b) Enteric fever
- (c) Malaria (d) All of the above

Ans. (d)

Q. 12. Which of the following agents is the commonest cause of infective endocarditis?

- (a) *Staphylococcus epidermidis*
- (b) *Candida* spp.
- (c) Viridans group of streptococci
- (d) Coliforms

Ans. (c)

Q. 13. Which of the following agents can cause diarrhoea?

- (a) Rotavirus
- (b) *Vibrio cholerae*
- (c) *Salmonella* serotype Typhimurium
- (d) All of the above

Ans. (d)

Q. 14. Which of the following protozoa can cause diarrhoea?

- (a) *Entamoeba histolytica*
- (b) *Giardia lamblia*
- (c) *Cryptosporidium parvum*
- (d) All of the above

Ans. (d)

Q. 15. Which of the following agents can cause dysentery?

- (a) *Shigella flexneri*
- (b) Enteroinvasive *Escherichia coli* (EIEC)
- (c) *Entamoeba histolytica*
- (d) All of the above

Ans. (d)

Q. 16. Which of the following bacteria can cause infective type of food poisoning?

- (a) *Salmonella* serotype Enteritidis
- (b) *Staphylococcus aureus*
- (c) *Clostridium botulinum*
- (d) All of the above

Ans. (a) *Salmonella* serotype Enteritidis causes infective type of food poisoning. When food contaminated with *S. serotype Enteritidis* is ingested, these organisms multiply and cause food poisoning. *Staphylococcus aureus* and *Clostridium botulinum* cause toxic type of food poisoning. Here preformed toxins are present in the food. Live organisms may or may not be present in the food.

Q. 17. Infective-toxic type of food poisoning is caused by:

- (a) *Clostridium perfringens*
- (b) *Salmonella* serotype Enteritidis
- (c) *Staphylococcus aureus*
- (d) *Salmonella* serotype Dublin

Ans. (a) *Clostridium perfringens* causes infective-toxic type of food poisoning. After ingestion of large number of vegetative organisms in food, multiplication occurs in the intestine for a brief period followed by sporulation and the production of enterotoxin which causes diarrhoea. *Salmonella* serotype Enteritidis and *Salmonella* serotype Dublin cause infective type and *Staphylococcus aureus* causes toxic type of food poisoning.

Q. 18. Which of the following anaerobes can cause wound infection?

- (a) Peptostreptococci
- (b) *Bacteroides* spp.
- (c) *Clostridium perfringens*
- (d) All of the above

Ans. (d)

Q. 19. A condition in which bacteria circulate in blood without overt disease is known as:

- (a) Bacteraemia
- (b) Septicaemia
- (c) Pyaemia
- (d) Endotoxaemia

Ans. (a) • *Bacteraemia*: Presence of bacteria in blood without overt disease.
• *Septicaemia*: Bacteria circulate within the bloodstream with clinical symptoms.
• *Pyaemia*: Septicaemia with metastatic infection.

Q. 20. A 4-year-old child has developed acute sore throat. On examination, a pseudomembrane was observed in the posterior pharyngeal wall. The causative agent could be any of the following, except:

- (a) *Candida albicans*
- (b) *Leptotrichia buccalis*
- (c) *Corynebacterium diphtheriae*
- (d) *Haemophilus influenzae*

Ans. (d) *Haemophilus influenzae* causes epiglottitis, bacteraemia, pneumonia, septic arthritis and meningitis. It does not lead to formation of pseudomembrane in the throat. *Candida albicans*, *Leptotrichia buccalis* and *Corynebacterium diphtheriae* may cause sore throat with pseudomembrane formation.

Q. 21. A 40-year-old man following sexual contact has developed a painless ulcer on the prepuce. On examination, it was found to be 2 cm in diameter with indurated margins. Which of the following is the most probable diagnosis?

- (a) Chancroid
- (b) Syphilis
- (c) Donovanosis
- (d) Lymphogranuloma venereum

Ans. (b) Syphilis, a sexually transmitted disease, leads to the formation of painless genital ulcer with indurated margin. Chancroid forms painful non-indurated ulcer. Donovanosis and lymphogranuloma venereum lead to the formation of painless genital ulcer which do not have indurated margin.

Q. 22. A 3-year-old child has reported in the accident and emergency department with fever, irritability, lethargy and skin rash since the previous evening. On examination, the patient had a temperature of 40.5°C, petechial skin rashes and was drowsy. There was neck stiffness. The CSF was cloudy and had 500 white blood cells/microlitre (90% neutrophils). Which of the following microorganisms is **least likely** to be causative agent of the disease?

- (a) *Mycobacterium tuberculosis*
- (b) *Neisseria meningitidis*
- (c) *Haemophilus influenzae* type b
- (d) *Streptococcus pneumoniae*

Ans. (a) In both purulent and tubercular meningitis, the number of white blood cells is increased. About 90% of white blood cells are neutrophils and lymphocytes, respectively. Therefore, *Mycobacterium tuberculosis* is the least likely cause of this disease. *Neisseria meningitidis*, *Haemophilus influenzae* type b and *Streptococcus pneumoniae* cause purulent meningitis.

Q. 23. A 4-day-old premature neonate has developed meningitis. Which of the following organisms is **most likely** to be the causative agent?

- (a) *Streptococcus pneumoniae*
- (b) *Streptococcus agalactiae*
- (c) *Neisseria meningitidis*
- (d) *Haemophilus influenzae* type b

Ans. (b) Group B streptococci (*Streptococcus agalactiae*) are present in the vaginal flora of about 25% of all women. Early rupture of membranes, prolonged labour, low birth weight and heavy colonization of mother's vagina by group B streptococci lead to early-onset-type meningitis. Therefore, the correct answer is (b).

Q. 24. A 40-year-old individual has developed dysentery after eating improperly cooked contaminated food. Which of the following organisms could be suspected?

- (a) *Citrobacter freundii*
- (b) *Klebsiella pneumoniae*
- (c) *Salmonella* serotype Enteritidis
- (d) *Shigella* spp.

Ans. (d) *Shigella* spp. cause dysentery. *Citrobacter freundii* does not cause diarrhoea. *Klebsiella pneumoniae* and *Salmonella* serotype Enteritidis cause diarrhoea but not dysentery.

Q. 25. Rhinitis is caused by:

- (a) Rhinoviruses
- (b) Coronaviruses
- (c) Respiratory syncytial virus
- (d) All of the above

Ans. (d)

Q. 26. Pharyngitis is caused by:

- (a) Influenza viruses
- (b) Parainfluenza viruses
- (c) Rhinoviruses
- (d) All of the above

Ans. (d)

Q. 27. Bronchiolitis is caused by:

- (a) Respiratory syncytial virus
- (b) Parainfluenza virus types 1, 2 and 3
- (c) *Influenzavirus A*
- (d) All of the above

Ans. (d)

Q. 28. Which of the following viruses is the commonest cause of severe diarrhoea in infants?

- (a) *Rotavirus* group A
- (b) Norwalk virus
- (c) *Astrovirus*
- (d) Calciviruses

Ans. (a) Organisms listed at (a), (b), (c) and (d) cause diarrhoea. Among these, *Rotavirus* group A is the commonest cause of severe diarrhoea in infants.

Q. 29. Which of the following viruses cause/s viral haemorrhagic fever?

- (a) Lassa
- (b) Marburg
- (c) Ebola
- (d) All of the above

Ans. (d)

Q. 30. Which of the following viruses causes maculopapular skin rash?

- (a) Varicella-zoster
- (b) *Enterovirus 71*
- (c) Measles
- (d) *Molluscum contagiosum*

Ans. (c)

Q. 31. Which of the following viruses cause/s genital infection?

- (a) Herpes simplex virus type 2
- (b) Human papillomavirus type 6
- (c) *Molluscum contagiosum*
- (d) All of the above

Ans. (d)

Q. 32. Which of the following sexually-transmitted viruses does not cause disease in genital tract itself?

- (a) Herpes simplex virus type 2
- (b) Human immunodeficiency virus
- (c) Human papillomavirus type 6
- (d) *Molluscum contagiosum*

Ans. (b) Human immunodeficiency virus is a sexually transmitted virus but it does not cause disease in genital tract itself. Herpes simplex virus type 2, human papillomavirus type 6 and molluscum contagiosum cause genital tract disease.

Q. 33. Which of the following viruses can cause prenatal infection?

- (a) Rubella
- (b) Cytomegalovirus
- (c) Varicella-zoster
- (d) All of the above

Ans. (d)

NOSOCOMIAL INFECTIONS

Q. 1. Which of the following bacteria can cause urinary tract infections in hospitalized patients?

- (a) *Escherichia coli*
- (b) *Klebsiella*
- (c) *Proteus*
- (d) All of the above

Ans. (d)

Q. 2. Which of the following bacteria is/are implicated in hospital-associated respiratory infections?

- (a) *Staphylococcus aureus* (b) *Klebsiella*
- (c) *Enterobacter* (d) All of the above

Ans. (d)

Q. 3. Which of the following bacteria can cause infection of burns in hospital patients?

- (a) *Pseudomonas aeruginosa* (b) *Acinetobacter*
- (c) *Staphylococcus aureus* (d) All of the above

Ans. (d)

Q. 4. Which of the following pathogens can be transmitted by air in the hospital?

- (a) *Legionella*
- (b) Human immunodeficiency virus
- (c) Hepatitis B virus
- (d) All of the above

Ans. (a)

Q. 5. Nosocomial infection can occur by:

- (a) Contact spread (b) Airborne spread
- (c) Oral route (d) All of the above

Ans. (d)

ANTIMICROBIAL SENSITIVITY TESTING

Q. 1. Presence of thymidine in the medium can interfere with the action of:

- (a) Trimethoprim (b) Aminoglycosides
- (c) Tetracyclines (d) All of the above

Ans. (a) Large quantities of thymidine are present in some lots of media. Some organisms can use thymidine to bypass the mechanism of action of trimethoprim and grow, even though they are sensitive to the antibiotic.

Q. 2. Which of the following media is most suitable for antibiotic sensitivity testing?

- (a) Mueller-Hinton medium
- (b) Nutrient agar
- (c) Blood agar
- (d) MacConkey agar

Ans. (a) Mueller-Hinton medium is most suitable for testing antibiotic sensitivity. This medium has minimal inhibitory effect on sulphonamide and trimethoprim.

Q. 3. The pH of the medium for antibiotic sensitivity testing should be:

- | | |
|-------------|-------------|
| (a) 6.0–6.2 | (b) 6.8–7.0 |
| (c) 7.2–7.4 | (d) 7.6–7.8 |

Ans. (c)

Q. 4. The inoculum for antibiotic sensitivity by disc diffusion method should contain:

- | | |
|-------------------|-------------------|
| (a) 10^4 cfu/ml | (b) 10^5 cfu/ml |
| (c) 10^6 cfu/ml | (d) 10^8 cfu/ml |

Ans. (d)

Q. 5. In Stokes disc diffusion method, if the zone size is equal to, larger than or not more than 3 mm smaller than the control, a strain is considered:

- | | |
|---------------|-----------------------|
| (a) Sensitive | (b) Intermediate |
| (c) Resistant | (d) None of the above |

Ans. (a)

Q. 6. In Stokes disc diffusion method, if the zone size of the test strain is less than 2 mm, a strain is considered:

- | | |
|---------------|-----------------------|
| (a) Sensitive | (b) Intermediate |
| (c) Resistant | (d) None of the above |

Ans. (c)

Q. 7. Addition of 5% salt in the medium is done when testing methicillin susceptibility of:

- (a) Staphylococci
- (b) Pneumococci
- (c) Coliforms
- (d) Non-fermenting Gram-negative bacilli

Ans. (a) Addition of 5% salt in the medium is done when testing methicillin susceptibility of staphylococci.

Q. 8. For broth dilution tests for determination of MIC, the final inoculum should be:

- | | |
|-------------------|-------------------|
| (a) 10^4 cfu/ml | (b) 10^5 cfu/ml |
| (c) 10^6 cfu/ml | (d) 10^7 cfu/ml |

Ans. (b)

Q. 9. For agar dilution tests for determination of MIC, the final inoculum should be:

- | | |
|---------------------|---------------------|
| (a) 10^4 cfu/spot | (b) 10^5 cfu/spot |
| (c) 10^6 cfu/spot | (d) 10^7 cfu/spot |

Ans. (a)

Q. 10. A pH of greater than 7.2–7.4 favours the action of:

- (a) Tetracyclines
- (b) Novobiocin
- (c) Fusidic acid
- (d) All of the above

Ans. (d)

Q. 11. How many antibiotic discs can be accommodated on a single 100 mm diameter plate in Stokes disc diffusion method?

- (a) Five
- (b) Six
- (c) Seven
- (d) Eight

Ans. (b)

Q. 12. Antimicrobial sensitivity testing makes use of the discs of the diameter of:

- (a) 2 mm
- (b) 4 mm
- (c) 6 mm
- (d) 8 mm

Ans. (c)

PROPHYLACTIC IMMUNIZATION

Q. 1. Which of the following vaccines is/are killed vaccine/s?

- (a) Pertussis vaccine
- (b) Cholera vaccine
- (c) Japanese encephalitis vaccine
- (d) All of the above

Ans. (d)

Q. 2. Which of the following vaccines is/are prepared from live microbes manipulated and attenuated?

- (a) BCG vaccine
- (b) Oral polio vaccine
- (c) Measles vaccine
- (d) All of the above

Ans. (d)

Q. 3. Which of the following vaccines is/are subunit vaccine/s?

- (a) Hepatitis B vaccine (plasma derived)
- (b) Vi typhoid fever vaccine
- (c) Meningococcal vaccine
- (d) All of the above

Ans. (d)

Q. 4. Which of the following vaccines is/are prepared from microbial toxin/s?

- (a) Diphtheria vaccine
- (b) Tetanus toxoid vaccine
- (c) Both of the above
- (d) None of the above

Ans. (c)

Q. 5. Which of the following vaccines should be administered at the birth of a child?

- (a) BCG
- (b) DPT
- (c) Measles
- (d) All of the above.

Ans. (a)

Q. 6. Measles vaccine should be administered at the age of:

- (a) 3 months
- (b) 6 months
- (c) 9 months
- (d) 12 months

Ans. (c)

Q. 7. Specific immunoglobulins are available for passive immunization against:

- (a) Tetanus
- (b) Rabies
- (c) Hepatitis B
- (d) All of the above

Ans. (d)

Q. 8. For which of the following diseases combined passive and active immunization is often undertaken?

- (a) Tetanus
- (b) Diphtheria
- (c) Rabies
- (d) All of the above

Ans. (d)

Q. 9. Which of the following diseases has/have remained without useful vaccine/s?

- (a) Malaria
- (b) Leprosy
- (c) AIDS
- (d) All of the above

Ans. (d)

Bacteriology of Water, Milk & Air, and Biological Warfare

BACTERIOLOGY OF WATER, MILK AND AIR

Q. 1. Which of the following is/are soil bacteria?

- (a) *Bacillus subtilis*
- (b) *Enterobacter aerogenes*
- (c) *Bacillus mycoides*
- (d) All of the above

Ans. (d)

Q. 2. Which of the following is/are water-borne pathogen/s?

- (a) Hepatitis A virus
- (b) *Vibrio cholerae*
- (c) *Entamoeba histolytica*
- (d) All of the above

Ans. (d)

Q. 3. Which of the following organisms can serve as indicator of faecal pollution of drinking water?

- (a) *Escherichia coli*
- (b) *Bacillus subtilis*
- (c) *Corynebacterium diphtheriae*
- (d) *Haemophilus influenzae*

Ans. (a) Refer to Q. No. 26 of Enterobacteriaceae: *Escherichia*, *Klebsiella* and other genera.

Q. 4. In presumptive coliform count of water, it is considered satisfactory if the count is:

- (a) 0
- (b) 1–3
- (c) 4–10
- (d) 10–15

Ans. (b)

Q. 5. In Eijkman test, the temperature of incubation of broth tubes is:

- (a) 28°C
- (b) 37°C
- (c) 44°C
- (d) 50°C

Ans. (c)

Q. 6. Besides coliforms, which other bacteria can serve as indicator organism/s for faecal pollution of water?

- (a) Enterococci
- (b) *Clostridium perfringens*
- (c) Both of the above
- (d) None of the above

Ans. (c) Enterococci and *Clostridium perfringens* are the normal flora of intestine, therefore, like *Escherichia coli*, they can also serve as indicator organisms for faecal pollution of water. Therefore, the correct answer is (c).

Q. 7. Which of the following bacteria is/are thermotolerant and survive/s pasteurization of milk?

- (a) *Bacillus*
- (b) *Micrococcus*
- (c) *Microbacterium*
- (d) All of the above

Ans. (d)

Q. 8. Which of the following bacteria is/are likely to be present in hygienically produced raw milk?

- (a) Coagulase-negative staphylococci
- (b) Micrococci
- (c) Streptococci
- (d) All of the above

Ans. (d)

Q. 9. Which of the following bacteria is/are likely to be present in milk if the cow has mastitis?

- (a) *Staphylococcus aureus*
- (b) *Streptococcus uberis*
- (c) *S. pyogenes*
- (d) All of the above

Ans. (d) *Staphylococcus aureus*, *Streptococcus uberis* and *S. pyogenes* may cause mastitis in cow. Therefore, these may be present in the milk if the cow has mastitis. Therefore, the correct answer is (d).

Q. 10. In general operation theatres, bacterial count of air should not exceed:

- (a) 50 per foot³
- (b) 10 per foot³
- (c) 5 per foot³
- (d) 1 per foot³

Ans. (b)

Q. 11. In operation theatre for neurosurgery, bacterial count of air should not exceed:

- (a) 50 per foot³
- (b) 10 per foot³
- (c) 5 per foot³
- (d) 1 per foot³

Ans. (d)

Q. 12. Bacteriological examination of air is essential in which of the following conditions?

- (a) Surgical operation theatre
- (b) Premises where pharmaceutical preparations are made
- (c) In hospital wards in which there is an outbreak of cross-infection
- (d) All of the above

Ans. (d)

BIOLOGICAL WARFARE: BIOWEAPONS: BIOTERRORISM

Q. 1. Which of the following bacteria has/have been used in weaponization?

- (a) *Bacillus anthracis*
- (b) *Yersinia pestis*
- (c) *Francisella tularensis*
- (d) All of the above

Ans. (d)

Q. 2. Which of the following toxins is the most toxic substance known to the mankind?

- (a) Botulinum toxin
- (b) Aflatoxin
- (c) Staphylococcal enterotoxin B
- (d) Diphtheria toxin

Ans. (a) Refer to Q. No. 14 of *Clostridium*.

Q. 3. The smallpox virus is a prime candidate for biological warfare because:

- (a) It is easy to genetically engineer
- (b) It is easily cultivated and large quantity of the virus could be produced in relatively short period of time
- (c) It is extremely hard
- (d) All of the above

Ans. (d)

Q. 4. What is/are characteristic/s of the perfect biological weapon?

- (a) Highly infectious
- (b) Efficient dispersal, usually in the air
- (c) Stable in storage
- (d) All of the above

Ans. (d)

Q. 5. How are the biological weapons delivered?

- (a) By rockets
- (b) By a light plane equipped with crop-spraying equipment
- (c) By purse-size perfume atomizer
- (d) All of the above

Ans. (d)

Q. 6. Which of the following toxins has/have been used in biological warfare?

- (a) Botulinum toxin
- (b) Aflatoxin
- (c) Ricin
- (d) All of the above

Ans. (d)

Quality Assurance of Microbiology

Q. 1. Primary sample collection manual does not contain:

- (a) List of laboratory tests offered
- (b) Instructions on how to perform tests
- (c) Instructions for completion of request form
- (d) Consent form

Ans. (b) Sample collection manual **does not** contain instructions on how to perform tests. These are given in standard operating procedures.

Q. 2. Internal quality assessment may be carried out by use of:

- (a) Certified reference material
- (b) Replicate testing
- (c) Retesting of retained items
- (d) All of the above

Ans. (d)

Q. 3. External quality assessment schemes help to:

- (a) Identify error
- (b) Improve the quality of work
- (c) Provide reliable results
- (d) All of the above

Ans. (d)

Q. 4. Standard operating procedures are required to:

- (a) Improve and maintain the quality of laboratory service to patients
- (b) Provide laboratory staff with written instructions on how to perform tests
- (c) Help avoid short-cuts being taken when performing tests
- (d) All of the above

Ans. (d)

General Parasitology

Q. 1. Which type of vector of malaria parasite is female *Anopheles* mosquito?

- (a) Mechanical
- (b) Propagative
- (c) Cyclo-developmental
- (d) Cyclo-propagative

Ans. (d) Since malaria parasites undergo a cyclic change and multiply in the body of female *Anopheles* mosquito, therefore, it is a cyclo-propagative vector.

Q. 2. Blood-sucking insects may transmit:

- (a) *Ancylostoma duodenale*
- (b) *Ascaris lumbricoides*
- (c) *Wuchereria bancrofti*
- (d) *Strongyloides stercoralis*

Ans. (c) Blood-sucking insects (*Culex*, *Aedes* and *Anopheles*) transmit *Wuchereria bancrofti*. *Ascaris lumbricoides* is acquired by ingestion of contaminated food and drink. Filariform larvae of *Ancylostoma duodenale* and *Strongyloides stercoralis* enter human body by penetration of the skin.

Q. 3. Crab may transmit:

- (a) *Diphyllobothrium latum*
- (b) *Clonorchis sinensis*
- (c) *Paragonimus westermani*
- (d) *Enterobius vermicularis*

Ans. (c) Crab may transmit *Paragonimus westermani*. *Diphyllobothrium latum* and *Clonorchis sinensis* are transmitted by fish. *Enterobius vermicularis* is acquired by autoinfection by direct anus-to-mouth transfer and ingestion of contaminated food and drink.

Q. 4. Undercooked pork may act as a source of:

- (a) *Taenia solium*
- (b) *Taenia saginata*
- (c) *Diphyllobothrium latum*
- (d) *Ancylostoma duodenale*

Ans. (a) Undercooked pork may act as a source of *Taenia solium*. Undercooked beef may transmit *Taenia saginata*. Undercooked fish may transmit *Diphyllobothrium latum*.

and filariform larvae of *Ancylostoma duodenale* enter by penetration of skin.

Q. 5. Which of the following parasites is transmitted by cat?

- (a) *Balantidium coli* (b) *Toxoplasma gondii*
- (c) *Echinococcus granulosus* (d) *Toxocara canis*

Ans. (b) *Toxoplasma gondii* is transmitted by cat. *Balantidium coli* is acquired by ingestion of faecally contaminated food and drink. *Echinococcus granulosus* and *Toxocara canis* are transmitted by dog.

Q. 6. Which of the following parasites is transmitted by dog?

- (a) *Echinococcus granulosus* (b) *Hymenolepis nana*
- (c) *Taenia solium* (d) *Diphyllobothrium latum*

Ans. (a) *Echinococcus granulosus* is transmitted by dog. *Hymenolepis nana* is acquired by ingestion of faecally contaminated food and drink. *Taenia solium* is acquired by ingestion of undercooked pork. *Diphyllobothrium latum* is acquired by ingestion of undercooked fish.

Q. 7. Which of the following parasites is transmitted congenitally?

- (a) *Toxoplasma gondii* (b) *Wuchereria bancrofti*
- (c) *Entamoeba histolytica* (d) *Giardia lamblia*

Ans. (a) *Toxoplasma gondii* may be transmitted congenitally. *Wuchereria bancrofti* is transmitted by mosquitoes of genera *Culex*, *Aedes* and *Anopheles*. *Entamoeba histolytica* and *Giardia lamblia* are acquired by ingestion of faecally contaminated food and drink.

Q. 8. Parasite which may be transmitted by sexual contact is:

- (a) *Trichomonas vaginalis* (b) *Trypanosoma cruzi*
- (c) *Leishmania donovani* (d) *Enteromonas hominis*

Ans. (a) *Trichomonas vaginalis* may be transmitted by sexual contact. *Trypanosoma cruzi* is transmitted by reduviid bug. *Leishmania donovani* is transmitted by sandfly. *Enteromonas hominis* is acquired by ingestion of faecally contaminated food and drink.

Q. 9. Parasite transmitted by percutaneous route is:

- (a) *Entamoeba histolytica* (b) *Giardia lamblia*
- (c) *Babesia* spp. (d) *Naegleria fowleri*

Ans. (c) *Babesia* spp. is transmitted by ticks by percutaneous route. *Entamoeba histolytica* and *Giardia lamblia* are transmitted by ingestion of faecally contaminated

food and drink. *Naegleria fowleri* is acquired by nasal contamination during swimming in fresh water lakes, ponds or swimming pools.

Q. 10. Obligate intracellular parasite is:

- (a) *Naegleria fowleri* (b) *Acanthamoeba culbertsoni*
- (c) *Toxoplasma gondii* (d) *Balamuthia mandrillaris*

Ans. (c) *Toxoplasma gondii* is obligate intracellular parasite. *Naegleria fowleri*, *Acanthamoeba culbertsoni* and *Balamuthia mandrillaris* are not.

Q. 11. Pernicious anaemia is seen in:

- (a) Diphyllbothriasis (b) Malaria
- (c) Hookworm disease (d) Filariasis

Ans. (a) Pernicious anaemia is seen in diphyllbothriasis. Malaria causes haemolytic anaemia. Hookworm disease causes iron-deficiency anaemia. Filariasis does not cause anaemia.

Q. 12. Cholangiocarcinoma is associated with:

- (a) *Clonorchis sinensis* (b) *Schistosoma haematobium*
- (c) *Paragonimus westermani* (d) *Fasciola hepatica*

Ans. (a) Cholangiocarcinoma is associated with *Clonorchis sinensis*. *Schistosoma haematobium* may cause urinary bladder cancer. *Paragonimus westermani* and *Fasciola hepatica* do not cause any cancer.

Q. 13. Which of the following parasites can be demonstrated in blood film?

- (a) *Naegleria fowleri* (b) *Leishmania donovani*
- (c) *Endolimax nana* (d) *Entamoeba histolytica*

Ans. (b) *Leishmania donovani* may be demonstrated inside circulating monocytes and less often in neutrophils in the stained peripheral blood film. *Naegleria fowleri* can be demonstrated in CSF smear. *Endolimax nana* and *Entamoeba histolytica* can be demonstrated in faecal smear.

Q. 14. Which of the following parasitic eggs is excreted in urine?

- (a) *Schistosoma haematobium*
- (b) *Schistosoma japonicum*
- (c) *Schistosoma mansoni*
- (d) *Clonorchis sinensis*

Ans. (a) *Schistosoma haematobium* eggs are excreted in urine. Eggs of *Schistosoma japonicum*, *Schistosoma mansoni* and *Clonorchis sinensis* are excreted in stool.

Q. 15. Trophozoites of *Naegleria fowleri* can be demonstrated in:

- (a) CSF (b) Blood (c) Stool (d) Urine

Ans. (a) Trophozoites of *Naegleria fowleri* can be demonstrated in CSF and not in blood, stool and urine.

Q. 16. Larvae of which of the following parasites can be demonstrated in muscle biopsy?

- (a) *Trichinella spiralis* (b) *Dracunculus medinensis*
(c) *Wuchereria bancrofti* (d) *Brugia malayi*

Ans. (a) Larvae of *Trichinella spiralis* can be demonstrated in muscle biopsy and not of *Dracunculus medinensis*, *Wuchereria bancrofti* and *Brugia malayi*.

Q. 17. Animal inoculation is **not** useful for detection of:

- (a) *Toxoplasma gondii* (b) *Babesia* spp.
(c) *Leishmania donovani* (d) *Trichomonas vaginalis*

Ans. (d) Animal inoculation is not useful in *Trichomonas vaginalis*. Mice and hamsters are experimental models of *Toxoplasma gondii* and *Babesia* spp., respectively. Hamster is the experimental model of *Leishmania donovani*.

Q. 18. Unicellular parasites belong to kingdom:

- (a) Monera (b) Protozoa (c) Plantae (d) Animalia

Ans. (b)

Q. 19. Helminths belong to kingdom:

- (a) Monera (b) Protozoa (c) Plantae (d) Animalia

Ans. (d)

Q. 20. A parasite that must spend at least part of its life cycle on or in a host is called:

- (a) Facultative parasite (b) Hyperparasite
(c) Obligate parasite (d) Pathogenic parasite

Ans. (c)

Q. 21. Parasites may damage their host's body by:

- (a) Taking nutrients from the host
(b) Triggering inflammatory response
(c) Causing internal haemorrhages
(d) All of these

Ans. (d)

Q. 22. Large parasites, such as helminths, are most likely attacked by:

- (a) Neutrophils (b) Eosinophils
(c) Basophils (d) Platelets

Ans. (b)

Protozoology

INTRODUCTION TO PROTOZOA

Q. 1. Organelles of locomotion in *Balantidium coli* are:

- (a) Flagella
- (b) Pseudopodia
- (c) Cilia
- (d) Fimbria

Ans. (c) Organelles of locomotion in *Balantidium coli* are cilia. Flagella are the organelles of locomotion of intestinal, oral and genital flagellates, and blood and tissue flagellates. Pseudopodia are organelles of locomotion in amoebae. Fimbriae are not seen in parasites.

Q. 2. Which of the following protozoa belongs to phylum Amoebozoa?

- (a) *Cryptosporidium parvum*
- (b) *Cytoisospora belli*
- (c) *Toxoplasma gondii*
- (d) *Entamoeba coli*

Ans. (d) *Entamoeba coli* belongs to phylum Amoebozoa. *Cryptosporidium parvum*, *cytoisospora belli* and *Toxoplasma gondii* belong to phylum Sporozoa.

Q. 3. Intestinal flagellate is:

- (a) *Giardia lamblia*
- (b) *Leishmania tropica*
- (c) *Trypanosoma brucei*
- (d) *Trypanosoma cruzi*

Ans. (a) *Giardia lamblia* is the intestinal flagellate. *Leishmania tropica*, *Trypanosoma brucei* and *Trypanosoma cruzi* are blood and tissue flagellates.

Q. 4. Phylum Sporozoa contains:

- (a) Malaria parasites
- (b) Ciliates
- (c) Flagellates
- (d) Amoebae

Ans. (a) Phylum Sporozoa contains malaria parasites. Ciliates and amoebae belong to phyla Ciliophora and Amoebozoa, respectively. Flagellates are now distributed under four phyla—Metamonada, Parabasala, Percolozoa and Euglenozoa.

Q. 5. Pseudopodium is the organelle of locomotion of:

- (a) *Entamoeba histolytica* (b) *Giardia lamblia*
- (c) *Leishmania donovani* (d) *Balantidium coli*

Ans. (a) Refer to Q. No. 1 above.

Q. 6. Which of the following protozoa belongs to phylum Ciliophora?

- (a) *Balantidium coli* (b) *Cryptosporidium parvum*
- (c) *Plasmodium* spp. (d) *Entamoeba histolytica*

Ans. (a) *Balantidium coli* belongs to phylum Ciliophora. *Cryptosporidium parvum* and *Plasmodium* spp. belong to phylum Sporozoa and *Entamoeba histolytica* belongs to phylum Amoebozoa.

Q. 7. Which of the following parasites belongs to the phylum Percolozoa?

- (a) *Cryptosporidium parvum*
- (b) *Cytoisosporea belli*
- (c) *Naegleria fowleri*
- (d) *Cyclospora cayentanensis*

Ans. (c) *Naegleria fowleri* belongs to phylum Percolozoa. *Cryptosporidium parvum*, *cytoisosporea belli* and *Cyclospora cayetanensis* belong to phylum Sporozoa.

AMOEBAE

Q. 1. Mature cyst of *Entamoeba histolytica* is:

- (a) Uninucleate (b) Binucleate
- (c) Quadrinucleate (d) Octanucleate

Ans. (c)

Q. 2. Glycogen mass and chromidial bars are **absent** in the cysts of *Entamoeba histolytica* in:

- (a) Uninucleate stage (b) Binucleate stage
- (c) Quadrinucleate stage (d) Octanucleate stage

Ans. (c)

Q. 3. Cysts of *Entamoeba histolytica* are formed in:

- (a) The lumen of the intestine (b) The tissues
- (c) The soil (d) All of the above

Ans. (a)

Q. 4. Infective stage of *Entamoeba histolytica* is:

- (a) Trophozoite (b) Binucleate cyst
- (c) Quadrinucleate cyst (d) Octanucleate cyst

Ans. (c)

Q. 5. Superficial intestinal ulcers do not extend beyond:

- (a) Muscularis mucosae (b) Submucosa
- (c) Muscular coat (d) peritoneum

Ans. (a)

Q. 6. Most common organ involved in extraintestinal amoebiasis is:

- (a) Liver (b) Lung (c) Brain (d) Spleen

Ans. (a)

Q. 7. All of the following characteristics are seen in the stools in amoebic dysentery, except:

- (a) RBCs in clumps
- (b) Charcot-Leyden crystals
- (c) Pyknotic bodies
- (d) Ghost cells

Ans. (d)

Q. 8. Diagnostic titre of indirect haemagglutination test in hepatic amoebiasis is:

- (a) 1 : 16 or more (b) 1 : 32 or more
- (c) 1 : 64 or more (d) 1 : 256 or more

Ans. (d)

Q. 9. All are non-pathogenic *Entamoeba*, except:

- (a) *Entamoeba coli* (b) *Entamoeba histolytica*
- (c) *Entamoeba hartmanni* (d) *Entamoeba gingivalis*

Ans. (b)

Q. 10. All non-pathogenic amoebae live in the lumen of large intestine, except:

- (a) *Entamoeba coli* (b) *Entamoeba hartmanni*
- (c) *Entamoeba gingivalis* (d) *Endolimax nana*

Ans. (c) *Entamoeba gingivalis* inhabits the mouth, while *Entamoeba coli*, *Entamoeba hartmanni* and *Endolimax nana* reside in the lumen of large intestine.

Q. 11. Central karyosome surrounded by refractile globules is seen in:

- (a) *Entamoeba histolytica* (b) *Entamoeba coli*
- (c) *Iodamoeba bütschlii* (d) *Endolimax nana*

Ans. (c) Central karyosome surrounded by refractile globules is seen in *Iodamoeba bütschlii*. *Entamoeba histolytica* possesses a central dot-like karyosome which is surrounded by a clear halo. In *Entamoeba coli*, karyosome is eccentric. In *Endolimax nana*, it is large, irregular lying eccentrically.

Q. 12. Following are the opportunistic protozoa, **except:**

- (a) *Naegleria fowleri* (b) *Acanthamoeba* spp.
- (c) *Balamuthia mandrillaris* (d) *Entamoeba histolytica*

Ans. (d)

Q. 13. Lobopodia are seen in trophozoites of:

- (a) *Naegleria fowleri* (b) *Acanthamoeba* spp.
- (c) *Balamuthia mandrillaris* (d) *Leishmania donovani*

Ans. (a)

Q. 14. Infection with *Naegleria* can be acquired by:

- (a) Swimming in lakes, ponds or pools containing infective forms
- (b) Blood transfusion
- (c) Sexual contact
- (d) Faecal–oral route

Ans. (a)

Q. 15. *Naegleria fowleri* causes:

- (a) Primary amoebic meningoencephalitis
- (b) Granulomatous amoebic encephalitis
- (c) Keratitis
- (d) Diarrhoea

Ans. (a)

Q. 16. What is/are the characteristic/s of CSF in primary amoebic meningoencephalitis?

- (a) It is purulent
- (b) Its leucocyte count varies from few hundreds to more than 20,000/microlitre
- (c) It has high protein and low glucose content
- (d) All of the above

Ans. (d)

Q. 17. A 25-year-old patient with a recent history of swimming in fresh water developed severe frontal headache, fever, vomiting, signs of meningeal irritation, seizures and coma. The CSF examination revealed motile amoebae. Which of the following amoebae is the probable causative agent?

- (a) *Naegleria fowleri* (b) *Acanthamoeba culbertsoni*
- (c) *Balamuthia mandrillaris* (d) *Entamoeba histolytica*

Ans. (a) *Naegleria fowleri*, *Acanthamoeba culbertsoni* and *Balamuthia mandrillaris* are ubiquitous in nature, found commonly in soil and water (swimming pools, tap water, and heating and air-conditioning units). Infection is acquired from

these sources. *Naegleria fowleri* causes primary amoebic meningoencephalitis. *Acanthamoeba culbertsoni* and *Balamuthia mandrillaris* cause granulomatous amoebic encephalitis. Therefore, the probable causative agent is *Naegleria fowleri*. *Entamoeba histolytica* is acquired by ingestion of faecally contaminated food and drink.

Q. 18. Pseudopodia are the organelles of locomotion in:

- | | |
|------------------------------|----------------------------------|
| (a) <i>Giardia lamblia</i> | (b) <i>Trichomonas vaginalis</i> |
| (c) <i>Toxoplasma gondii</i> | (d) <i>Entamoeba histolytica</i> |

Ans. (d) Pseudopodia are the organelles of locomotion in *Entamoeba histolytica*. In *Giardia lamblia* and *Trichomonas vaginalis* flagella are the organelles of locomotion. *Toxoplasma gondii* does not possess any organelle of locomotion.

Q. 19. Amoebic ulcers are seen in:

- | | |
|--------------|-------------|
| (a) Duodenum | (b) Jejunum |
| (c) Ileum | (d) Colon |

Ans. (d) *Entamoeba histolytica*, the causative agent of amoebic ulcers, is the parasite of large intestine, therefore, amoebic ulcers are seen in colon.

Q. 20. Reservoir host of *Entamoeba histolytica* is:

- | | |
|---------|-----------|
| (a) Man | (b) Pig |
| (c) Dog | (d) Sheep |

Ans. (a)

Q. 21. Red blood cells are seen in the endoplasm of trophozoites of:

- | | |
|-----------------------------|----------------------------------|
| (a) <i>Entamoeba coli</i> | (b) <i>Entamoeba histolytica</i> |
| (c) <i>Entamoeba dispar</i> | (d) <i>Entamoeba hartmanni</i> |

Ans. (b)

Q. 22. Granulomatous amoebic encephalitis is caused by:

- | | |
|----------------------------------|-------------------------------------|
| (a) <i>Entamoeba histolytica</i> | (b) <i>Acanthamoeba culbertsoni</i> |
| (c) <i>Naegleria fowleri</i> | (d) <i>Leishmania donovani</i> |

Ans. (b)

Q. 23. Charcot-Leyden crystals are derived from:

- | | |
|-----------------|-----------------|
| (a) Neutrophils | (b) Basophils |
| (c) Eosinophils | (d) Macrophages |

Ans. (c)

Q. 24. Cysts of which of the following intestinal parasites do not possess four or more nuclei?

- | | |
|----------------------------------|------------------------------|
| (a) <i>Entamoeba histolytica</i> | (b) <i>Entamoeba coli</i> |
| (c) <i>Entamoeba dispar</i> | (d) <i>Entamoeba polecki</i> |

Ans. (d) Mature cysts of *Entamoeba histolytica* and *Entamoeba dispar* possess four nuclei and those of *Entamoeba coli* possess eight nuclei. Mature cyst of *Entamoeba polecki* has only one nucleus. Therefore, the correct answer is (d).

Q. 25. Which of the following amoebae forms cysts in tissues?

- (a) *Acanthamoeba culbertsoni* (b) *Naegleria fowleri*
- (c) *Entamoeba histolytica* (d) *Balantidium coli*

Ans. (a) *Acanthamoeba culbertsoni* forms cysts in tissues. Cysts of *Naegleria fowleri* are formed in soil and water and not in tissues. Cysts of *Entamoeba histolytica* and *Balantidium coli* are formed in large intestine.

Q. 26. Which of the following features characterize/s *Entamoeba histolytica* / *Entamoeba dispar* cysts?

- (a) Spherical measuring 10–15 μm in diameter
- (b) Presence of four nuclei in mature cyst
- (c) Presence of centrally located karyosome
- (d) All of the above

Ans. (d)

Q. 27. The maximum number of nuclei in the mature cysts of *Endolimax nana* is:

- (a) Two (b) Four
- (c) Six (d) Eight

Ans. (b)

Q. 28. Which of the following characteristics is satisfactory for distinguishing *Entamoeba histolytica* and *Entamoeba dispar* morphologically?

- (a) Progressive motility
- (b) Fine peripheral chromatin
- (c) Ingested red blood cells
- (d) Central dot-like karyosome

Ans. (c) *Entamoeba histolytica* and *Entamoeba dispar* are morphologically identical. Trophozoites containing ingested red blood cells can be identified as *Entamoeba histolytica* and those lacking as *Entamoeba dispar*. Therefore, the correct answer is (c).

Q. 29. Amoebic cysts can be visualized with all of the following techniques, except?

- (a) Wet mount (b) Trichrome stain
- (c) Iron haematoxylin stain (d) Modified acid-fast stain

Ans. (d) Amoebic cysts are non-acid-fast, therefore, they cannot be visualized with modified acid-fast stain. These, however, can be visualized with wet mount, trichrome stain and iron haematoxylin stain.

Q. 30. Which of the following parasites causes keratitis?

- | | |
|----------------------------------|-------------------------------------|
| (a) <i>Naegleria fowleri</i> | (b) <i>Acanthamoeba culbertsoni</i> |
| (c) <i>Entamoeba histolytica</i> | (d) <i>Endolimax nana</i> |

Ans. (b)

Q. 31. Which of the following amoebae inhabits mouth rather than the large intestine?

- | | |
|--------------------------------|---------------------------------|
| (a) <i>Entamoeba hartmanni</i> | (b) <i>Entamoeba polecki</i> |
| (c) <i>Entamoeba dispar</i> | (d) <i>Entamoeba gingivalis</i> |

Ans. (d)

Q. 32. Refrigeration of cerebrospinal fluid is **not** recommended because it may kill:

- | | |
|------------------------------|-----------------------------------|
| (a) <i>Naegleria fowleri</i> | (b) <i>Haemophilus influenzae</i> |
| (c) Both of the above | (d) Neither of the above |

Ans. (c)

FLAGELLATES

Q. 1. How many pairs of flagella are present in the trophozoite of *Giardia lamblia*?

- | | |
|-----------------|----------------|
| (a) One pair | (b) Two pairs |
| (c) Three pairs | (d) Four pairs |

Ans. (d)

Q. 2. Which is the infective form of *Giardia lamblia*?

- | | |
|-----------------|----------------|
| (a) Trophozoite | (b) Cyst |
| (c) Precyst | (d) Pseudocyst |

Ans. (b)

Q. 3. *Giardia lamblia* resides in:

- | |
|--|
| (a) Duodenum and upper part of jejunum |
| (b) Caecum |
| (c) Colon |
| (d) Rectum |

Ans. (a)

Q. 4. *Trichomonas tenax* resides in:

- | | |
|--------------|------------|
| (a) Vagina | (b) Mouth |
| (c) Duodenum | (d) Caecum |

Ans. (b)

Q. 5. Trussell and Johnson's medium is employed for the cultivation of:

- (a) *Giardia lamblia* (b) *Trichomonas vaginalis*
- (c) *Entamoeba histolytica* (d) *Leishmania donovani*

Ans. (b) Trussell and Johnson's medium is employed for the cultivation of *Trichomonas vaginalis*. Diamond's medium is used for the cultivation of *Giardia lamblia* and *Entamoeba histolytica*. For the cultivation of *Leishmania donovani* NNN and Hockmeyer's media are employed.

Q. 6. Diagnosis of *Trichomonas vaginalis* infection can be established by:

- (a) Demonstration of trophozoites in wet mounts
- (b) Cultivation
- (c) Nucleic acid hybridization techniques
- (d) All of the above

Ans. (d)

Q. 7. *Chilomastix mesnili* lives in:

- (a) Duodenum (b) Mouth
- (c) Vagina (d) Caecum

Ans. (d)

Q. 8. All of the following are characteristics of trophozoites of *Enteromonas hominis*, **except**:

- (a) Four flagella
- (b) Nucleus at the anterior end
- (c) Pear-shaped structure
- (d) Cytostome

Ans. (d) Cytostome is not present in the trophozoites of *Enteromonas hominis*. It is present in the trophozoites of *Balantidium coli*.

Q. 9. *Dientamoeba fragilis* is classified under:

- (a) amoebae (b) Flagellates
- (c) Sporozoa (d) Ciliata

Ans. (b) *Dientamoeba fragilis* was initially thought to be an amoeba. It is now classified as a flagellate.

Q. 10. *Dientamoeba fragilis* can be differentiated from the amoebae by the presence of:

- (a) Two and sometimes up to four nuclei
- (b) Cytostome
- (c) Cyst stage
- (d) Food vacuoles containing RBCs

Ans. (a) Trophozoite of *Dientamoeba fragilis* contains two and sometimes four nuclei. Cyst stage has not been confirmed to date. Food vacuoles do not contain RBCs. Cytostome is present in *Balantidium coli* and not in *Dientamoeba fragilis*.

Q. 11. Old World leishmaniasis is caused by:

- (a) *Leishmania donovani* (b) *Leishmania infantum*
- (c) *Leishmania tropica* (d) All of the above

Ans. (d)

Q. 12. New World leishmaniasis is caused by:

- (a) *Leishmania donovani*
- (b) *Leishmania aethiopica*
- (c) *Leishmania tropica*
- (d) *Leishmania braziliensis* complex

Ans. (d)

Q. 13. Amastigote form of *Leishmania donovani* resides in the:

- (a) Cells of reticuloendothelial system
- (b) Red blood cells
- (c) Digestive tract of insect vector
- (d) All of the above.

Ans. (a) Amastigote form of *Leishmania donovani* resides in the cells of reticuloendothelial cells of man. Promastigote form of *L. donovani* is seen in the invertebrate host (sandfly) and in culture.

Q. 14. Promastigote form of *Leishmania donovani* is seen in the:

- (a) Red blood cells
- (b) Culture media
- (c) Hepatocytes
- (d) Cells of reticuloendothelial system

Ans. (b) Refer to Q. No. 13 above.

Q. 15. *Leishmania donovani* can be cultivated in:

- (a) brain heart infusion agar
- (b) Hockmeyer's medium
- (c) Boeck and Drbohlav's diphasic medium
- (d) Trussell and Johnson's medium

Ans. (b) Refer to Q. No. 5 above.

Q. 16. Which is the most susceptible experimental animal used for inoculation of *Leishmania donovani*?

- (a) Guinea pig (b) Hamster (c) Rabbit (d) Mouse

Ans. (b)

Q. 17. Kala-azar must be differentiated from:

- (a) Malaria
- (b) Tuberculosis
- (c) Histoplasmosis
- (d) All of the above

Ans. (d)

Q. 18. Patients of post kala-azar dermal leishmaniasis present with:

- (a) Hypopigmented macules
- (b) Erythematous patches
- (c) Yellowish-pink nodules
- (d) All of the above

Ans. (d)

Q. 19. Post kala-azar dermal leishmaniasis is probably a sequel to infection with:

- (a) *Leishmania donovani*
- (b) *Leishmania infantum*
- (c) *Leishmania tropica*
- (d) *Leishmania major*

Ans. (a)

Q. 20. Invertebrate host for *Leishmania tropica* is:

- (a) *Phlebotomus argentipes*
- (b) *Phlebotomus orientalis*
- (c) *Phlebotomus sergenti*
- (d) *Phlebotomus papatasi*

Ans. (c)

Q. 21. In *Leishmania tropica* infection amastigote form resides in:

- (a) Clasmotocytes of skin
- (b) Reticuloendothelial cells of viscera
- (c) Sandfly vector
- (d) Artificial culture medium

Ans. (a)

Q. 22. *Leishmania tropica* causes:

- (a) Kala-azar
- (b) Oriental sore
- (c) Espundia
- (d) Chiclero's ulcer

Ans. (b)

Q. 23. *Leishmania braziliensis* complex resides inside the macrophages of:

- (a) Skin and mucous membrane of nose and buccal cavity
- (b) In the internal organs
- (c) In the peripheral blood
- (d) All of the above

Ans. (a)

Q. 24. Espundia is caused by:

- (a) *Leishmania mexicana* complex
- (b) *Leishmania braziliensis* complex
- (c) *Leishmania peruviana*
- (d) *Leishmania chagasi*

Ans. (b)

Q. 25. American visceral leishmaniasis is caused by:

- (a) *Leishmania mexicana* complex
- (b) *Leishmania peruviana*
- (c) *Leishmania chagasi*
- (d) *Leishmania tropica*.

Ans. (c)

Q. 26. Which of the following trypanosomes is non-pathogenic?

- (a) *Trypanosoma brucei gambiense*
- (b) *Trypanosoma brucei rhodesiense*
- (c) *Trypanosoma cruzi*
- (d) *Trypanosoma rangeli*

Ans. (d)

Q. 27. Chagas' disease is caused by:

- (a) *Trypanosoma brucei gambiense*
- (b) *Trypanosoma brucei rhodesiense*
- (c) *Trypanosoma cruzi*
- (d) *Trypanosoma rangeli*

Ans. (c)

Q. 28. Which stage of *Trypanosoma brucei gambiense* is infective for mammalian host?

- (a) Metacyclic trypomastigote
- (b) Long slender form
- (c) Short stumpy form
- (d) Intermediate form

Ans. (a)

Q29. Which form of *Trypanosoma brucei gambiense* is infective to tsetse fly?

- (a) Long slender form
- (b) Intermediate form
- (c) Short stumpy form
- (d) Metacyclic trypomastigotes

Ans. (c)

Q. 30. Which of the following drugs is used to treat early-stage disease caused by *Trypanosoma brucei gambiense* infection?

- (a) Suramin
- (b) Pentamidine
- (c) Eflornithine
- (d) Amphotericin B

Ans. (b)

Q. 31. Chagoma is seen in infection with:

- (a) *Trypanosoma brucei gambiense*
- (b) *Trypanosoma brucei rhodesiense*
- (c) *Trypanosoma cruzi*
- (d) *Trypanosoma rangeli*

Ans. (c)

Q. 32. Which animal is used for xenodiagnosis of American trypanosomiasis?

- (a) Guinea pig
- (b) Mouse
- (c) Reduviid bug
- (d) Hamster

Ans. (c)

Q. 33. The commonest cause of steatorrhoea is:

- (a) *Giardia lamblia*
- (b) *Entamoeba histolytica*
- (c) *Toxoplasma gondii*
- (d) *Naegleria fowleri*

Ans. (a) With the help of sucking disc, *Giardia lamblia* attaches itself to the surface of the intestinal cells in the duodenum and jejunum leading to chronic diarrhoea of steatorrhoea type. This is due to malabsorption since the parasites are coated on the mucosa, thus absorption suffers. *Entamoeba histolytica* infects large intestine leading to diarrhoea (not of steatorrhoea type) and dysentery. *Toxoplasma gondii* and *Naegleria fowleri* do not infect intestines.

Q. 34. *Giardia lamblia* was discovered by:

- (a) Giard
- (b) Lambl
- (c) Leeuwenhoek
- (d) Robert Koch

Ans. (c) *Giardia lamblia* was discovered by Leeuwenhoek in 1681 in his own stool but was not described until 1859 by Lambl. It was named after Professor A. Giard of Paris and Professor F. Lambl of Prague.

Q. 35. Enterotest is useful for the identification of which of the following parasites?

- (a) *Entamoeba histolytica*
- (b) *Giardia lamblia*
- (c) *Trichomonas hominis*
- (d) *Cryptosporidium parvum*

Ans. (b) Trophozoites of *Giardia lamblia* attach to the mucosa of duodenum and upper part of jejunum. It inhibits absorption of fat. These may be detected in the bile aspirated from duodenum by intubation or by duodenal capsule technique (Enterotest).

Q. 36. In *Trypanosoma cruzi* infection the parasitic form present in fixed and wandering histiocytes is:

- (a) Amastigote (b) Promastigote
- (c) Trypomastigote (d) epimastigote

Ans. (a) *Trypanosoma cruzi* lives as trypomastigote in the blood and as an amastigote in reticuloendothelial cells of spleen, liver, lymph nodes, bone marrow and myocardium of man.

Q. 37. Non-ulcerated nodules are characteristic of:

- (a) Oriental sore
- (b) Espundia
- (c) Post kala-azar dermal leishmaniasis
- (d) Kala-azar

Ans. (c) *Leishmania tropica* causes a cutaneous lesion (oriental sore) which begins as a raised papule about 2.5 cm in diameter. In majority of cases it ulcerates.

L. mexicana complex and *L. brasiliensis* complex cause espundia. In majority of cases it also ulcerates. In post-kala-azar dermal leishmaniasis, caused by *L. donovani*, the nodules do not ulcerate. Kala-azar is systemic disease.

Q. 38. *Trypanosoma brucei gambiense* is transmitted by:

- (a) Housefly (b) Sandfly
- (c) Tsetse fly (d) Reduviid bug

Ans. (c)

Q. 39. *Trypanosoma cruzi* is transmitted by:

- (a) Sandfly (b) Tsetse fly
- (c) Housefly (d) Reduviid bug

Ans. (d)

Q. 40. Sandfly is the vector of:

- (a) *Leishmania donovani* (b) *Plasmodium falciparum*
- (c) *Wuchereria bancrofti* (d) *Brugia malayi*

Ans. (a) Sandfly is the vector of *Leishmania donovani*. Female *Anopheles* mosquito transmits *Plasmodium falciparum* and other malaria parasites. *Wuchereria bancrofti* is transmitted by *Culex*, *Aedes* and *Anopheles* mosquitoes. *Brugia malayi* is transmitted by *Mansonia*, *Anopheles* and *Aedes*.

Q. 41. Romana's sign is positive in:

- (a) Malaria (b) Filariasis
- (c) Chagas' disease (d) Kala-azar

Ans. (c)

Q. 42. Chiclero's ulcer is caused by:

- (a) *Leishmania mexicana* complex
- (b) *Leishmania braziliensis* complex
- (c) *Leishmania tropica*
- (d) *Leishmania infantum*

Ans. (a)

Q. 43. Oriental sore is caused by:

- (a) *Leishmania donovani*
- (b) *Leishmania infantum*
- (c) *Leishmania aethiopica*
- (d) *Leishmania tropica*

Ans. (d) Oriental sore is caused by *Leishmania tropica* and *Leishmania major*.

Q. 44. Which of the following parasites attaches to the mucosa of the duodenum and the upper part of the jejunum with sucking disc?

- (a) *Entamoeba histolytica*
- (b) *Balantidium coli*
- (c) *Giardia lamblia*
- (d) *Balamuthia mandrillaris*

Ans. (c) *Giardia lamblia* attaches to the mucosa of the duodenum and upper part of jejunum. *Entamoeba histolytica* and *Balantidium coli* infect large intestine. *Balamuthia mandrillaris* does not involve intestines. It causes granulomatous amoebic encephalitis.

Q. 45. Which of the following is **not** true about *Trichomonas vaginalis*?

- (a) It is a pyriform flagellate
- (b) It has four anterior and one posterior flagella
- (c) Cyst of the parasite is the infective stage
- (d) It causes vaginitis with discharge

Ans. (c) *Trichomonas vaginalis* exists only as trophozoite. Cystic stage is absent. Therefore, the correct answer is (c).

Q. 46. Which of the following parasites is **not** intracellular in human beings?

- (a) *Trypanosoma brucei gambiense*
- (b) *Plasmodium vivax*
- (c) *Leishmania donovani*
- (d) *Toxoplasma gondii*

Ans. (a) In human host, *Trypanosoma brucei gambiense* exists free in blood in trypomastigote form. *Plasmodium vivax*, *Leishmania donovani* and *Toxoplasma gondii* are intracellular parasites. Therefore, the correct answer is (a).

Q. 47. How many nuclei does a mature cyst of *Giardia lamblia* possess?

- (a) One (b) Two (c) Three (d) Four

Ans. (d)

Q. 48. Montenegro test is used for the diagnosis of which of the following diseases?

- (a) Kala-azar (b) Cysticercosis
(c) Toxoplasmosis (d) Echinococcosis

Ans. (a)

Q. 49. Enterotest is used for sampling:

- (a) Alveolar lavage specimen
(b) Urogenital specimen
(c) Duodenal contents
(d) Rectal specimen

Ans. (c) Refer to Q. No. 35 above.

Q50. Dum Dum fever is the name given to:

- (a) Hepatic amoebiasis
(b) Visceral leishmaniasis
(c) Cerebral malaria
(d) Neurocysticercosis

Ans. (b)

Q. 51. Romana's sign refers to:

- (a) Unilateral oedema and conjunctivitis
(b) Ileo-caecal amoebiasis
(c) Greenish or yellow vaginal discharge
(d) Sleeping sickness

Ans. (a)

Q. 52. Which of the following parasites possesses ability to vary the antigenic nature of their surface coat?

- (a) *Trypanosoma brucei gambiense*
(b) *Trypanosoma rangeli*
(c) *Leishmania donovani*
(d) *Leishmania tropica*

Ans. (a)

Q. 53. Which of the following acts as a vector for *Trypanosoma cruzi*?

- (a) Reduviid bug (b) Tsetse fly
(c) Dearfly (d) Blackfly

Ans. (a) Reduviid bug acts as a vector of *Trypanosoma cruzi*. Tsetse fly transmits *T. brucei gambiense*. Dearfly (*Chrysops*) and blackfly (*Simulium*) transmit *Loa loa* and *Onchocercus volvulus*, respectively.

Q. 54. West African sleeping sickness is caused by:

- (a) *Trypanosoma brucei gambiense*
- (b) *Trypanosoma brucei brucei*
- (c) *Trypanosoma cruzi*
- (d) *Trypanosoma rangeli*

Ans. (a)

Q. 55. Which morphological form of *Trypanosoma brucei gambiense* is seen in humans?

- (a) Amastigote
- (b) Promastigote
- (c) Epimastigote
- (d) Trypomastigote

Ans. (d) Refer to Q. No. 46 above.

Q. 56. In which of the following parasites both amastigote and trypomastigote forms are seen in humans?

- (a) *Trypanosoma brucei gambiense*
- (b) *Trypanosoma brucei rhodesiense*
- (c) *Trypanosoma cruzi*
- (d) *Trypanosoma rangeli*

Ans. (c) *Trypanosoma cruzi* occurs in trypomastigote form in the blood, and in amastigote form in fixed and wandering histiocytes, especially in spleen, liver, lymph nodes and bone marrow. Therefore, the correct answer is (c).

Q. 57. *Trypanosoma brucei gambiense* can be grown in:

- (a) Weinman's medium
- (b) Diamond's medium
- (c) Chocolate agar
- (d) Boeck and Drbohlav's diphasic medium

Ans. (a)

Q. 58. *Trypanosoma cruzi* can be grown in:

- (a) Trussell and Johnson's medium
- (b) Diamond's medium
- (c) NNN medium
- (d) Boeck and Drbohlav's diphasic medium

Ans. (c) *T. b. gambiense* can be grown in Weinman's medium. *T. b. rhodesiense* and *T. cruzi* can be grown in NNN medium. Trussell and Johnson's medium is used for culture of *Trichomonas vaginalis*, Diamond's medium is used for culture of *Entamoeba histolytica* and *Giardia lamblia*, and Boeck and Drbohlav's diphasic medium can be used for culture of *Entamoeba histolytica*.

Q. 59. Which of the following protozoan parasites inhibits the absorption of fats in the intestine?

- (a) *Giardia lamblia* (b) *Cryptosporidium parvum*
- (c) *Isospora belli* (d) *Entamoeba histolytica*

Ans. (a) Refer to Q. No. 35 above.

SPOROZOA

Q. 1. Which is the infective form of the malaria parasite?

- (a) Oocyst (b) Sporozoite
- (c) Bradyzoite (d) Tachyzoite

Ans. (b) Sporozoite is the infective form of malaria parasite. It is present in the saliva of infected mosquito (female *Anopheles*). Oocyst is the infective form of *Toxoplasma gondii*, *Cryptosporidium parvum*, *Cytoisopora belli* and *Cyclospora cayetanensis*. Tachyzoites and bradyzoites are the infective forms of *Toxoplasma gondii*.

Q. 2. Resting stage of the malaria parasite is known as:

- (a) Sporozoite (b) Trophozoite
- (c) Merozoite (d) Hypnozoite

Ans. (d) Hypnozoite is the resting stage of malaria parasite. Trophozoite and merozoite are the stages of schizogony cycle of malaria parasites. Sporozoite is the end stage of sexual cycle in female *Anopheles* mosquito. It is infective form of malaria parasite.

Q. 3. Relapse of malaria is **not** seen in infection with:

- (a) *Plasmodium vivax* (b) *Plasmodium ovale*
- (c) *Plasmodium falciparum* (d) All of the above

Ans. (c) Since secondary exo-erythrocytic or dormant schizogony does not occur in *Plasmodium falciparum*. Therefore, relapse of malaria is not seen in *P. falciparum* infection. Secondary exo-erythrocytic schizogony occurs in *Plasmodium vivax* and *Plasmodium ovale*, therefore, relapse may occur in infection with these parasites. Secondary exo-erythrocytic schizogony does not occur in *Plasmodium malariae* also.

Q. 4. For infection of mosquito, the blood of human carrier must contain atleast:

- (a) 6 gametocytes/ml (b) 8 gametocytes/ml
- (c) 10 gametocytes/ml (d) 12 gametocytes/ml

Ans. (d)

Q. 5. Malaria infection can be transmitted by:

- (a) Bite of infected female *Anopheles* mosquito
- (b) Blood transfusion
- (c) Vertical transmission through placental defect
- (d) All of the above

Ans. (d)

Q. 6. *Plasmodium falciparum* is the most pathogenic of the human *Plasmodium* spp. as:

- (a) It causes a high level of parasitaemia
- (b) It invades erythrocytes of all ages
- (c) Its erythrocytic schizogony takes place in the capillaries of internal organs
- (d) All of the above

Ans. (d)

Q. 7. Which forms of *Plasmodium falciparum* are generally absent in peripheral blood film of the patient?

- (a) Early ring stage
- (b) Schizonts
- (c) Crescents
- (d) None of the above

Ans. (b) *Plasmodium falciparum* differs from other malaria parasites in that developing erythrocytic schizonts aggregate in the capillaries of the brain and other internal organs, so that only young trophozoites or ring forms and crescents are found in the peripheral blood. Schizonts are generally absent in the peripheral blood.

Q. 8. Crescent-shaped or banana-shaped gametocytes are seen in infection with:

- (a) *Plasmodium vivax*
- (b) *Plasmodium falciparum*
- (c) *Plasmodium ovale*
- (d) *Plasmodium malariae*

Ans. (b)

Q. 9. Maurer's dots in red blood cells are seen in infection with:

- (a) *Plasmodium vivax*
- (b) *Plasmodium falciparum*
- (c) *Plasmodium malariae*
- (d) *Plasmodium ovale*

Ans. (b)

Q. 10. Quartan periodicity of malaria is seen in infection with:

- (a) *Plasmodium vivax*
- (b) *Plasmodium falciparum*
- (c) *Plasmodium malariae*
- (d) *Plasmodium ovale*

Ans. (c)

Q. 11. Which drug is used to eliminate exo-erythrocytic parasites in the liver?

- (a) Chloroquine
- (b) Quinine
- (c) Primaquine
- (d) Mefloquine

Ans. (c) Chloroquine, quinine and mefloquine eliminate erythrocytic malaria parasites. Primaquine eliminates exo-erythrocytic malaria parasites.

Q. 12. Which was the first arthropod-borne disease to be identified?

- (a) Leishmaniasis
- (b) Trypanosomiasis
- (c) Malaria
- (d) Babesiosis

Ans. (d)

Q. 13. Babesiosis is transmitted by bite of:

- (a) Female *Anopheles* mosquito
- (b) Sandfly
- (c) Reduviid bug
- (d) Tick

Ans. (d) Babesiosis is transmitted by ticks. Female *Anopheles* mosquito transmits malaria parasites *Wuchereria bancrofti* and *Brugia malayi*. Sandfly transmits leishmaniasis and reduviid bug transmits *Trypanosoma cruzi*.

Q. 14. Which is the infective stage of parasite in babesiosis?

- (a) Sporozoite
- (b) Merozoite
- (c) Tachyzoite
- (d) Bradyzoite

Ans. (a) Sporozoite is the infective stage of parasite in babesiosis. For merozoite, tachyzoite and bradyzoite refer to Q. No. 1 above.

Q. 15. Which animal is used for diagnosis of babesiosis?

- (a) Hamster
- (b) Guinea pig
- (c) Mouse
- (d) Rabbit

Ans. (a)

Q. 16. In the intermediate host *Toxoplasma gondii* lives inside the:

- (a) Lumen of small intestine
- (b) Lumen of large intestine
- (c) Reticuloendothelial cells and many other nucleated cells
- (d) Red blood cells

Ans. (c) In intermediate host (humans, mice, rats, sheep, cattle, pigs and certain birds), *Toxoplasma gondii* lives inside reticuloendothelial cells and many other nucleated cells. In definitive host, cat and other felines, it resides in the mucosal cells of small intestine. After development in the mucosal cells oocysts exit from host cell into gut lumen.

Q. 17. Oocysts of *Toxoplasma gondii* are seen in:

- (a) Domestic cat and other felines
- (b) Humans
- (c) Sheep
- (d) Cattle

Ans. (a)

Q. 18. During which trimester/s of pregnancy infection with *Toxoplasma gondii* is more severe?

- (a) First
- (b) Second
- (c) Third
- (d) Second and third

Ans. (a)

Q. 19. The commonest manifestation of postnatally-acquired infection with *Toxoplasma gondii* is:

- (a) Lymphadenopathy
- (b) Pneumonitis
- (c) Myocarditis
- (d) Meningoencephalitis

Ans. (a)

Q. 20. Intermediate host for *Sarcocystis hominis* is:

- (a) Man
- (b) Cattle
- (c) Pig
- (d) Cat

Ans. (b) Intermediate host for *Sarcocystis hominis* is cattle and the definitive host is man.

Q. 21. Man acts as accidental intermediate host in infection with:

- (a) *Sarcocystis hominis*
- (b) *Sarcocystis suihominis*
- (c) *Sarcocystis lindemanni*
- (d) All of the above

Ans. (c) Man acts as accidental intermediate host in infection with *Sarcocystis lindemanni*. Man acquires infection by ingestion of food and drinks contaminated with sporocysts excreted in the faeces of cats, dogs or other carnivorous animals which are believed to be the definitive hosts of the parasite.

Q. 22. How many sporozoites are seen in mature oocyst of *Sarcocystis suihominis*?

- (a) Two
- (b) Four
- (c) Six
- (d) Eight

Ans. (d)

Q. 23. Muscular sarcocystosis is caused by:

- (a) *Sarcocystis hominis*
- (b) *Sarcocystis suihominis*
- (c) *Sarcocystis lindemanni*
- (d) All of the above

Ans. (c) *Sarcocystis hominis* and *Sarcocystis suihominis* cause intestinal sarcocystosis. *S. lindemanni* may cause muscular sarcocystosis.

Q. 24. Sporulated oocysts of *Cytoisospora belli* contain:

- (a) One sporocyst (b) Two sporocysts
- (c) Three sporocysts (d) Four sporocysts

Ans. (b) Sporulated oocysts of *Cytoisospora belli* contain two sporocysts, each sporocyst has four sporozoites. Oocysts of *Cyclospora cayetanensis* contain two sporocysts, each sporocyst has two sporozoites. Sporulated oocysts of *Cryptosporidium parvum* contain four crescent-shaped naked or non-encysted sporozoites.

Q. 25. Each sporulated oocyst of *Cyclospora cayetanensis* contains:

- (a) Two sporozoites (b) Four sporozoites
- (c) Six sporozoites (d) Eight sporozoites

Ans. (b)

Q. 26. Which statement is true about *Cryptosporidium parvum*?

- (a) Developmental stages of the parasite are extracellular
- (b) Both asexual and sexual multiplication of the parasite occurs in a single host
- (c) Each oocyst contains eight naked sporozoites
- (d) It causes meningoencephalitis in AIDS patients

Ans. (b)

Q. 27. Which of the following stains is used for demonstration of *Cryptosporidium* oocysts in stool?

- (a) Modified Ziehl-Neelsen stain
- (b) Haematoxylin and eosin stain
- (c) Iron haematoxylin
- (d) Gram stain

Ans. (a)

Q. 28. A 40-year-old patient developed high fever of sudden onset. Peripheral blood film showed all stages of malaria parasite. The mature schizonts were 9–10 µm in diameter and contained 12–24 merozoites each. The malaria pigment was yellowish-brown in colour. Which of the following malaria parasites is the causative agent?

- (a) *Plasmodium falciparum* (b) *Plasmodium vivax*
- (c) *Plasmodium ovale* (d) *Plasmodium malariae*

Ans. (b) Since peripheral blood film showed all stages of malaria parasite, therefore, *Plasmodium falciparum* is excluded. The size of the mature schizont and number of merozoites in each schizont is in favour of *P. vivax*. Sizes of schizonts of *Plasmodium malariae* and *Plasmodium ovale* are 6.5–7 µm

and 6.2 μm , respectively, and number of merozoites in each of these are 6–12 and 8–12, respectively.

Q. 29. Schuffner's dots in red blood cells are seen in infection with:

- (a) *Plasmodium vivax* (b) *Plasmodium falciparum*
- (c) *Plasmodium malariae* (d) *Plasmodium ovale*

Ans. (a)

Q. 30. Ziemann's dots in red blood cells are seen in infection with:

- (a) *Plasmodium vivax* (b) *Plasmodium falciparum*
- (c) *Plasmodium malariae* (d) *Plasmodium ovale*

Ans. (c)

Q. 31. James's dots in red blood cells are seen in infection with:

- (a) *Plasmodium vivax* (b) *Plasmodium falciparum*
- (c) *Plasmodium malariae* (d) *Plasmodium ovale*

Ans. (d) Red blood cells infected with *Plasmodium vivax*, *Plasmodium falciparum*, *Plasmodium malariae* and *Plasmodium ovale* possess Schuffner's dots, Maurer's dots, Ziemann's dots and James's dots, respectively. Therefore, the correct answers of Q. Nos. 29, 30 and 31 are (a), (c) and (d), respectively.

Q. 32. Cerebral malaria is caused by:

- (a) *Plasmodium vivax* (b) *Plasmodium falciparum*
- (c) *Plasmodium malariae* (d) *Plasmodium ovale*

Ans. (b) *Plasmodium falciparum* differs from other malaria parasites in that developing erythrocytic schizonts aggregate in the capillaries of the brain and other internal organs leading to cerebral malaria.

Q. 33. The situation in which the RBC infection with *Plasmodium* spp. is not eliminated by immune system or by therapy and their numbers in the RBCs begin to increase again with subsequent clinical symptoms is called:

- (a) Gametogony
- (b) Secondary exo-erythrocytic schizogony
- (c) Relapse
- (d) Recrudescence

Ans. (d) The situation in which the RBC infection with *Plasmodium* spp. is not eliminated by immune system or therapy and their numbers in the RBCs begin to increase again with subsequent clinical symptoms is called recrudescence. For relapse, refer to Q. No. 3 above.

Q. 34. Which of the following parasites can be transmitted vertically?

- (a) *Echinococcus granulosus* (b) *Toxoplasma gondii*
- (c) *Giardia lamblia* (d) *Entamoeba histolytica*

Ans. (b)

Q. 35. In which of the following parasites domestic cat is the definitive host?

- (a) *Plasmodium falciparum* (b) *Leishmania donovani*
- (c) *Toxoplasma gondii* (d) *Trichomonas vaginalis*

Ans. (c) Refer to Q. No. 16 above.

Q. 36. Sabin-Feldman dye test is used for the diagnosis of:

- (a) Toxoplasmosis (b) Histoplasmosis
- (c) Leishmaniasis (d) Chagas' disease

Ans. (a)

Q. 37. All of the following are common causes of diarrhoeal disease in persons with HIV infection, **except**:

- (a) *Cytoisopora belli* (b) *Cyclospora cayetanensis*
- (c) *Cryptosporidium parvum* (d) *Toxoplasma gondii*

Ans. (d) In persons with HIV infection *Toxoplasma gondii* causes intracerebral lesions. It does not cause diarrhoea. *Cytoisopora belli*, *Cyclospora cayetanensis* and *Cryptosporidium parvum* cause diarrhoea in HIV-infected patients.

Q. 38. Which of the following parasites is **not** a sporozoan?

- (a) *Balantidium coli* (b) *Plasmodium falciparum*
- (c) *Cytoisopora belli* (d) *Cryptosporidium parvum*

Ans. (a) *Balantidium coli* is a ciliate and not a sporozoan. *Plasmodium falciparum*, *Cytoisopora belli* and *Cryptosporidium parvum* are sporozoans.

Q. 39. Malaria parasites can be detected in the peripheral blood when the parasite density is at least:

- (a) 1 parasite/ μ l (b) 5 parasites/ μ l
- (c) 10 parasites/ μ l (d) 100 parasites/ μ l

Ans. (b)

Q. 40. More than one ring stage of *Plasmodium* in an infected RBC is common in:

- (a) *Plasmodium falciparum* (b) *Plasmodium vivax*
- (c) *Plasmodium ovale* (d) *Plasmodium malariae*

Ans. (a)

Q. 41. Definitive host of *Toxoplasma gondii* is:

- (a) Dog (b) Cat (c) Cattle (d) Man

Ans. (b) Refer to Q. No. 16 above.

Q. 42. *Toxoplasma gondii* can be cultured on:

- (a) NNN medium
- (b) Boeck and Drbohlav's diphasic medium
- (c) Diamond's medium
- (d) Intraperitoneal inoculation of mice

Ans. (d) *Toxoplasma gondii* can be cultured by intraperitoneal inoculation of mice. It does not grow on artificial culture media.

Q. 43. Schizonts of *Plasmodium falciparum* are generally **not** seen in peripheral blood because:

- (a) These are ingested by monocytes
- (b) These are killed by antibodies
- (c) These are absent in its life cycle
- (d) Erythrocytic schizogony of *Plasmodium falciparum* takes place in the capillaries of internal organs

Ans. (d) Refer to Q. No. 32 above.

Q. 44. *Plasmodium vivax* can cause:

- (a) Cerebral malaria
- (b) Algid malaria
- (c) Blackwater fever
- (d) None of the above

Ans. (d) *Plasmodium vivax* does not cause cerebral malaria, algid malaria and blackwater fever. All these are caused by *P. falciparum*.

Q. 45. Malaria parasites can be cultured in:

- (a) Human red blood cells
- (b) *Anopheles* mosquito cell lines
- (c) Human amnion cells
- (d) Vero cell lines

Ans. (a)

Q. 46. Who first found and described malaria parasite?

- (a) Charles Laveran
- (b) Ronald Ross
- (c) Robert Koch
- (d) Carlos Chagas

Ans. (a)

Q. 47. Which form of malaria parasite is present in the saliva of infected mosquito?

- (a) Merozoite
- (b) Sporozoite
- (c) Tachyzoite
- (d) Bradyzoite

Ans. (b) Refer to Q. No. 1 above.

Q. 48. Which form of malaria parasite present in peripheral blood of the patient is capable of further development in female *Anopheles* mosquito?

- (a) Gametocytes
- (b) Merozoites
- (c) Schizonts
- (d) Ring forms

Ans. (a)

Q. 49. Primary exoerythrocytic schizogony or pre-erythrocytic schizogony of *Plasmodium* spp. occurs in:

- (a) Brain
- (b) Liver
- (c) Spleen
- (d) Kidney

Ans. (b)

Q. 50. Relapse of malaria due to *Plasmodium vivax* and *P. ovale* is due to:

- (a) Antigenic variation
- (b) Drug resistance
- (c) Hypnozoites
- (d) All of the above

Ans. (c) In case of *Plasmodium vivax* and *P. ovale*, some sporozoites on entering into hepatocytes enter into a resting stage before undergoing asexual multiplication while others undergo multiplication without delay. The resting stage of the parasite is known as hypnozoite. After a period of weeks, months or years (usually up to 2 years) hypnozoites are reactivated to become secondary exoerythrocytic schizonts and release merozoites which infect red blood cells producing a relapse of malaria.

Q. 51. Oocysts of which of the following parasites are infective when passed in stools?

- (a) *Cytoisospora belli*
- (b) *Cyclospora cayetanensis*
- (c) *Cryptosporidium parvum*
- (d) All of the above

Ans. (c) Oocysts of *Cryptosporidium parvum* are infective when passed in stools. Oocysts of *Cytoisospora belli* and *Cyclospora cayetanensis* are not infective when passed in stools. These develop further in the external environment to become infective.

Q. 52. Which of the following parasites preferably infect young red blood cells?

- (a) *Plasmodium falciparum*
- (b) *Plasmodium vivax*
- (c) *Plasmodium ovale*
- (d) *Plasmodium malariae*

Ans. (b)

Q. 53. In which of the following parasites band forms are seen in red blood cells?

- (a) *Plasmodium falciparum* (b) *Plasmodium vivax*
- (c) *Plasmodium malariae* (d) *Plasmodium ovale*.

Ans. (c)

Q. 54. Malignant tertian malaria is caused by:

- (a) *Plasmodium falciparum* (b) *Plasmodium vivax*
- (c) *Plasmodium malariae* (d) *Plasmodium ovale*

Ans. (a) The periodicity of attack of malaria varies with the species of infecting parasites. The periodicity is 48 hours in *P. vivax* (benign tertian) and *Plasmodium ovale* (ovale tertian), and 72 hours in *P. malariae* (quartan). With *P. falciparum*, cycles of different broods of parasite do not become synchronized as they do in other species. Therefore, typical tertian fever is not usual in falciparum (malignant tertian) malaria.

Q. 55. Quartan malaria is caused by:

- (a) *Plasmodium falciparum* (b) *Plasmodium vivax*
- (c) *Plasmodium malariae* (d) *Plasmodium ovale*

Ans. (c)

Q. 56. Benign tertian malaria is caused by:

- (a) *Plasmodium falciparum* (b) *Plasmodium vivax*
- (c) *Plasmodium malariae* (d) *Plasmodium ovale*

Ans. (b)

Q. 57. Which of the following parasites causes cerebral malaria, pernicious malaria and blackwater fever?

- (a) *Plasmodium falciparum* (b) *Plasmodium vivax*
- (c) *Plasmodium malariae* (d) *Plasmodium ovale*

Ans. (a)

Q. 58. A genetic deficiency known as glucose-6-phosphate dehydrogenase trait confers some protection against:

- (a) *Plasmodium falciparum* (b) *Plasmodium vivax*
- (c) *Plasmodium malariae* (d) *Plasmodium ovale*

Ans. (a)

Q. 59. Presence of abnormal haemoglobin like thalassemia haemoglobin and foetal haemoglobin confers resistance against:

- (a) *Plasmodium falciparum*
- (b) *Plasmodium vivax*

(c) *Plasmodium malariae*

(d) All of the above

Ans. (d) Presence of abnormal haemoglobin like thalassemia haemoglobin and foetal haemoglobin confers resistance against all *Plasmodium* spp. while sickle cell anaemia trait and haemoglobin E protect against *P. falciparum* and *P. vivax*, respectively.

Q. 60. Modified Ziehl-Neelsen staining is used for staining oocysts of:

(a) *Cytoisospora belli*

(b) *Cyclospora cayetanensis*

(c) *Cryptosporidium parvum*

(d) All of the above

Ans. (d)

Q. 61. Which of the following parasites **does not** occur in human intestine?

(a) *Giardia lamblia*

(b) *Entamoeba histolytica*

(c) *Cyclospora cayetanensis*

(d) *Toxoplasma gondii*

Ans. (d) *Toxoplasma gondii* does not occur in human intestine. It is an obligate intracellular parasite, which is found inside the reticuloendothelial cells and many other nucleated cells. *Giardia lamblia*, *Entamoeba histolytica* and *Cyclospora cayetanensis* occur in human intestine.

Q. 62. Which of the following statements about malaria is correct?

(a) Infection is transmitted by *Culex* mosquito

(b) The parasites develop first in liver

(c) Once infected, immunity is lifelong

(d) The most dangerous species is *Plasmodium vivax*

Ans. (b) Statement at (b) is correct because malaria parasites develop and multiply first in liver. (a) is wrong because malaria parasites are transmitted by female *Anopheles* mosquito and not by *Culex*. (c) is wrong because once infected it leads to concomitant immunity and not lifelong immunity. (d) is wrong because most dangerous species is *Plasmodium falciparum* and not *P. vivax*.

Q. 63. Which of the following malaria parasites has the shortest incubation period?

(a) *Plasmodium vivax*

(b) *Plasmodium falciparum*

(c) *Plasmodium malariae*

(d) *Plasmodium ovale*

Ans. (b)

Q. 64. Recrudescence of malaria may be caused by:

- (a) *Plasmodium vivax* (b) *Plasmodium falciparum*
- (c) *Plasmodium malariae* (d) All of the above

Ans. (d)

Q. 65. Which of the following statements is correct for the protozoan parasite *Toxoplasma gondii*?

- (a) It is obligate intracellular parasite producing tachyzoites 6 μm in length and 2 μm in breadth.
- (b) It produces infective oocysts.
- (c) It infects cat, pigs, sheep and man.
- (d) All of the above.

Ans. (d)

Q. 66. Which one of the following laboratory tests **does not** detect *Cyclospora cayetanensis*?

- (a) Antigen detection by enzyme immunoassay
- (b) UV fluorescence microscopy
- (c) Modified acid-fast stain
- (d) Safranin stain

Ans. (a)

Q. 67. Which of the following tests would be most useful for examination of *Cryptosporidium parvum* oocysts in stool?

- (a) Trichrome stain (b) Modified acid-fast stain
- (c) Gram stain (d) Methylene blue stain

Ans. (b)

Q. 68. One of the major features that can be used to differentiate *Cyclospora cayetanensis* and *Cryptosporidium parvum* is:

- (a) Shape (b) Colour
- (c) Size (d) Refractility

Ans. (c)

Q. 69. Which of the following parasites should be of special interest to pregnant women?

- (a) *Cytoisopora belli* (b) *Toxoplasma gondii*
- (c) *Ascaris lumbricoides* (d) *Endolimax nana*

Ans. (b)

Q. 70. An AIDS patient complained of watery diarrhoea (15–20 motions/day). Modified acid-fast staining of the stools revealed oocysts 4–5 μm in diameter. What is the probable organism?

- (a) Microsporidia (b) *Cytoisopora belli*
- (c) *Cyclospora cayetanensis* (d) *Cryptosporidium parvum*

Ans. (d)

BALANTIDIUM COLI

Q. 1. Which of the following acts as the main reservoir of *Balantidium coli* infection in human beings?

- (a) Man (b) Monkey (c) Pig (d) Cow

Ans. (c)

Q. 2. Which of the following is the largest protozoal parasite inhabiting the large intestine of man?

- (a) *Entamoeba histolytica* (b) *Entamoeba coli*
(c) *Balantidium coli* (d) *Giardia lamblia*

Ans. (c)

Q. 3. Which is the natural host of *Balantidium coli*?

- (a) Pig (b) Man (c) Cow (d) Dog

Ans. (a)

Q. 4. Which of the following parasites may cause dysentery?

- (a) *Cryptosporidium parvum* (b) *Balantidium coli*
(c) *Cyclospora cayetanensis* (d) *Cytoisospora belli*

Ans. (b)

MICROSPORIDIA

Q. 1. How many genera of microsporidia have been reported to cause disease in man?

- (a) Two (b) Four (c) Seven (d) Eight

Ans. (d)

Q. 2. *Enterocytozoon bienersi* tends to preferentially infect:

- (a) Enterocytes (b) Brain
(c) Kidneys (d) Conjunctiva

Ans. (a)

Q. 3. What is the infective stage of microsporidia in the stool?

- (a) Cyst (b) Oocyst
(c) Spore (d) Trophozoite

Ans. (c)

Q. 4. Which of the following parasites are **not** seen in faecal specimens:

- (a) *Entamoeba histolytica* (b) *Cyclospora cayetanensis*
(c) *Toxoplasma gondii* (d) *Enterocytozoon bienersi*

Ans. (c)

Helminthology

Q.1. Miracidium larval form is seen in:

- (a) Cestodes
- (b) Nematodes
- (c) Trematodes
- (d) Sporozoa

Ans. (c)

Q.2. Two intermediate hosts are essential to complete the life cycle in:

- (a) Cestodes, except *Diphyllobothrium latum*
- (b) Nematodes
- (c) Trematodes
- (d) Sporozoa

Ans. (c)

Q.3. Two different hosts are essential to complete the life cycle in the following helminths, except:

- (a) *Hymenolepis nana*
- (b) *Echinococcus granulosus*
- (c) *Taenia saginata*
- (d) *Dracunculus medinensis*

Ans. (a)

Cestodes or Tapeworms

Q. 1. In which of the following cestodes man can act as both definitive and intermediate host?

- (a) *Taenia saginata*
- (b) *Taenia solium*
- (c) *Diphyllobothrium latum*
- (d) *Hymenolepis nana*

Ans. (b)

Q. 2. Which of the following cestodes belongs to family Diphyllobothriidae?

- (a) *Diphyllobothrium latum*
- (b) *Taenia solium*
- (c) *Hymenolepis nana*
- (d) *Echinococcus multilocularis*

Ans. (a)

Q. 3. Adult worms of the following cestodes are seen in the intestine of man, **except**:

- (a) *Taenia saginata*
- (b) *Diphyllobothrium latum*
- (c) *Hymenolepis nana*
- (d) *Echinococcus granulosus*

Ans. (d) *Taenia saginata*, *Diphyllobothrium latum* and *Hymenolepis nana* reside in the small intestine of man. The latter is definitive host of these parasites. Man is intermediate host of *Echinococcus granulosus*. The larval form of this parasite is formed within the hydatid cyst in the liver and other organs. Adult worms of *Echinococcus granulosus* are seen in the intestine of dog.

Q. 4. Common name for *Diphyllobothrium latum* is:

- (a) The fish tapeworm
- (b) The beef tapeworm
- (c) The pork tapeworm
- (d) The rat tapeworm

Ans. (a) Common name for *Diphyllobothrium latum* is fish tapeworm. Beef tapeworm, pork tapeworm and rat tapeworm are the common names of *Taenia saginata*, *Taenia solium* and *Hymenolepis diminuta*, respectively.

Q. 5. Which is the longest tapeworm found in man?

- (a) *Diphyllobothrium latum* (b) *Taenia saginata*
(c) *Taenia solium* (d) *Echinococcus granulosus*

Ans. (a) *Diphyllobothrium latum* is the longest tapeworm found in man. *Hymenolepis nana*, the dwarf tapeworm, is the smallest tapeworm infecting humans.

Q. 6. Parasite-induced pernicious anaemia is seen in infection with:

- (a) *Diphyllobothrium latum* (b) *Spirometra mansoni*
(c) *Taenia saginata* (d) *Taenia solium*

Ans. (a) Parasite-induced pernicious anaemia is seen in infection with *Diphyllobothrium latum*. Iron-deficiency and haemolytic anaemias are seen in infection with hookworm and malaria parasite infection, respectively.

Q. 7. Which form of *Spirometra* is seen in man?

- (a) Adult worm (b) Coracidium larva
(c) Proceroid larva (d) Plerocercoid larva

Ans. (d) Adult worm of *Spirometra* lives in the intestinal tract of cats and dogs. Coracidium larva occurs in water. Proceroid larva is found in the body cavity of suitable copepod. Plerocercoid larva develops in various organs of the body of frog, fish and snake. In humans, plerocercoid larvae penetrate the intestinal wall and migrate to the subcutaneous tissue and other organs.

Q. 8. Which is the intermediate host for *Taenia saginata*?

- (a) Man (b) Cattle (c) Pig (d) Sheep

Ans. (b)

Q. 9. Larval form of *Taenia solium* is seen in:

- (a) Pig (b) Cattle
(c) Dog (d) Cat

Ans. (a)

Q. 10. Which is the drug of choice for *Taenia saginata* infection?

- (a) Praziquantel (b) Niclosamide
(c) Albendazole (d) Amphotericin B

Ans. (a) Praziquantel is the drug of choice for the treatment of *T. saginata* infection, although niclosamide can also be used. Niclosamide is preferred for the treatment of intestinal infections with *T. solium*. Albendazole is the drug of choice for treating cysticercosis.

Q. 11. Which is the smallest tapeworm infecting man?

- (a) *Hymenolepis nana* (b) *Taenia saginata*
- (c) *Taenia solium* (d) *Diphyllobothrium latum*

Ans. (a) Refer to Q. No. 5 above.

Q. 12. Common name of *Hymenolepis nana* is:

- (a) The dwarf tapeworm (b) The fish tapeworm
- (c) The pork tapeworm (d) The rat tapeworm

Ans. (a)

Q. 13. Which of the following cestodes is capable of completing its life cycle in a single host?

- (a) *Taenia saginata* (b) *Echinococcus granulosus*
- (c) *Diphyllobothrium latum* (d) *Hymenolepis nana*

Ans. (d) *Hymenolepis nana* is the only cestode which is capable of completing its life cycle in a single host. *Taenia saginata* and *Echinococcus granulosus* have two hosts, and *Diphyllobothrium latum* has three hosts.

Q. 14. Which is the intermediate host in indirect life cycle of *Hymenolepis nana*?

- (a) Housefly (b) Head louse
- (c) Body louse (d) Rat flea

Ans. (d)

Q. 15. Rat tapeworm is the common name of:

- (a) *Hymenolepis nana* (b) *Hymenolepis diminuta*
- (c) *Taenia saginata* (d) *Diphyllobothrium latum*

Ans. (b) Refer to Q. No. 4 above.

Q. 16. *Coenurus* is the larval form of:

- (a) *Taenia solium* (b) *Taenia multiceps*
- (c) *Echinococcus granulosus* (d) *Echinococcus multilocularis*

Ans. (b) *Coenurus* is the larval form of *Taenia multiceps*. Larval forms of *Taenia solium*, *Echinococcus granulosus* and *Echinococcus multilocularis* are cysticercus cellulosae, hydatid cyst, and alveolar or multilocular hydatid cyst, respectively.

Q. 17. The common name of *Dipylidium caninum* is:

- (a) The fish tapeworm
- (b) The beef tapeworm
- (c) The double-pored dog tapeworm
- (d) The dog tapeworm.

Ans. (c) The common name of *Dipylidium caninum* is the double-pored dog tapeworm.

Q. 18. Common name of *Echinococcus granulosus* is:

- (a) The fish tapeworm
- (b) The beef tapeworm
- (c) The dwarf tapeworm
- (d) The dog tapeworm

Ans. (d) Common name of *Echinococcus granulosus* is the dog tapeworm.

Q. 19. Which is the definitive host for *Echinococcus granulosus*?

- (a) Dog
- (b) Sheep
- (c) Cattle
- (d) Man

Ans. (a)

Q. 20. Larval form of *Echinococcus granulosus* is seen in:

- (a) Dog
- (b) Man
- (c) Wolf
- (d) Fox

Ans. (b) Man is the intermediate host of *Echinococcus granulosus*, therefore, the larval form of this parasite is seen in man.

Q. 21. Which is the most common organ involved in hydatidosis?

- (a) Liver
- (b) Lung
- (c) Spleen
- (d) Kidney

Ans. (a)

Q. 22. Alveolar echinococcosis is caused by:

- (a) *Echinococcus granulosus*
- (b) *Echinococcus multilocularis*
- (c) *Echinococcus vogeli*
- (d) *Taenia multiceps*

Ans. (b) *Echinococcus granulosus*, *Echinococcus vogeli* and *Taenia multiceps* cause hydatid cyst, polycystic hydatid disease and coenurus, respectively. Alveolar echinococcosis is caused by *Echinococcus multilocularis*.

Q. 23. Cyst of *Echinococcus multilocularis* differs from that of *Echinococcus granulosus* in having:

- (a) Multiple locules
- (b) Little or no fluid
- (c) Hyperplastic germinal layer
- (d) All of the above

Ans. (d)

Q. 24. Which is/are the intermediate host/s of *Echinococcus multilocularis*?

- (a) Squirrels
- (b) Field mice
- (c) Man
- (d) All of the above

Ans. (d)

Q. 25. Polycystic echinococcosis is caused by:

- (a) *Echinococcus granulosus*
- (b) *Echinococcus multilocularis*
- (c) *Echinococcus vogeli*
- (d) *Taenia multiceps*

Ans. (c) Polycystic echinococcosis is caused by *Echinococcus vogeli*. Also refer to Q. No. 22 above.

Q. 26. Liver is the most common organ involved in infection with:

- (a) *Echinococcus granulosus* (b) *Echinococcus multilocularis*
- (c) *Echinococcus vogeli* (d) All of the above

Ans. (d)

Q. 27. A 30-year-old patient reported in the medical outpatient department with chief complaints of fatigue, weakness, diarrhoea and numbness of extremities. The peripheral blood film revealed megaloblastic anaemia and stool examination showed yellowish-brown operculated eggs, 70 µm in length and 45 µm in breadth. Which of the following parasites is likely to be the cause of the disease?

- (a) *Fasciola hepatica* (b) *Clonorchis sinensis*
- (c) *Paragonimus westermani* (d) *Diphyllbothrium latum*

Ans. (d)

Q. 28. The parasite transmitted by inadequately cooked freshwater fish is:

- (a) *Diphyllbothrium latum* (b) *Taenia solium*
- (c) *Taenia saginata* (d) *Echinococcus granulosus*

Ans. (a) *Diphyllbothrium latum* (the fish tapeworm) is transmitted by ingestion of inadequately cooked freshwater fish. *Taenia solium* and *Taenia saginata* are transmitted by ingestion of inadequately cooked pork and beef, respectively. *Echinococcus granulosus* is acquired by a direct contact with infected dog or by allowing the dog to feed from the same dish or by ingesting food and water contaminated with dog's faeces containing eggs of *E. granulosus*.

Q. 29. Operculated eggs are produced by:

- (a) *Hymenolepis nana* (b) *Taenia solium*
- (c) *Echinococcus granulosus* (d) *Diphyllbothrium latum*

Ans. (d)

Q. 30. The egg containing hexacanth embryo with radially striated embryophore is seen in:

- (a) *Diphyllbothrium latum* (b) *Taenia solium*
- (c) *Hymenolepis nana* (d) *Dipylidium caninum*

Ans. (b)

Q. 31. Which of the following parasites requires two intermediate hosts?

- (a) *Taenia solium* (b) *Diphyllbothrium latum*
- (c) *Hymenolepis nana* (d) *Echinococcus granulosus*

Ans. (b) *Diphyllobothrium latum* requires two intermediate hosts (copepods and fish). *Taenia solium* and *Echinococcus granulosus* require one intermediate host each. *Hymenolepis nana* is capable of completing its life cycle in a single host. Therefore, it does not require intermediate host.

Q. 32. Cysticercoid is the larval form of:

- | | |
|-----------------------------|------------------------------------|
| (a) <i>Hymenolepis nana</i> | (b) <i>Echinococcus granulosus</i> |
| (c) <i>Taenia solium</i> | (d) <i>Taenia saginata</i> |

Ans. (a) Cysticercoid is the larval form of *Hymenolepis nana*. Larval forms of *Echinococcus granulosus*, *Taenia solium* and *Taenia saginata* are known as hydatid cyst, cysticercus cellulosae and cysticercus bovis, respectively.

Q. 33. Which of the following parasites liberates eggs that are not bile-stained?

- | | |
|-----------------------------------|-----------------------------|
| (a) <i>Diphyllobothrium latum</i> | (b) <i>Taenia saginata</i> |
| (c) <i>Taenia solium</i> | (d) <i>Hymenolepis nana</i> |

Ans. (d) Eggs of *Hymenolepis nana* are not bile-stained. Eggs of *Diphyllobothrium latum*, *Taenia saginata* and *Taenia solium* are bile-stained.

Q. 34. Man serves as an intermediate host of:

- | |
|------------------------------------|
| (a) <i>Echinococcus granulosus</i> |
| (b) <i>Taenia saginata</i> |
| (c) <i>Wuchereria bancrofti</i> |
| (d) <i>Diphyllobothrium latum</i> |

Ans. (a) Man serves as an intermediate host of *Echinococcus granulosus*. Man serves as definitive host of *Taenia saginata*, *Wuchereria bancrofti* and *Diphyllobothrium latum*.

Q. 35. Larval form of *Taenia solium* is called:

- | | |
|----------------------------|-----------------------|
| (a) Cysticercus cellulosae | (b) Cysticercus bovis |
| (c) Cysticercoid | (d) Hydatid cyst |

Ans. (a) Refer to Q. No. 32 above.

Q. 36. Larval form of *Taenia saginata* is called:

- | | |
|----------------------------|-----------------------|
| (a) Cysticercus cellulosae | (b) Cysticercus bovis |
| (c) Cysticercoid | (d) Hydatid cyst |

Ans. (b)

Q. 37. Larval form of *Echinococcus granulosus* is called:

- | | |
|----------------------------|------------------------|
| (a) Cysticercus cellulosae | (b) Cysticercus bovis. |
| (c) Cysticercoid | (d) Hydatid cyst |

Ans. (d)

Q. 38. Which of the following parasites does not possess rostellum?

- (a) *Taenia solium* (b) *Taenia saginata*
(c) *Echinococcus granulosus* (d) *Hymenolepis nana*

Ans. (b) *Taenia saginata* does not possess rostellum. *Taenia solium*, *Echinococcus granulosus* and *Hymenolepis nana* possess rostellum.

Q. 39. The skin test used for the diagnosis of hydatid cyst is known as:

- (a) Casoni test (b) Dick test
(c) Schick test (d) Montenegro test

Ans. (a) Casoni test is the skin test used for diagnosis of hydatid cyst. Dick test and Schick test detect the susceptibility of a person to streptococcal erythrogenic toxin and diphtheria toxin, respectively. Montenegro test is used for the diagnosis of kala-azar. Its principle is delayed hypersensitivity.

Q. 40. Which of the following tapeworms is acquired by eating raw or undercooked pork?

- (a) *Taenia saginata* (b) *Taenia solium*
(c) *Diphyllobothrium latum* (d) *Hymenolepis nana*

Ans. (b) Refer to Q. No. 28 above. *Hymenolepis nana* is acquired by ingestion of food and drinks contaminated with faeces of infected individuals. Man may also get infection by ingestion of infected beetles which may act as intermediate host (indirect cycle) of *H. nana*.

Q. 41. Which of the following tapeworms is acquired by eating raw or undercooked beef?

- (a) *Taenia saginata* (b) *Taenia solium*
(c) *Diphyllobothrium latum* (d) *Hymenolepis nana*

Ans. (a) Refer to Q. No. 28 and Q. No. 40 above.

Q. 42. *Taenia solium*, a parasite that is transmitted to humans by eating undercooked pork, is classified as:

- (a) Fluke (b) Flagellate (c) Nematode (d) Cestode

Ans. (d)

Q. 43. Which of the following is a cestode?

- (a) *Clonorchis sinensis* (b) *Toxocara canis*
(c) *Schistosoma mansoni* (d) *Hymenolepis diminuta*

Ans. (d) *Hymenolepis diminuta* is a cestode. *Clonorchis sinensis* and *Schistosoma mansoni* are flukes and *Toxocara canis* is a nematode.

Q. 44. Eggs of *Hymenolepis nana*:

- (a) Have 4–8 polar filaments emanating from polar thickenings at either end of embryophore
- (b) Contain a hexacanth embryo
- (c) Are spherical or oval, hyaline, 35–40 μm in diameter
- (d) All of the above

Ans. (d)

Q. 45. Which of the following cestodes lays eggs in egg packets rather than single eggs?

- (a) *Taenia solium*
- (b) *Hymenolepis diminuta*
- (c) *Hymenolepis nana*
- (d) *Dipylidium caninum*

Ans. (d)

Q. 46. Which of the following genera produces eggs with a thick-walled shell and contains an embryo with 3 pairs of hooklets?

- (a) *Taenia*
- (b) *Fasciola*
- (c) *Necator*
- (d) *Strongyloides*

Ans. (a)

Q. 47. In the stool of an infant objects that look like pumpkin seeds have been noticed. The patient has not eaten this vegetable. What could these objects be?

- (a) Proglottids of *Taenia solium*
- (b) Proglottids of *Taenia saginata*
- (c) Proglottids of *Dipylidium caninum*
- (d) Proglottids of *Hymenolepis nana*

Ans. (c)

Q. 48. Which of the following parasites deprives the host of vitamin B₁₂, causing pernicious anaemia?

- (a) *Taenia solium*
- (b) *Taenia saginata*
- (c) *Echinococcus granulosus*
- (d) *Diphyllobothrium latum*

Ans. (d)

Q. 49. The most lethal of all helminthic infections of man is:

- (a) *Echinococcus granulosus*
- (b) *Echinococcus multilocularis*
- (c) *Echinococcus vogeli*
- (d) *Taenia solium*

Ans. (b)

Q. 50. A 40-year-old female patient is suffering from abdominal pain, megaloblastic anaemia and weight loss. She is habitual of tasting fish before cooking. Which of the following parasites is most likely cause of her illness?

- (a) *Taenia solium* (b) *Echinococcus granulosus*
- (c) *Diphyllobothrium latum* (d) *Hymenolepis nana*

Ans. (c)

Q. 51. Intradermal test of which of the following pathogens gives rise to an erythema and induration 5 cm or more in diameter with pseudopodia within 30 minutes of inoculation?

- (a) *Mycobacterium tuberculosis*
- (b) *Mycobacterium leprae*
- (c) *Echinococcus granulosus*
- (d) *Leishmania donovani*

Ans. (c)

Trematodes or Flukes

Q. 1. In which of the following parasites sexes are separate?

- (a) *Schistosoma haematobium* (b) *Clonorchis sinensis*
(c) *Taenia solium* (d) *Paragonimus westermani*

Ans. (a)

Q. 2. Operculated eggs are seen in the following, **except**:

- (a) *Fasciola hepatica* (b) *Schistosoma japonicum*
(c) *Clonorchis sinensis* (d) *Diphyllbothrium latum*

Ans. (b)

Q. 3. Eggs are passed in urine in case of infection with:

- (a) *Schistosoma mansoni* (b) *Schistosoma haematobium*
(c) *Schistosoma japonicum* (d) *Clonorchis sinensis*

Ans. (b) Eggs of *Schistosoma haematobium* are passed in urine and those of *Schistosoma mansoni*, *Schistosoma japonicum* and *Clonorchis sinensis* are passed in stool.

Q. 4. Eggs are passed in sputum in case of infection with:

- (a) *Clonorchis sinensis* (b) *Ascaris lumbricoides*
(c) *Strongyloides stercoralis* (d) *Paragonimus westermani*

Ans. (d) Adult worms of *Paragonimus westermani* reside usually in pairs in the parenchyma of lung close to the bronchioles and lay yellowish-brown eggs. Eggs escape into bronchi and are coughed up and voided in rusty-brown sputum. Eggs of *Clonorchis sinensis*, *Ascaris lumbricoides* and *Strongyloides stercoralis* are passed in stool.

Q. 5. Which of the following is **not** a hepatic trematode?

- (a) *Fasciola hepatica* (b) *Fasciolopsis buski*
(c) *Clonorchis sinensis* (d) *Opisthorchis felinus*

Ans. (b) *Fasciolopsis buski* is not a hepatic trematode. The adult worm lives attached to the mucosa of the duodenum and jejunum of man and pig. *Fasciola hepatica*, *Clonorchis sinensis* and *Opisthorchis felinus* reside in the biliary tract of liver.

Q. 6. Largest trematode is:

- (a) *Fasciola hepatica* (b) *Fasciolopsis buski*
- (c) *Clonorchis sinensis* (d) *Metagonimus yokogawai*

Ans. (b) *Fasciolopsis buski* is the largest and *Metagonimus yokogawai* is the smallest trematode.

Q. 7. Gynaecophoric canal is seen in case of male worm of:

- (a) *Ascaris lumbricoides* (b) *Trichinella spiralis*
- (c) *Schistosoma mansoni* (d) *Clonorchis sinensis*

Ans. (c)

Q. 8. Pseudotubercles may be formed around the eggs of:

- (a) *Schistosoma haematobium*
- (b) *Fasciola hepatica*
- (c) *Clonorchis sinensis*
- (d) *Fasciolopsis buski*

Ans. (a)

Q. 9. Katayama fever is produced by:

- (a) *Schistosoma japonicum* (b) *Clonorchis sinensis*
- (c) *Fasciola hepatica* (d) *Fasciolopsis buski*

Ans. (a)

Q. 10. Carcinoma of urinary bladder is associated with which of the following parasites?

- (a) *Schistosoma japonicum* (b) *Schistosoma haematobium*
- (c) *Schistosoma mansoni* (d) *Schistosoma intercalatum*

Ans. (b) *Schistosoma haematobium* lives primarily in the veins of vesicle and pelvic plexus, less commonly in the portal vein and its mesenteric branches. The International Agency for Research on Cancer considers *S. haematobium* infection a definitive cause of urinary bladder cancer with an associated 5-fold risk.

Q. 11. Sheep liver fluke is the common name of:

- (a) *Fasciola hepatica* (b) *Fasciola gigantica*
- (c) *Clonorchis sinensis* (d) *Fasciolopsis buski*

Ans. (a) Sheep liver fluke is the common name of *Fasciola hepatica*. The common names of *Clonorchis sinensis* and *Fasciolopsis buski* are the Chinese liver fluke and large or giant intestinal fluke, respectively.

Q. 12. Chinese liver fluke is the common name of:

- (a) *Fasciola hepatica* (b) *Fasciola gigantica*
- (c) *Clonorchis sinensis* (d) *Fasciolopsis buski*

Ans. (c)

Q. 13. Cholangiocarcinoma is associated with which of the following trematodes?

- (a) *Clonorchis sinensis* (b) *Fasciola hepatica*
(c) *Fasciola gigantica* (d) *Schistosoma haematobium*

Ans. (a) Cholangiocarcinoma is associated with *Clonorchis sinensis* infection. *Schistosoma haematobium* is associated with urinary bladder cancer.

Q. 14. Which of the following parasites is **not** transmitted by eating raw or undercooked fish?

- (a) *Clonorchis sinensis*
(b) *Schistosoma japonicum*
(c) *Diphyllbothrium latum*
(d) *Paragonimus westermani*

Ans. (b) The free-swimming cercariae of *Schistosoma japonicum* released from infected snails have the capability of directly penetrating the water-softened skin of human beings bathing or wading in this water. *S. japonicum* is not transmitted by eating raw or undercooked fish. *Clonorchis sinensis*, *Diphyllbothrium latum* and *Paragonimus westermani* are transmitted by eating raw or undercooked fish.

Q. 15. All of the following worms lay bile-stained eggs, **except**:

- (a) *Ascaris lumbricoides* (b) *Fasciola hepatica*
(c) *Ancylostoma duodenale* (d) *Taenia solium*

Ans. (c) *Ancylostoma duodenale* lays eggs which are not bile-stained. Eggs of *Ascaris lumbricoides*, *Fasciola hepatica* and *Taenia solium* are bile-stained.

Q. 16. All of the following parasites reside in small intestine, **except**:

- (a) *Gastrodiscoides hominis* (b) *Watsonius watsoni*
(c) *Heterophyes heterophyes* (d) *Metagonimus yokogawai*

Ans. (a) Adult *Gastrodiscoides hominis* resides in caecum and ascending colon of man, pigs, monkeys, rats and other rodents. *Watsonius watsoni*, *Heterophyes heterophyes* and *Metagonimus yokogawai* reside in small intestine.

Q. 17. Cercaria is the infective stage of:

- (a) *Schistosoma haematobium* (b) *Paragonimus westermani*
(c) *Clonorchis sinensis* (d) *Fasciola hepatica*

Ans. (a) Cercaria is the infective stage of *Schistosoma haematobium*, and metacercariae are the infective stages of *Paragonimus westermani*, *Clonorchis sinensis* and *Fasciola hepatica*.

Q. 18. Which of the following parasites lays elongate eggs with lateral spines?

- (a) *Schistosoma haematobium*
- (b) *Schistosoma japonicum*
- (c) *Schistosoma mansoni*
- (d) *Schistosoma intercalatum*

Ans. (c) *Schistosoma mansoni* lays elongate eggs with lateral spines. Eggs of *Schistosoma haematobium* and *Schistosoma intercalatum* have a characteristic terminal spine. Eggs of *Schistosoma japonicum* may have a small latent knob.

Q. 19. Rusty-brown sputum containing traces of blood and yellowish brown eggs are seen in infection with:

- (a) *Taenia solium*
- (b) *Paragonimus westermani*
- (c) *Ascaris lumbricoides*
- (d) *Diphyllobothrium latum*

Ans. (b) Refer to Q. No. 4 above.

Q. 20. Which of the following parasites is located in the biliary tract?

- (a) *Fasciolopsis buski*
- (b) *Paragonimus westermani*
- (c) *Clonorchis sinensis*
- (d) *Schistosoma haematobium*

Ans. (c) *Clonorchis sinensis* is located in the biliary tract. *Fasciolopsis buski* is located in duodenum and jejunum, *Paragonimus westermani* in parenchyma of lung, and *Schistosoma haematobium* primarily in the veins of vesicle and pelvic plexuses, less commonly in the portal vein and its mesenteric branches.

Q. 21. Which of the following parasites **does not** reside in the biliary tract?

- (a) *Fasciola hepatica*
- (b) *Fasciolopsis buski*
- (c) *Clonorchis sinensis*
- (d) *Opisthorchis felinus*

Ans. (b) Refer to Q. No. 5 above.

Q. 22. Which of the following schistosomes can lodge in the veins of vesical and pelvic plexuses and can cause haematuria?

- (a) *Schistosoma haematobium*
- (b) *Schistosoma japonicum*
- (c) *Schistosoma mekongi*
- (d) *Schistosoma mansoni*

Ans. (a) *Schistosoma haematobium* resides in the veins of vesical and pelvic plexuses and can cause haematuria. *Schistosoma japonicum* and *Schistosoma mansoni* inhabit the mesenteric veins draining ileocaecal and sigmoidorectal regions, respectively. The adult worms of *Schistosoma mekongi* are normally found in mesenteric veins.

Q. 23. Freshwater crayfish is the second intermediate host of:

- (a) *Paragonimus westermani* (b) *Schistosoma mansoni*
(c) *Fasciola hepatica* (d) *Fasciolopsis buski*

Ans. (a) Freshwater crayfish is the second intermediate host of *Paragonimus westermani*. Water plants are the second intermediate hosts of *Fasciola hepatica* and *Fasciolopsis buski*. *Schistosoma mansoni* has one (snail) intermediate host.

Q. 24. Which of the following parasites infects by the penetration of skin?

- (a) *Fasciolopsis buski* (b) *Schistosoma haematobium*
(c) *Paragonimus westermani* (d) *Heterophyes heterophyes*

Ans. (b) *Schistosoma haematobium* infects by penetration of skin. *Fasciolopsis buski* is acquired by ingestion of metacercariae. *Paragonimus westermani* and *Heterophyes heterophyes* are acquired by ingestion of poorly cooked or salted fish, flesh of which contains encysted metacercariae.

Q. 25. Which of the following parasites resides in human small intestine?

- (a) *Fasciolopsis buski* (b) *Schistosoma haematobium*
(c) *Paragonimus westermani* (d) *Opisthorchis felineus*

Ans. (a) *Fasciolopsis buski* resides in human small intestine. *Schistosoma haematobium* resides in veins of vesicle and pelvic plexuses. *Paragonimus westermani* resides in the parenchyma of lung, and *Opisthorchis felineus* resides in the biliary and pancreatic passages.

Q. 26. Which of the following parasites resides in human lungs?

- (a) *Heterophyes heterophyes* (b) *Paragonimus westermani*
(c) *Fasciola hepatica* (d) *Schistosoma haematobium*

Ans. (b) *Paragonimus westermani* resides in human lungs. *Heterophyes heterophyes* resides, attached to the mucosa or burrowed into the mucosa, in small intestine of cat, dog, fox, wolf and man. *Fasciola hepatica* resides in the biliary passages of liver of sheep, goat, cattle and man. *Schistosoma haematobium* resides in veins of vesicle and pelvic plexuses, less commonly in portal vein and mesenteric branches.

Q. 27. Snail is **not** the intermediate host of:

- (a) *Trichinella spiralis* (b) *Schistosoma haematobium*
(c) *Clonorchis sinensis* (d) *Fasciola hepatica*

Ans. (a) Snail is not the intermediate host of *Trichinella spiralis*. Man acquires infection by ingestion of raw or inadequately cooked pork containing the viable larvae. Snail is intermediate host of *Schistosoma haematobium*, *Clonorchis sinensis* and *Fasciola hepatica*.

Q. 28. In life cycle of schistosomes:

- (a) Transmission is direct
- (b) Transmission involves an aquatic snail
- (c) Transmission involves an insect vector
- (d) Humans are infected by swallowing eggs

Ans. (b)

Q. 29. The parasitic helminths that are most likely to be found in bile ducts, lungs and blood are the:

- (a) Tapeworms
- (b) Roundworms
- (c) Flatworms
- (d) Flukes

Ans. (d)

Q. 30. All of the following are trematodes, except:

- (a) *Naegleria fowleri*
- (b) *Schistosoma haematobium*
- (c) *Paragonimus westermani*
- (d) *Fasciola hepatica*

Ans. (a) *Naegleria fowleri* is a protozoan. *Schistosoma haematobium*, *Paragonimus westermani* and *Fasciola hepatica* are trematodes.

Q. 31. Examination of a fresh faecal sample shows operculated eggs. Which of the following can be ruled out?

- (a) *Schistosoma haematobium*
- (b) *Heterophyes heterophyes*
- (c) *Clonorchis sinensis*
- (d) *Metagonimus yokogawai*

Ans. (a) *Heterophyes heterophyes*, *Clonorchis sinensis* and *Metagonimus yokogawai* lay operculated eggs while eggs of *Schistosoma haematobium* are not operculated.

Q. 32. Eggs of which of the following parasites can be seen in the sputum?

- (a) *Strongyloides stercoralis*
- (b) *Paragonimus westermani*
- (c) *Ancylostoma duodenale*
- (d) *Ascaris lumbricoides*

Ans. (b) Adult worms of *Paragonimus westermani* reside usually in pairs, in the parenchyma of lung and lay eggs. Eggs escape into the bronchi and are coughed and voided in sputum. Rhabditiform larvae, filariform larvae, adult female and sometimes unhatched larvae of *Strongyloides stercoralis* are passed in stool. Eggs of *Ancylostoma duodenale* and *Ascaris lumbricoides* are passed in stool.

Q. 33. Which of the following infections is acquired by eating raw or improperly cooked fish?

- (a) *Heterophyes heterophyes* (b) *Fasciolopsis buski*
(c) *Schistosoma haematobium* (d) *Trichinella spiralis*

Ans. (a) Metacercariae of *Heterophyes heterophyes* are present under the scales and in superficial muscles of freshwater fishes. Humans acquire the infection by eating raw, poorly cooked pickled fish harbouring the metacercariae. *Fasciolopsis buski*, *Schistosoma haematobium* and *Trichinella spiralis* do not develop in fish.

Q. 34. Which of the following parasites is **not** acquired by ingestion of infective eggs?

- (a) *Enterobius vermicularis* (b) *Schistosoma japonicum*
(c) *Trichuris trichiura* (d) *Ascaris lumbricoides*

Ans. (b) *Schistosoma japonicum* is not acquired by ingestion of infective eggs. Free-swimming cercariae of this parasite penetrate the water-softened skin of human beings bathing or wading in water. *Enterobius vermicularis*, *Trichuris trichiura* and *Ascaris lumbricoides* are acquired by ingestion of infective eggs.

Nematodes

Q. 1. Largest nematode parasite known to cause infection in man is:

- (a) *Ascaris lumbricoides* (b) *Strongyloides stercoralis*
(c) *Ancylostoma duodenale* (d) *Dracunculus medinensis*

Ans. (d) *Dracunculus medinensis* is the largest and *Strongyloides stercoralis* is the smallest nematode causing infection in man.

Q. 2. Which of the following nematodes is ovo-viviparous?

- (a) *Ascaris lumbricoides* (b) *Dracunculus medinensis*
(c) *Strongyloides stercoralis* (d) *Trichinella spiralis*

Ans. (c)

Q. 3. Which of the following nematodes lays unsegmented eggs?

- (a) *Necator americanus* (b) *Trichuris trichiura*
(c) *Strongyloides stercoralis* (d) *Trichinella spiralis*

Ans. (b) *Trichuris trichiura* lays unsegmented eggs. *Necator americanus* lays segmented eggs. *Strongyloides stercoralis* lays eggs containing rhabditiform larvae. *Trichinella spiralis* lays larvae.

Q. 4. Which of the following nematodes lays eggs containing larvae?

- (a) *Trichinella spiralis* (b) *Enterobius vermicularis*
(c) *Brugia malayi* (d) *Ascaris lumbricoides*

Ans. (b) *Enterobius vermicularis* lays eggs containing larvae. *Trichinella spiralis* and *Brugia malayi* lay larvae, and *Ascaris lumbricoides* lays fertilized and unfertilized eggs.

Q. 5. Best site for taking biopsy for diagnosis of trichinellosis is:

- (a) Deltoid muscle (b) Diaphragm
(c) Pectoralis major (d) Liver

Ans. (a) Deltoid, biceps and gastrocnemius muscles are best site for taking biopsy for diagnosis of trichinellosis.

Q. 6. Bachman's test is done to diagnose infection with:

- (a) *Schistosoma japonicum* (b) *Trichinella spiralis*
- (c) *Trichuris trichiura* (d) *Ancylostoma duodenale*

Ans. (b)

Q. 7. Rectal prolapse is seen in infection with:

- (a) *Enterobius vermicularis* (b) *Trichuris trichiura*
- (c) *Ascaris lumbricoides* (d) *Ancylostoma duodenale*

Ans. (b)

Q. 8. Disseminated systemic infection in AIDS patients is seen with:

- (a) *Ancylostoma duodenale* (b) *Dracunculus medinensis*
- (c) *Strongyloides stercoralis* (d) *Trichinella spiralis*

Ans. (c)

Q. 9. 'Larva currens' is the name given to the migrating larvae of:

- (a) *Ancylostoma braziliense* (b) *Strongyloides stercoralis*
- (c) *Ancylostoma caninum* (d) *Wuchereria bancrofti*

Ans. (b)

Q. 10. Which of the following nematodes **does not** pass through lungs during its life cycle?

- (a) *Ancylostoma duodenale* (b) *Necator americanus*
- (c) *Ascaris lumbricoides* (d) *Trichuris trichiura*

Ans. (d) *Trichuris trichiura* and *Enterobius vermicularis* do not pass through lungs during their life cycle.

Q. 11. Cutaneous larva migrans is the name given to migrating larvae of:

- (a) *Ancylostoma braziliense*
- (b) *Enterobius vermicularis*
- (c) *Wuchereria bancrofti*
- (d) *Trichuris trichiura*

Ans. (a)

Q. 12. All of the following parasites may cause iron deficiency anaemia, **except**:

- (a) *Ancylostoma duodenale*
- (b) *Diphyllobothrium latum*
- (c) *Trichuris trichiura*
- (d) *Necator americanus*

Ans. (b) *Diphyllobothrium latum* causes pernicious anaemia and not iron-deficiency anaemia. The latter is caused by *Ancylostoma duodenale*, *Trichuris trichiura* and *Necator americanus*.

Q. 13. Which of the following stages of *Ancylostoma duodenale* is infective to human beings?

- (a) Rhabditiform larva (b) Filariform larva
- (c) Eggs (d) Adult worm

Ans. (b)

Q. 14. Which of the following characteristics possessed by fertilized eggs of *Ascaris lumbricoides* differentiates them from unfertilized?

- (a) Do not float in the concentrated salt solution
- (b) Larger in size
- (c) Always non-mammilated
- (d) Possess a clear crescentic space at each pole

Ans. (d)

Q. 15. Visceral larva migrans is caused by the migrating larvae of which of the following worms?

- (a) *Ancylostoma caninum* (b) *Ancylostoma braziliense*
- (c) *Toxocara canis* (d) *Enterobius vermicularis*

Ans. (c) Migrating larvae of *Toxocara canis* cause visceral larva migrans, and *Ancylostoma caninum* and *Ancylostoma braziliense* cause cutaneous larva migrans. *Enterobius vermicularis* does not cause either of these.

Q. 16. Life cycle of larvae of *W. bancrofti* in mosquito is:

- (a) Cyclo-developmental
- (b) Cyclo-propagative
- (c) Propagative
- (d) Cyclo-propagative and propagative

Ans. (a) Since the larvae of *Wuchereria bancrofti* undergo cyclic changes but do not multiply in the body of the mosquito, therefore, it is cyclo-developmental development.

Q. 17. Diurnal periodicity is shown by larvae of:

- (a) *Wuchereria bancrofti* (b) *Brugia malayi*
- (c) *Loa loa* (d) *Mansonella perstans*

Ans. (c) Diurnal periodicity is shown by larvae of *Loa loa*. *Wuchereria bancrofti* and *Brugia malayi* have nocturnal periodicity. Microfilariae of *Mansonella perstans* are non-periodic.

Q. 18. Tail-tip contains 2 nuclei in case of microfilariae of:

- (a) *Wuchereria bancrofti* (b) *Brugia malayi*
- (c) *Loa loa* (d) *Onchocerca volvulus*

Ans. (b)

Q. 19. Diethylcarbamazine provocation test is done to:

- (a) Test sensitivity of microfilariae to the drug
- (b) Test hypersensitivity reaction to the drug
- (c) Make a peripheral blood film for diagnosis
- (d) To induce production of antibodies for serology

Ans. (c)

Q. 20. Dose of diethylcarbamazine for the treatment of bancroftian filariasis is:

- (a) 6 mg/kg body weight daily for 12 days
- (b) 9 mg/kg body weight daily for 12 days
- (c) 12 mg/kg body weight daily for 12 days
- (d) 15 mg/kg body weight daily for 12 days

Ans. (a)

Q. 21. Which of the following microfilariae is unsheathed?

- (a) *Mf. perstans* (b) *Mf. bancrofti*
- (c) *Mf. malayi* (d) *Mf. loa*

Ans. (a) *Microfilaria perstans* is unsheathed while those of *Mf. bancrofti*, *Mf. malayi* and *Mf. loa* are sheathed.

Q. 22. Microfilariae can be diagnosed in peripheral blood film examination in all of the following, **except**:

- (a) *Mf. malayi* (b) *Mf. loa*
- (c) *Mf. perstans* (d) *Mf. streptocerca*

Ans. (d) *Microfilaria streptocerca* occur in the skin. They do not enter bloodstream. *Mf. malayi*, *Mf. loa* and *Mf. perstans* can be seen in peripheral blood film.

Q. 23. *Microfilaria* of *B. malayi* differs from that of *W. bancrofti* in that the latter:

- (a) Is smaller in size
- (b) Possesses secondary kinks
- (c) Has longer cephalic space
- (d) Has tail-tip free from nuclei

Ans. (d)

Q. 24. River blindness is the name given to disease caused by:

- (a) *Loa loa* (b) *Onchocerca volvulus*
- (c) *Toxoplasma gondii* (d) *Acanthamoeba culbertsoni*

Ans. (b)

Q. 25. Fugitive or Calabar swellings are seen in infection with:

- (a) *Onchocerca volvulus* (b) *Loa loa*
- (c) *Wuchereria bancrofti* (d) *Brugia timori*

Ans. (b)

Q. 26. Mazzotti test is the name given to:

- (a) Complement fixation test for *Loa loa*
- (b) Serological test for *Onchocerca volvulus*
- (c) provocation test for *Onchocerca volvulus*
- (d) Intradermal skin test for *Loa loa*

Ans. (c)

Q. 27. Which stage of *Gnathostoma spinigerum* is infective to man?

- (a) Adult worm
- (b) L₁ larvae
- (c) L₂ larvae
- (d) L₃ larvae

Ans. (d)

Q. 28. Dog heartworm is the common name for:

- (a) *Toxocara canis*
- (b) *Dirofilaria immitis*
- (c) *Mansonella streptocerca*
- (d) *Toxoplasma gondii*

Ans. (b)

Q. 29. The blister formed by *Dracunculus medinensis* contains:

- (a) Many polymorphs and bacteria
- (b) Haemorrhagic fluid
- (c) Sterile fluid and inflammatory infiltrate
- (d) Dead larvae

Ans. (c)

Q. 30. The parasite which has been eradicated from India is:

- (a) *Leishmania donovani*
- (b) *Dracunculus medinensis*
- (c) *Babesia microti*
- (d) *Toxoplasma gondii*

Ans. (b)

Q. 31. Eosinophilic meningoencephalitis is caused by:

- (a) *Naegleria fowleri*
- (b) *Angiostrongylus cantonensis*
- (c) *Angiostrongylus costaricensis*
- (d) *Toxoplasma gondii*

Ans. (b)

Q. 32. Rat lungworm is the common name of:

- (a) *Paragonimus westermani*
- (b) *Toxocara canis*
- (c) *Angiostrongylus cantonensis*
- (d) *Mansonella streptocerca*

Ans. (c)

Q. 33. Lesions produced by which of the following worms mimic those of leprosy?

- (a) *Ancylostoma caninum*
- (b) *Mansonella streptocerca*
- (c) *Angiostrongylus cantonensis*
- (d) *Schistosoma haematobium*

Ans. (b)

Q. 34. Adult worms of which of the following parasites reside in human body cavities?

- (a) *Mansonella streptocerca* (b) *Wuchereria bancrofti*
(c) *Brugia malayi* (d) *Mansonella perstans*

Ans. (d)

Q. 35. Dracunculiasis was a health problem in which state of India?

- (a) Rajasthan (b) Haryana (c) Bihar (d) Kerala

Ans. (a)

Q. 36. Paratenic host for *Angiostrongylus cantonensis* is:

- (a) Man (b) Rat (c) Frog (d) Sheep

Ans. (c)

Q. 37. In *Angiostrongylus costaricensis*, species name is given after:

- (a) Name of the scientist who discovered it
(b) Name of the patient in which it was first seen
(c) Name of the place where incidence is high
(d) Name of the university where it was first reported

Ans. (c)

Q. 38. Clinical illness caused by which worm resembles appendicitis?

- (a) *Ancylostoma duodenale*
(b) *Dracunculus medinensis*
(c) *Angiostrongylus costaricensis*
(d) *Trichuris trichiura*

Ans. (c)

Q. 39. All of the following parasites inhabit ocular tissues, **except**:

- (a) *Thelazia callipaeda* (b) *Onchocerca volvulus*
(c) *Loa loa* (d) *Mansonella streptocerca*

Ans. (d) *Mansonella streptocerca* lives in the dermis, usually less than 1 mm below the skin surface. *Thelazia callipaeda*, *Onchocerca volvulus* and *Loa loa* inhabit ocular tissue.

Q. 40. Which of the following parasitic eggs can be demonstrated in urine of infected patient?

- (a) *Diectophyma renale* (b) *Schistosoma japonicum*
(c) *Ascaris lumbricoides* (d) *Trichuris trichiura*

Ans. (a) Adult worms of *Diectophyma renale* inhabit the pelvis of the kidney, usually the right kidney, of many mammals including man. Female worm produces eggs which are excreted in urine. Eggs of *Schistosoma japonicum*, *Ascaris lumbricoides* and *Trichuris trichiura* are passed in stool.

Q. 41. A 50-year-old patient reported in surgery outpatient department with multiple subcutaneous nodules over the right iliac crest. They measured 5–15 mm in diameter and were fully movable. Adult worms and microfilariae could be detected inside the excised nodules and skin snips taken from the vicinity of the lesions, respectively. Which of the following nematodes is most likely to be the causative agent?

- (a) *Onchocerca volvulus* (b) *Wuchereria bancrofti*
(c) *Brugia malayi* (d) *Brugia timori*

Ans. (a) Adult worms of *Onchocerca volvulus* are located in the nodules in the subcutaneous tissue of man. The female worm, after fertilization by the male, lays as many as 2000 actively motile unsheathed microfilariae each day. Adult worms of *Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori* reside in lymph nodes and lymphatics and their microfilariae can be seen in the peripheral blood film.

Q. 42. Loeffler's syndrome may be seen in infection with:

- (a) *Ancylostoma duodenale* (b) *Ascaris lumbricoides*
(c) *Trichinella spiralis* (d) *Trichuris trichiura*

Ans. (b) In persons repeatedly infected with *Ascaris lumbricoides* and sensitized to the parasite antigens, the migrating larvae may lead to inflammatory and hypersensitivity reactions in the lungs. This is known as Loeffler's syndrome.

Q. 43. NIH swab is used for the detection of eggs of:

- (a) *Ascaris lumbricoides* (b) *Necator americanus*
(c) *Enterobius vermicularis* (d) *Ancylostoma duodenale*

Ans. (c) Female *Enterobius vermicularis* deposits large number of eggs on the perianal skin at night. These can be scraped with NIH swab and seen under microscope.

Q. 44. Which of the following parasites is **not** transmitted by ingestion of eggs?

- (a) *Ancylostoma duodenale* (b) *Ascaris lumbricoides*
(c) *Enterobius vermicularis* (d) *Trichuris trichiura*

Ans. (a) The eggs of *Ancylostoma duodenale* are excreted in the faeces. These develop into filariform larvae in soil. These penetrate the skin of persons walking barefoot on faecally contaminated soil. Ingestion of eggs does not

lead to infection with *Ancylostoma duodenale*. Infection with *Ascaris lumbricoides*, *Enterobius vermicularis* and *Trichuris trichiura* is acquired by ingestion of eggs.

Q. 45. Which of the following adult worms resides in the subcutaneous nodules?

- (a) *Onchocerca volvulus* (b) *Gnathostoma spinigerum*
- (c) *Wuchereria bancrofti* (d) *Brugia malayi*

Ans. (a) Adult worms of *Onchocerca volvulus* are located in the subcutaneous tissue of man. Adult *Gnathostoma spinigerum* resides in the tumours or granulomatous lesions of the stomach wall of cat, dog and many other carnivores. Adult worms of *Wuchereria bancrofti* and *Brugia malayi* reside in lymph nodes and lymphatics.

Q. 46. Which of the following adult worms resides in lymphatics and lymph nodes?

- (a) *Dracunculus medinensis*
- (b) *Loa loa*
- (c) *Brugia malayi*
- (d) *Gnathostoma spinigerum*

Ans. (c) Adult worms of *Dracunculus medinensis* and *Loa loa* reside in subcutaneous tissue. Adult worms of *Loa loa* may also reside in subconjunctival tissue. Adult *Gnathostoma spinigerum* resides in the tumours or granulomatous lesions of the stomach wall of cat, dog and many other carnivores. *Brugia malayi* resides in lymph nodes and lymphatics.

Q. 47. Infection with which of the following parasites may cause enuresis?

- (a) *Ascaris lumbricoides* (b) *Enterobius vermicularis*
- (c) *Trichuris trichiura* (d) *Wuchereria bancrofti*

Ans. (b) In girls, the migrating female *Enterobius vermicularis* may enter into vagina and urethra leading to vaginitis and urethritis. The latter leads to enuresis. This does not happen with *Ascaris lumbricoides*, *Trichuris trichiura* and *Wuchereria bancrofti*.

Q. 48. Humans acquire infection with *Dracunculus medinensis* by:

- (a) Penetration of the skin by the larva
- (b) Drinking water containing infected *Cyclops*
- (c) Bite of female *Aedes* mosquito
- (d) Bite of female sandfly

Ans. (b) Larvae of *Dracunculus medinensis* occur in coelomic cavity of *Cyclops*, therefore, humans acquire infection by drinking water containing infected *Cyclops*.

Q. 49. Which of the following parasites **does not** penetrate human skin?

- (a) *Ascaris lumbricoides* (b) *Ancylostoma duodenale*
(c) *Strongyloides stercoralis* (d) *Schistosoma haematobium*

Ans. (a) Infection with *Ascaris lumbricoides* is acquired by ingestion of food and water contaminated with embryonated eggs. They do not penetrate human skin while larvae of *Ancylostoma duodenale*, *Strongyloides stercoralis* and *Schistosoma haematobium* enter by penetrating human skin.

Q. 50. Which of the following nematodes is oviparous?

- (a) *Wuchereria bancrofti* (b) *Strongyloides stercoralis*
(c) *Ancylostoma duodenale* (d) *Trichinella spiralis*

Ans. (c) *Ancylostoma duodenale* is oviparous (lays eggs). *Wuchereria bancrofti* and *Trichinella spiralis* are viviparous (lay embryos), and *Strongyloides stercoralis* is ovo-viviparous (lays ova containing larvae).

Q. 51. Which of the following filarial worms produces sheathed microfilariae?

- (a) *Mansonella oozardi* (b) *Mansonella perstans*
(c) *Onchocerca volvulus* (d) *Loa loa*

Ans. (d) *Loa loa* produces sheathed microfilariae, while those of *Mansonella oozardi*, *Mansonella perstans* and *Onchocerca volvulus* are not sheathed.

Q. 52. Autoinfection is seen with following parasites, **except**:

- (a) *Strongyloides stercoralis* (b) *Ascaris lumbricoides*
(c) *Enterobius vermicularis* (d) *Taenia solium*

Ans. (b) Autoinfection is not seen in *Ascaris lumbricoides* because eggs of this parasite passed in stool are not infective. They become infective by developing in soil. Autoinfection is seen with *Strongyloides stercoralis*, *Enterobius vermicularis* and *Taenia solium*.

Q. 53. Which of the following filarial worms resides in the subconjunctival tissue of the eye?

- (a) *Loa loa* (b) *Brugia malayi*
(c) *Wuchereria bancrofti* (d) *Onchocerca volvulus*

Ans. (a) *Loa loa* resides in the subconjunctival tissue of eye. *Brugia malayi* and *Wuchereria bancrofti* reside in lymph nodes and lymphatics. *Onchocerca volvulus* is located in nodules in subcutaneous tissue.

Q. 54. Fish is **not** the source of infection with:

- (a) *Diphyllobothrium latum*
- (b) *Clonorchis sinensis*
- (c) *Heterophyes heterophyes*
- (d) *Trichinella spiralis*

Ans. (d) Man acquires infection with *Trichinella spiralis* by ingestion of raw or inadequately cooked pork containing the viable larvae. Infection with *Diphyllobothrium latum*, *Clonorchis sinensis* and *Heterophyes heterophyes* is acquired by ingestion of raw or inadequately cooked fish. Therefore, the correct answer is (d).

Q. 55. Microfilariae of which of the following filarial worms are found in skin?

- (a) *Onchocerca volvulus*
- (b) *Brugia malayi*
- (c) *Wuchereria bancrofti*
- (d) *Mansonella oozardi*

Ans. (a) Microfilariae of *Onchocerca volvulus* are found in skin, while those of *Brugia malayi*, *Wuchereria bancrofti* and *Mansonella oozardi* are found in blood.

Q. 56. *Dracunculus medinensis* resides in:

- (a) Subcutaneous tissue
- (b) Small intestine
- (c) Liver
- (d) Lung

Ans. (a)

Q. 57. Smallest nematode known to cause infection in man is:

- (a) *Trichinella spiralis*
- (b) *Ancylostoma duodenale*
- (c) *Strongyloides stercoralis*
- (d) *Trichuris trichiura*

Ans. (c) *Strongyloides stercoralis* is the smallest nematode known to cause infection in man. *Dracunculus medinensis* is the largest nematode parasitizing the human intestine.

Q. 58. Which of the following nematodes **does not** occur in the intestine?

- (a) *Trichuris trichiura*
- (b) *Enterobius vermicularis*
- (c) *Ascaris lumbricoides*
- (d) *Wuchereria bancrofti*

Ans. (d) *Wuchereria bancrofti* inhabits lymph nodes and lymphatics. It does not reside in intestine, while *Trichuris trichiura*, *Enterobius vermicularis* and *Ascaris lumbricoides* reside in intestine.

Q. 59. Infection with *Dracunculus medinensis* is acquired through ingestion of infective larvae harboured in which of the organisms listed below?

- (a) Snails
- (b) Copepods (cyclops)
- (c) Fish
- (d) None of the above

Ans. (b) Refer to Q. No. 48 above.

Q. 60. Which of the following helminth genera **does not** need an intermediate host in its life cycle?

- (a) *Schistosoma haematobium*
- (b) *Strongyloides stercoralis*
- (c) *Dracunculus medinensis*
- (d) *Anisakis simplex*

Ans. (b) *Strongyloides stercoralis* does not need an intermediate host. Intermediate hosts of *Schistosoma haematobium*, *Dracunculus medinensis* and *Anisakis simplex* are snail, cyclops and small marine crustacea (krill), respectively.

Q. 61. Which of the following stages of the specific parasites could be found in a human muscle squash preparation?

- (a) Metacercariae of *Paragonimus*
- (b) Encysted larvae of *Trichinella spiralis*
- (c) Metacercariae of *Fasciolopsis buski*
- (d) Metacercariae of *Clonorchis sinensis*

Ans. (b) Encysted larvae of *Trichinella spiralis* can be found in human muscle squash preparation. Metacercariae of *Paragonimus* occur in crab and crayfish, and those of *Fasciolopsis buski* occur in water plants. Metacercariae of *Clonorchis sinensis* occur in fish.

Q. 62. In *Trichinella spiralis* infection encysted, coiled larvae can be seen in:

- (a) Stool
- (b) Cerebrospinal fluid
- (c) Sputum
- (d) Muscle tissue

Ans. (d)

Q. 63. Man acquires infection by ingestion of eggs of:

- (a) *Ancylostoma duodenale*
- (b) *Schistosoma haematobium*
- (c) *Enterobius vermicularis*
- (d) *Strongyloides stercoralis*

Ans. (c) Man acquires infection by ingestion of eggs of *Enterobius vermicularis*. Filariform larvae of *Ancylostoma duodenale* and *Strongyloides stercoralis* enter human body by penetrating skin of persons walking barefoot on faecally contaminated soil. Free-swimming cercariae of *Schistosoma haematobium* also penetrate the skin.

Q. 64. Which of the following parasites lays eggs with mucoid polar plugs?

- | | |
|---------------------------------|------------------------------------|
| (a) <i>Ascaris lumbricoides</i> | (b) <i>Ancylostoma duodenale</i> |
| (c) <i>Trichuris trichiura</i> | (d) <i>Enterobius vermicularis</i> |

Ans. (c)

Q. 65. Which of the following parasites can cause dysentery in heavy infection?

- | | |
|--------------------------------|-----------------------------------|
| (a) <i>Trichuris trichiura</i> | (b) <i>Necator americanus</i> |
| (c) <i>Giardia lamblia</i> | (d) <i>Cryptosporidium parvum</i> |

Ans. (a)

Q. 66. Eye worm is the common name of which of the following nematodes?

- | | |
|--------------------------------|----------------------------------|
| (a) <i>Onchocerca volvulus</i> | (b) <i>Loa loa</i> |
| (c) <i>Mansonella oozardi</i> | (d) <i>Dirofilaria bancrofti</i> |

Ans. (b)

Applied Parasitology, Diagnostic Procedures, Medically Important Arthropods and Quality Assurance

PARASITIC OPPORTUNISTIC INFECTIONS IN AIDS CASES AND NOSOCOMIAL PARASITIC INFECTIONS

Q. 1. The most common clinical presentation of toxoplasmosis in patients with HIV infection is:

- (a) Chorioretinitis
- (b) Pneumonia
- (c) CNS involvement
- (d) Peritonitis with ascites

Ans. (c)

Q. 2. In AIDS cases, *Cytoisospora belli* may disseminate beyond the intestinal wall to:

- (a) Mesenteric and tracheobronchial lymph nodes
- (b) Gall bladder
- (c) Liver and spleen
- (d) All of the above

Ans. (d)

Q. 3. Most important microsporidia causing opportunistic infection in AIDS cases is:

- (a) *Enterocytozoon bienersi*
- (b) *Microsporidium ceylonensis*
- (c) *Encephalitozoon cuniculi*
- (d) *Nosema connori*

Ans. (a)

Q. 4. Diarrhoea in AIDS patients may be caused by:

- (a) *Cryptosporidium parvum*
- (b) Microsporidia
- (c) *Cytoisospora belli*
- (d) All of the above

Ans. (d)

DIAGNOSTIC PROCEDURES

Q. 1. Disadvantage of formalin-fixed stool samples is:

- (a) Bacterial overgrowth in the sample
- (b) Further development of helminthic ova

- (c) Unsuitability for the preparation of trichrome-stained smears
- (d) Distortion of cyst morphology

Ans. (c)

Q. 2. Polyvinyl alcohol is especially suitable for preservation of stool samples for:

- (a) Parasitic cysts
- (b) Trophozoite stage
- (c) Helminthic eggs
- (d) Helminthic larvae

Ans. (b)

Q. 3. Modified acid-fast stain is used for the diagnosis of:

- (a) *Entamoeba histolytica*
- (b) *Toxoplasma gondii*
- (c) *Cryptosporidium parvum*
- (d) *Leishmania donovani*

Ans. (c)

Q. 4. Which of the following helminthic eggs floats in saturated salt solution?

- (a) Unfertilized eggs of *Ascaris lumbricoides*
- (b) *Taenia solium*
- (c) *Taenia saginata*
- (d) *Ancylostoma duodenale*

Ans. (d)

Q. 5. Stoll's method is used for:

- (a) Determining the number of helminthic eggs in faeces
- (b) Demonstration of *Cryptosporidium* oocysts in faeces
- (c) Concentrating microfilariae in blood
- (d) Staining of lymph node smear for *Leishmania donovani*

Ans. (a)

Q. 6. Which of the following eggs is found in sputum samples?

- (a) *Paragonimus westermani*
- (b) *Enterobius vermicularis*
- (c) *Ascaris lumbricoides*
- (d) *Ancylostoma duodenale*

Ans. (a)

Q. 7. Knott concentration method is used for demonstration of:

- (a) Malaria parasites in peripheral blood film
- (b) Microfilariae in peripheral blood film
- (c) *Leishmania donovani* in bone marrow aspirate
- (d) *Trypanosoma cruzi* in blood

Ans. (b)

Q. 8. Which of the following is a reason to reject a stool specimen for parasitological examination?

- (a) Specimen was in refrigerator overnight
- (b) Specimen is diarrhoeic
- (c) Patient has just been given a barium enema
- (d) Patient has no symptom of infection

Ans. (c)

Q. 9. Modified acid-fast staining technique **does not** provide optimum staining for identification of:

- (a) *Cryptosporidium parvum*
- (b) *Entamoeba histolytica*
- (c) *Cyclospora cayetanensis*
- (d) *Cytoisospora belli*

Ans. (b)

MEDICALLY IMPORTANT ARTHROPODS

Q. 1. Which type of vector is *Culex quinquefasciatus* for the transmission of *Wuchereria bancrofti*?

- (a) Propagative
- (b) Cyclo-propagative
- (c) Cyclo-developmental
- (d) Transovarian

Ans. (c)

Q. 2. Sandflies belong to which of the following classes?

- (a) Insecta
- (b) Arachnida
- (c) Pentastomida
- (d) Crustacea

Ans. (a)

Q. 3. Both males and females of which of the following genera of arthropods bite?

- (a) *Phlebotomus*
- (b) *Glossina*
- (c) *Crysops*
- (d) *Anopheles*

Ans. (b)

Q. 4. Which of the following arthropods bite during daytime?

- (a) *Anopheles*
- (b) Reduviid bugs
- (c) *Phlebotomus*
- (d) *Aedes*

Ans. (d)

Q. 5. Which of the following genera of arthropods can pass through ordinary mosquito net?

- (a) *Phlebotomus*
- (b) *Culicoides*
- (c) *Anopheles*
- (d) *Aedes*

Ans. (a)

Q. 6. In which of the following arthropods transovarial transmission of pathogens occurs?

- (a) Sandflies
- (b) Ticks
- (c) Head lice
- (d) Reduviid bugs

Ans. (b)

QUALITY ASSURANCE IN PARASITOLOGY

Q. 1. Which of the following activities is/are essential to achieve and maintain a quality service?

- (a) Good laboratory service
- (b) Performance standards
- (c) Management skills
- (d) All of the above

Ans. (d)

Q. 2. For effective quality management system:

- (a) The laboratory should practise internal quality control
- (b) Participate in organized inter-laboratory comparisons
- (c) Monitor environmental conditions daily
- (d) All of the above

Ans. (d)

Q. 3. Which of the following test results should be communicated immediately to the medical officer caring for the patient?

- (a) Trypanosomes in blood or CSF
- (b) Heavy falciparum parasitaemia
- (c) *Naegleria fowleri* in CSF
- (d) All of the above

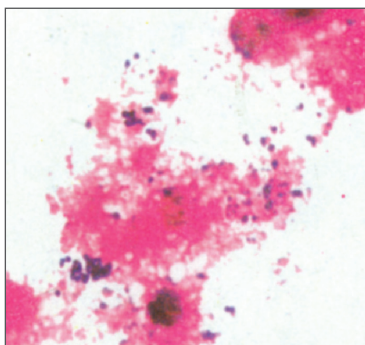
Ans. (d)

Image-based MCQs

BACTERIOLOGY

Q. 1. The figure given below is Gram-stained smear of pus. It is likely to be caused by:

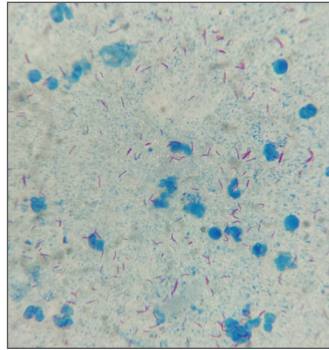
- (a) *Streptococcus pneumoniae*
- (b) *Streptococcus pyogenes*
- (c) *Staphylococcus aureus*
- (d) *Enterococcus faecalis*



Ans. (c) It shows Gram-positive cocci in clumps. *Streptococcus pneumoniae* occurs in pairs. *Streptococcus pyogenes* occurs in chains. *Enterococcus faecalis* occurs in pairs or short chains.

Q. 2. The image given below is Ziehl-Neelsen stained smear of sputum. Concentration of sulphuric acid used for decolourization is 20%. This condition could be due to any of the following, **except**:

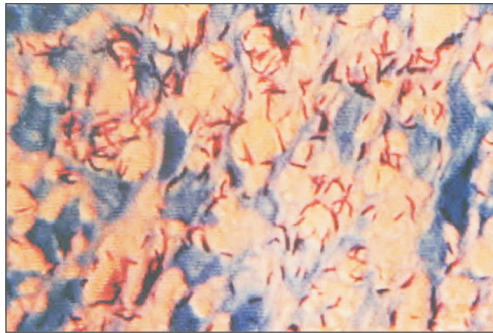
- (a) *Mycobacterium leprae*
- (b) *Mycobacterium tuberculosis*
- (c) *Mycobacterium bovis*
- (d) Non-tuberculous mycobacteria



Ans. (a) *Mycobacterium leprae* is acid-fast to 5% and not to 20% sulphuric acid. *Mycobacterium tuberculosis*, *Mycobacterium bovis* and non-tuberculous mycobacteria resist decolorization with 20% sulphuric acid.

Q. 3. The figure given below is Ziehl-Neelsen stained smear, using 5% sulphuric acid as decolourizing agent, of nodular skin lesion caused by *Mycobacterium leprae*. The most likely spectrum of leprosy is:

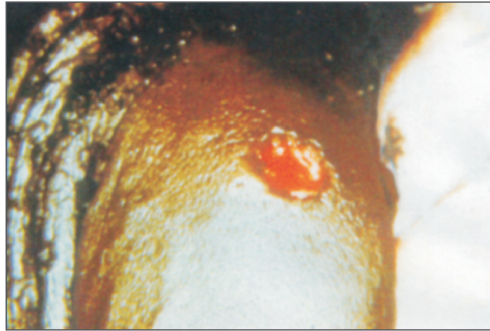
- (a) Tuberculoid leprosy
- (b) Borderline tuberculoid leprosy
- (c) Borderline lepromatous leprosy
- (d) Lepromatous leprosy



Ans. (d) The figure shows numerous acid-fast bacilli. Lepromatous leprosy is multibacillary disease. Tuberculoid leprosy is paucibacillary disease, therefore, acid-fast bacilli are generally not seen microscopically. In borderline tuberculoid leprosy acid-fast bacilli are absent or few in number. In borderline lepromatous leprosy the acid-fast bacilli are much less than those seen in lepromatous leprosy.

Q. 4. The figure given below depicts a painless ulcer on penis. The most likely causative agent is:

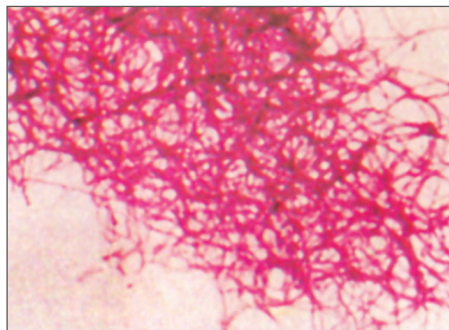
- (a) Herpes simplex virus
- (b) *Haemophilus ducreyi*
- (c) *Neisseria gonorrhoeae*
- (d) *Treponema pallidum*



Ans. (d) *Treponema pallidum* causes painless genital ulcer. Herpes simplex virus and *Haemophilus ducreyi* cause painful genital ulcer. *Neisseria gonorrhoeae* causes genital discharge. It does not cause ulcer.

Q. 5. The figure given below shows modified acid-fast stained (using 1% sulphuric acid) sputum smear. It shows acid-fast filaments. These could be those of:

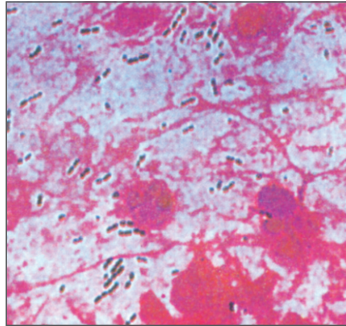
- (a) *Actinomyces israelii*
- (b) *Nocardia asteroides*.
- (c) *Actinomyces madurae*
- (d) *Streptomyces somaliensis*



Ans. (b) *Nocardia asteroides* is acid-fast. *Actinomyces israelii*, *Actinomyces madurae* and *Streptomyces somaliensis* are non-acid-fast.

Q. 6. The figure given below is Gram-stained smear of sputum. It is likely to be caused by:

- (a) *Neisseria meningitidis*
- (b) *Streptococcus pneumoniae*
- (c) *Staphylococcus aureus*
- (d) *Streptococcus pyogenes*

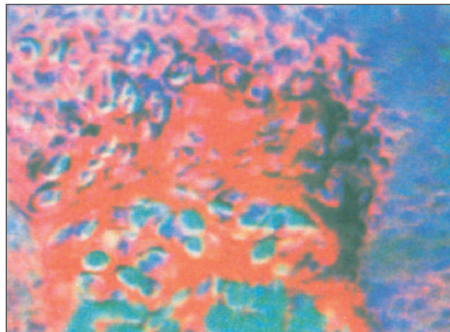


Ans. (b) The figure shows Gram-positive cocci occurring mostly in pairs. Therefore, it is likely to be caused by *Streptococcus pneumoniae*. *Neisseria meningitidis* is Gram-negative coccus, *Streptococcus pyogenes* and *Staphylococcus aureus* are Gram-positive cocci occurring in chains and clumps, respectively.

VIROLOGY

Q. 7. The figure given below shows haematoxylin and eosin stained section of umbilicated nodule in the anogenital area. It shows numerous large, hyaline, acidophilic intracytoplasmic inclusion bodies. The causative agent could be:

- (a) Vaccinia virus
- (b) Fowlpox virus
- (c) Molluscipoxvirus
- (d) Rabies virus

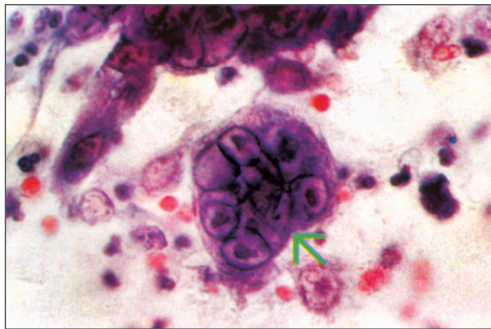


Ans. (c) Molluscipoxvirus causes sexually-transmitted disease—molluscum contagiosum. Patient develops multiple

discrete umbilicated nodules occurring anywhere on the body except on soles and palms. Lesions are more commonly seen on anogenital area. The cells in the nodules are greatly hypertrophied and contain large (up to 35 μm) acidophilic intracytoplasmic inclusion bodies which displace the nuclei to the margin.

Q. 8. The figure given below shows haematoxylin and eosin stained section of biopsy of a vesicle on the corner of the mouth. It shows intranuclear inclusions and multinucleated giant cells. The most probable causative agent is:

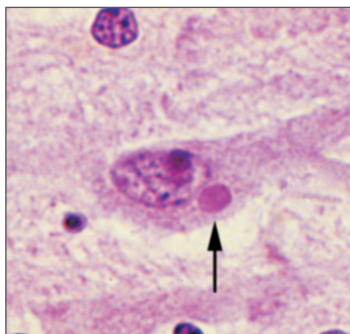
- | | |
|--------------------------|------------------------|
| (a) Herpes simplex virus | (b) Yellow fever virus |
| (c) Adenovirus | (d) Poliovirus |



Ans. (a) All the viruses (a to d) listed above form intranuclear inclusion bodies, but, of these, only herpes simplex virus forms multinucleated giant cells.

Q. 9. The figure given below depicts intracytoplasmic, eosinophilic inclusion body in impression smear of brain stained with Seller's stain. The most probable diagnosis is:

- | | |
|--------------------|--------------------|
| (a) Negri body | (b) Bollinger body |
| (c) Guarnieri body | (d) Molluscum body |

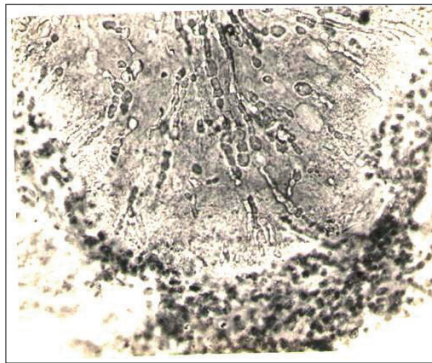


Ans. (a) Intracytoplasmic, eosinophilic inclusion bodies (Negri bodies) in the brain are formed by rabies virus. Bollinger, Guarnieri and mollusum bodies are also intracytoplasmic but they are found in the skin and not in the brain.

MYCOLOGY

Q. 10. The figure given below shows haematoxylin- and eosin-stained section of mycetoma showing grain and granulomatous reaction. The most probable cause of mycetoma is:

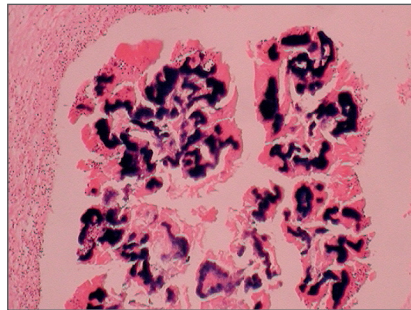
- (a) *Madurella mycetomatis* (b) *Trematosphaeria grisea*
(c) *Actinomadura madurae* (d) *Streptomyces somaliensis*



Ans. (a) *Madurella mycetomatis* and *Trematosphaeria grisea* are fungi, and *Actinomadura madurae* and *Streptomyces somaliensis* are higher bacteria. The hyphae of fungi are 2–5 μm in diameter and terminal cells may be 12–15 μm in diameter. In *Madurella mycetomatis* the brown cement substance is distributed in the whole grain as is evident in the figure. In *Trematosphaeria grisea*, the brown cement substance is present only in the periphery, therefore, *Trematosphaeria grisea* can be excluded. The hyphae of higher bacteria are 0.5–1 μm in diameter, thus excluding *Actinomadura madurae* and *Streptomyces somaliensis*.

Q. 11. The figure given below shows haematoxylin and eosin-stained section of mycetoma. It shows grain and granulomatous reaction. The hyphae are 1 μm in diameter. The probable diagnosis is:

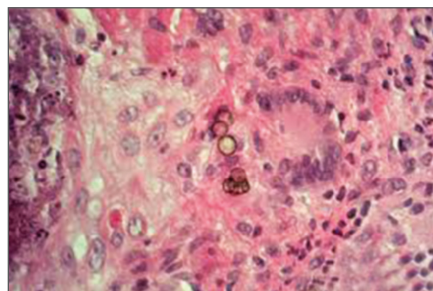
- (a) *Madurella mycetomatis* (b) *Trematosphaeria grisea*
(c) *Actinomadura madurae* (d) *Scedosporium apiospermum*



Ans. (c) The grains of *Actinomyces madurae* are white, 1–5 mm in diameter, irregular and serpiginous in shape due to an irregular relatively unstained and empty centre and a broad zone of deep blue (haematoxylinophilic) stained margin. Mycelial filaments are delicate 0.5–1 µm in diameter and branching. The hyphae and the grain are surrounded by eosinophilic material. Also refer to Q. No. 10 above.

Q. 12. The figure given below is haematoxylin- and eosin-stained section of crusted, warty lesion on the lower leg. It shows rounded, thick-walled, brown fungal cells, 5–12 µm in diameter with horizontal splitting bodies (sclerotic bodies). The probable diagnosis is:

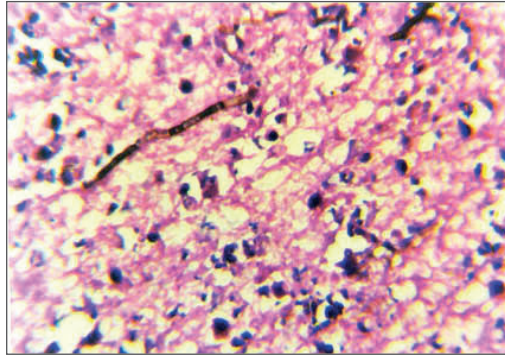
- (a) Chromoblastomycosis
- (b) Phaeohyphomycosis
- (c) Hyalohyphomycosis
- (d) Aspergillosis



Ans. (a) Brown-coloured fungi are known as dematiaceous (phaeoid) fungi. Chromoblastomycosis and phaeohyphomycosis are caused by dematiaceous fungi. In the tissue, the former appear as rounded cells (sclerotic bodies), and the latter appear as hyphae. Aspergillosis and hyalohyphomycosis are caused by hyaline (colourless) fungi. In tissue, they appear as hyaline hyphae.

Q. 13. The figure given below depicts haematoxylin and eosin stained section of subcutaneous lesion. It shows inflammatory infiltrates and a darkly pigmented septate hypha, 5 μm in diameter. The probable diagnosis is:

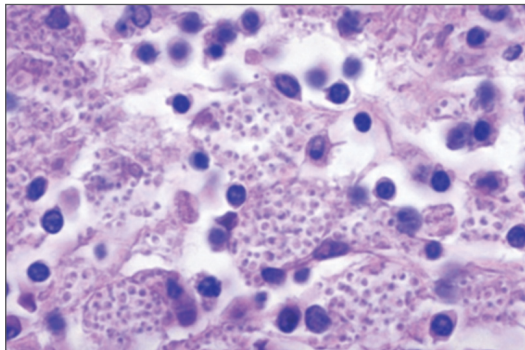
- (a) Chromoblastomycosis
- (b) Phaeohyphomycosis
- (c) Hyalohyphomycosis
- (d) Aspergilliosis



Ans. (b) For explanation, refer to Q. No. 12 above.

Q. 14. The figure given below is a section of papulonodular skin lesion stained with haematoxylin and eosin showing budding yeast cells, 2–5 μm in diameter, surrounded by clear halo filling the cytoplasm of phagocytes. The probable causative agent is:

- (a) *Leishmania donovani*
- (b) *Trypanosoma cruzi*
- (c) *Talaromyces marneffei*
- (d) *Histoplasma capsulatum*

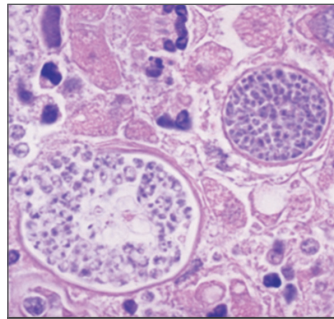


Ans. (d) Histoplasmosis is an intracellular mycosis of reticuloendothelial system. They are 2–5 μm in diameter, surrounded by clear halo filling the cytoplasm of phagocytes. Amastigote forms of *Leishmania donovani* and

Trypanosoma cruzi can be differentiated from *Histoplasma capsulatum* in that they do not have halo. Yeast cells of *Talaromyces marneffe* do not bud.

Q. 15. The figure given below is a section of lung. It shows two spherules 30 and 100 μm in diameter, respectively. The probable causative agent is:

- (a) *Coccidioides immitis*
- (b) *Paracoccidioides brasiliensis*
- (c) *Rhinosporidium seeberi*
- (d) *Blastomyces dermatitidis*



Ans. (a) The picture resembles *Coccidioides immitis*. In *Paracoccidioides brasiliensis*, the parent cell is surrounded by small buds attached by narrow necks giving it classic 'ship's wheel' appearance. *Rhinosporidium seeberi* involves upper respiratory sites and the spherules are larger (up to 500 μm). Yeast-like cells of *Blastomyces dermatitidis* are 8–15 μm in diameter. Each yeast cell produces only one bud which is attached to the parent cell on broad base.

Q. 16. Figure given below is India ink preparation of centrifuged deposit of cerebrospinal fluid. The probable causative agent is:

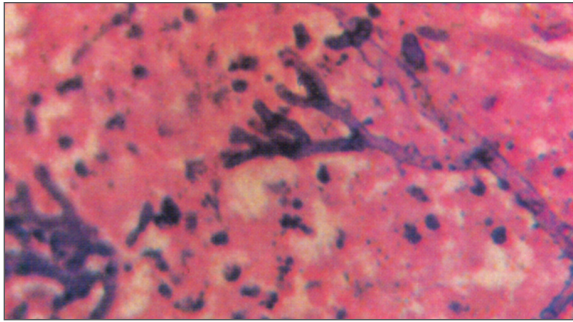
- (a) *Candida albicans*
- (b) *Cryptococcus neoformans*
- (c) *Trichosporon ovoides*
- (d) *Pneumocystis jirovecii*



Ans. (b) *Cryptococcus neoformans* is capsulated budding yeast cell. *Candida albicans*, *Trichosporon ovoides* and *Pneumocystis jirovecii* are not capsulated.

Q. 17. The figure depicted below is haematoxylin- and eosin-stained section of lung. It shows dichotomously branching, septate, colourless hyphae. The probable diagnosis is:

- (a) Mucormycosis (b) Aspergillosis
(c) Phaeohyphomycosis (d) Blastomycosis

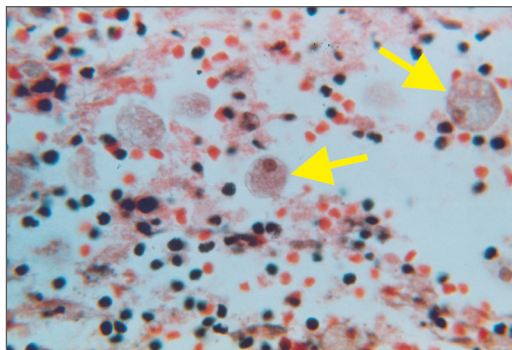


Ans. (b) The picture is characteristic of aspergillosis. Hyphae in case of mucormycosis are colourless and non-septate. In phaeohyphomycosis, the hyphae are brown in colour (phaeoid fungus). Fungus in blastomycosis occurs in yeast form and not in mycelial form in tissues.

PARASITOLOGY

Q. 18. The figure given below is haematoxylin- and eosin-stained liver aspirate. Name the probable parasite causing this.

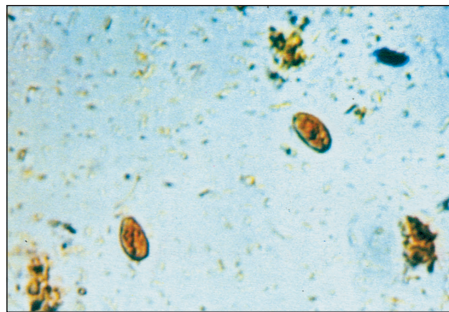
- (a) *Balantidium coli* (b) *Entamoeba histolytica*
(c) *Nagleria fowleri* (d) *Giardia lamblia*



Ans. (b) Morphologically, the parasite in the figure is the trophozoite of *Entamoeba histolytica*. It is an important cause of liver abscess. *Balantidium coli* is a ciliate (possessing cilia on its surface) and rare cause of liver abscess. *Nagleria fowleri* causes primary amoebic meningoencephalitis. It does not involve liver. *Giardia lamblia* is localized in duodenum and upper part of jejunum. It does not invade intestine.

Q. 19. The figure given below is photomicrograph of iodine wet mount of faeces. Name the parasite seen in this.

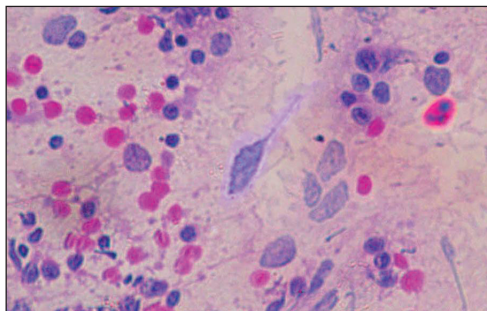
- (a) Cyst of *Giardia lamblia*
- (b) Cyst of *Entamoeba histolytica*
- (c) Cyst of *Balantidium coli*
- (d) Cyst of *Iodamoeba bütschlii*



Ans. (a)

Q. 20. Name the parasite shown in photomicrograph of vaginal smear stained with Papanicolaou stain.

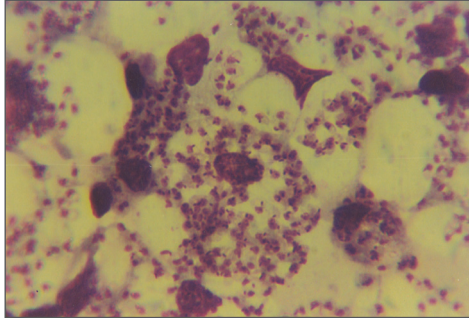
- (a) Trophozoite of *Nagleria fowleri*
- (b) Trophozoite of *Acanthamoeba culbertsoni*
- (c) Trophozoite of *Balamuthia mandrillaris*
- (d) Trophozoite of *Trichomonas vaginalis*



Ans. (d)

Q. 21. The figure given below is bone marrow smear stained with Giemsa stain. Name the parasite it shows.

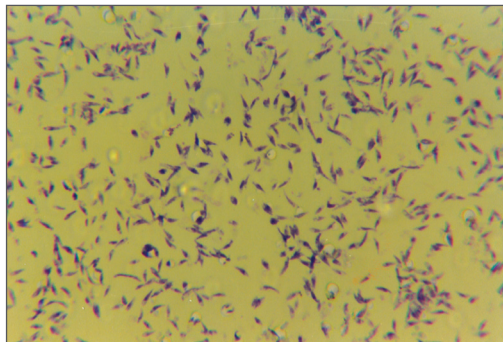
- (a) *Plasmodium falciparum*
- (b) *Histoplasma capsulatum*
- (c) *Leishmania donovani*
- (d) *Trypanosoma brucei gambiense*



Ans. (c)

Q. 22. A parasite has been cultured in NNN medium. After the growth appeared smear has been prepared and stained with Giemsa stain. The figure of the same is given below. Name the parasite.

- (a) *Leishmania donovani*
- (b) *Trypanosoma brucei gambiense*
- (c) *Trypanosoma brucei rhodesiense*
- (d) *Trypanosoma cruzi*

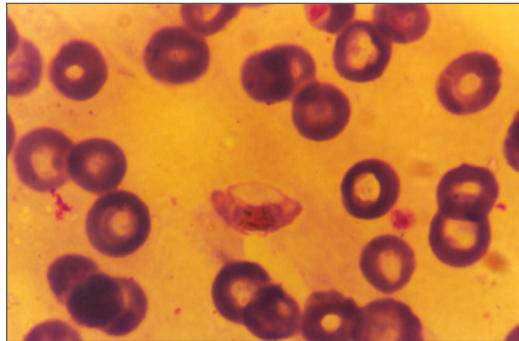


Ans. (a)

Q. 23. Figure depicted below is peripheral blood film stained with Leishman stain. It shows:

- (a) *Leishmania donovani*
- (b) *Plasmodium falciparum*

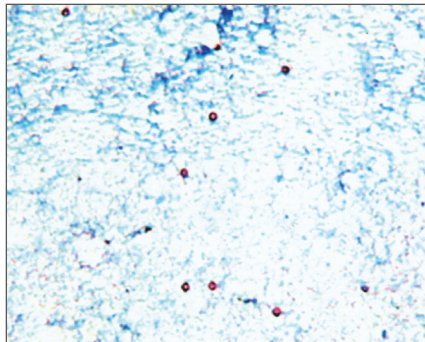
- (c) *Trypanosoma brucei gambiense*
- (d) *Trypanosoma cruzi*



Ans. (b)

Q. 24. Faecal smear has been stained with modified acid-fast stain. The photomicrograph of the same under high-power magnification is given below. It shows spherical oocysts measuring 4–5 μm in diameter. Identify the parasite.

- (a) Oocysts of *Cytoisospora belli*
- (b) Oocysts of *Cyclospora cayetenensis*
- (c) Oocysts of *Cryptosporidium parvum*
- (d) None of the above

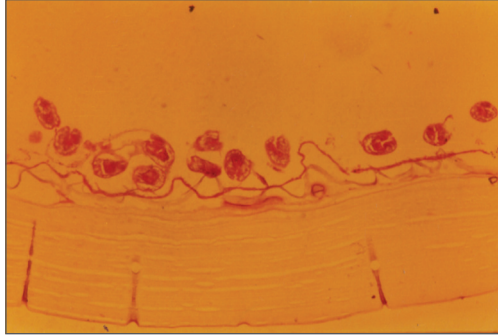


Ans. (c) Oocysts of all the parasites listed in (a) to (c) are acid-fast. The sizes of these oocysts are $20\text{--}33 \times 10\text{--}19 \mu\text{m}$, $8\text{--}10 \mu\text{m}$ and $4\text{--}5 \mu\text{m}$, respectively. Therefore, the correct answer is (c).

Q. 25. The figure given below is haematoxylin- and eosin-stained section of liver biopsy. Diagnose the disease.

- (a) Hydatid cyst
- (b) *Cysticercus cellulosae*

- (c) Cysticercoid
- (d) Coenurus



Ans. (a)

Q. 26. Identify the parasite whose egg is shown in the figure below.

- (a) *Schistosoma haematobium*
- (b) *Schistosoma mansoni*
- (c) *Schistosoma japonicum*
- (d) *Hymenolepis nana*



Ans. (b) The eggs of *Schistosoma haematobium*, *Schistosoma mansoni* and *Schistosoma japonicum* have terminal spine, lateral spine and a small lateral knob, respectively. *Hymenolepis nana* does not possess any spine or knob.

Q. 27. Figure given below is a photomicrograph of normal saline preparation of stool under high power. Patient had iron-deficiency anaemia. He complained of rectal prolapse, rectal bleeding and rectal tenesmus. Which of the following parasites is the cause of the infection in the patient?

- (a) *Ancylostoma duodenale*
- (b) *Trichuris trichiura*
- (c) *Entamoeba histolytica*
- (d) *Balantidium coli*



Ans. (b)

Second Edition

MCQs in Microbiology and Parasitology

With Explanations

has been thoroughly revised. Most of the books available in the market deal with MCQs and their answers only. As no explanations of correct and incorrect choices are given, the candidate forgets the correct answer.

For proper understanding and remembering, the student must know why a particular choice is correct and other choices are wrong. In this book explanations of **correct** and **incorrect** answers have been given. This helps the candidate to remember the correct answers. In the last chapter, image-based MCQs have been given. Each question carries one photomicrograph or photograph and the candidate is asked to identify the correct answer. Explanations of both correct and incorrect choices are given. In addition, more MCQs with explanations have been added.

D R Arora MD, PhD, MNAMS is ex-Professor and Head, Department of Microbiology, Postgraduate Institute of Medical Sciences, Rohtak, Haryana; and Maharaja Agrasen Medical College, Agroha, Haryana; ex-Professor and Head, Department of Microbiology, Medical Superintendent, and Dean, Faculty of Allied Health Sciences, SGT University, Gurugram, Haryana; Lead Assessor and Member, Accreditation Committee, National Accreditation Board for Testing and Calibration Laboratories (NABL), Gurugram, Haryana; Principal Assessor, National Accreditation Board for Hospitals and Healthcare Providers (NABH), New Delhi; Assessor, National Accreditation Board for Education and Training (NABET), New Delhi, has more than 45 years of teaching experience in microbiology to medical and dental undergraduate and postgraduate students. Besides conducting and supervising research in microbiology, he has published Twelve textbooks on microbiology, parasitology and mycology, and 150 research articles in several indexed national and international journals of repute. The results of his research on malaria parasites and *Klebsiella pneumoniae* have been cited in *World Health Organization WHO/MAL/83.10003* and *Topley & Wilson's Microbiology and Microbial Infections, Bacteriology* Vol 2, 10th ed, 2005, respectively. He has supervised a number of PG students of PhD, MD and MS. In appreciation of outstanding research carried out by him in India on bacteriocins of *Klebsiella pneumoniae*, he was awarded Smt. Kunti Mehrotra Award of Indian Association of Pathologists and Microbiologists in 1983. He was awarded Lifetime Achievement Award by Indian Association of Medical Microbiologists in 2023. He was honoured by Pandit Bhagwat Dayal Sharma University of Health Sciences, Rohtak, on the eve of 15th Foundation Day on 02.06.2023. In recognition of significant contribution to the advancement of medical sciences, he was elected Member of National Academy of Medical Sciences (India) in 1985. He has been a Visiting Professor at University of Mauritius in 1989. He was awarded WHO fellowship on Laboratory Aspects of HIV/AIDS and STD at Community Health Surveillance and Laboratories Administration, Baltimore, Maryland (USA) in 1992. He was honoured by Indian Medical Association, Kaithal, Haryana, on the eve of Doctors' Day on 01.07.1999. He has been examiner for BDS, MBBS, MD, DNB and PhD microbiology of a number of universities. His biography including academic activities and research work has been published in *Who's Who in Medicine and Healthcare* 2011-12 (8th edition), NJ 07922, USA, distinguishing him as one of the leading healthcare professionals from around the world.



Scan for
price of this
book and
catalogue

Dedicated to Education



CBSPD

CBS Publishers & Distributors Pvt Ltd

4819/XI, Prahlad Street, 24 Ansari Road, Daryaganj, New Delhi 110 002, India

E-mail: delhi@cbspd.com, customercare@cbspd.com; Website: www.cbspd.com

New Delhi | Bengaluru | Chennai | Kochi | Kolkata | Lucknow | Mumbai

Hyderabad | Jharkhand | Nagpur | Patna | Pune | Uttarakhand