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PREFACE

This book is designed to help aspiring Laboratory Technologists. It is specifically developed for students pursuing career in Medical Laboratory Technology who aim to achieve success in various Laboratory Technologists Entrance Exams. We created this book based on our vast experience as renowned institute, acknowledging the need for a comprehensive resource to build future Laboratory Technologists equipped with in-depth understanding of Medical Laboratory Technology.

This book contains multiple-choice questions (MCQs) of the following subjects:

- Anatomy And Physiology
- Haematology And Blood Banking
- Clinical Pathology
- Biochemistry
- Microbiology
- Laboratory Management

These MCQs are designed to provide authentic knowledge and practical understanding for future Laboratory Technologists.

We are grateful to our students for their encouragement in presenting this book. We welcome any suggestions for further improvement in this book. We are confident that our efforts will benefit our aspiring Laboratory Technologists.

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Anatomy and Physiology

Cell

1. **What is the primary role of the extracellular matrix (ECM) in tissues?**

- (a) To provide structural support to cells
- (b) To facilitate the synthesis of ATP
- (c) To replicate DNA
- (d) To transport lipids across the cell membrane

Ans. (a) To provide structural support to cells

Exp. The extracellular matrix provides structural and biochemical support to the surrounding cells. It is essential for tissue integrity and plays a crucial role in cell communication, differentiation, and proliferation.

2. **Which component is NOT typically found in the extracellular matrix?**

- (a) Collagen
- (b) Elastin
- (c) Ribosomes
- (d) Fibronectin

Ans. (c) Ribosomes

Exp. Ribosomes are not a part of the extracellular matrix; they are cellular structures involved in protein synthesis found within the cell. The ECM mainly consists of fibrous proteins like collagen, elastin, and fibronectin.

3. **Which function is primarily facilitated by the fluids in the extracellular space?**

- (a) Energy storage
- (b) Transport of nutrients and waste products
- (c) DNA transcription
- (d) Protein folding

Ans. (b) Transport of nutrients and waste products

Exp. The extracellular space contains interstitial fluid that helps in the transport of nutrients, oxygen, and waste products between cells and blood vessels, facilitating efficient exchange and maintaining homeostasis.

4. **What feature of the plasma membrane allows it to selectively regulate the entry and exit of substances?**

- (a) Selective permeability
- (b) Fluid mosaic model
- (c) Integral proteins
- (d) Phospholipid bilayer

Ans. (a) Selective permeability

Exp. The plasma membrane is selectively permeable, allowing it to regulate what enters and exits the cell efficiently. This property is crucial for maintaining cellular homeostasis and responding to environmental changes.

5. **What role do membrane proteins play in the function of the plasma membrane?**

- (a) Energy storage
- (b) Acting as enzymes
- (c) Serving only structural purposes
- (d) DNA replication

Ans. (b) Acting as enzymes

Exp. Membrane proteins play various roles including acting as enzymes to speed up metabolic processes, as receptors for signaling, and as transporters to help substances move across the membrane.

6. **Which molecule in the plasma membrane is primarily responsible for the membrane's fluidity?**

Excretory System

1. What is the primary function of the excretory system?

- (a) To digest food and absorb nutrients
- (b) To circulate blood throughout the body
- (c) To eliminate waste products of metabolism from the body
- (d) To produce hormones

Ans. (c) To eliminate waste products of metabolism from the body

Exp. The excretory system is responsible for removing waste products from the body, which are produced as a result of metabolic processes. This is essential to maintain homeostasis and prevent damage to the body.

2. Which organs are included in the human excretory system?

- (a) Heart, liver, kidneys
- (b) Lungs, skin, liver
- (c) Kidneys, ureters, bladder, urethra
- (d) Stomach, intestines, colon

Ans. (c) Kidneys, ureters, bladder, urethra

Exp. The excretory system primarily includes the kidneys, ureters, bladder, and urethra. These organs work together to filter blood, create urine, and expel urine from the body.

3. How does the excretory system help regulate blood pressure?

- (a) By controlling the volume of blood
- (b) By producing digestive enzymes
- (c) By secreting insulin
- (d) By absorbing nutrients in the intestines

Ans. (a) By controlling the volume of blood

Exp. The excretory system, particularly through the kidneys, helps regulate blood pressure by controlling the volume of blood (through adjusting fluid balance) and the amount of salts in the blood, which in turn affects the blood pressure.

4. What is the primary role of the kidneys in the excretory system?

- (a) To produce bile
- (b) To filter blood and produce urine
- (c) To digest proteins
- (d) To circulate blood

Ans. (b) To filter blood and produce urine

Exp. The kidneys filter waste products and excess substances from the blood, which results in the production of urine. This process is vital for cleansing the blood and balancing the body's fluids and electrolytes.

5. What is the functional unit of the kidney called?

- (a) Nephron
- (b) Alveolus
- (c) Hepatocyte
- (d) Neuron

Ans. (a) Nephron

Exp. The nephron is the functional unit of the kidney. Each kidney contains about one million nephrons, which are responsible for filtering the blood and producing urine.

6. Which substance is NOT normally found in the filtrate in healthy kidneys?

- (a) Urea
- (b) Glucose
- (c) Red blood cells
- (d) Sodium ions

Ans. (c) Red blood cells

Exp. Healthy kidneys typically do not allow red blood cells to pass into the urine. Their presence in the urine can indicate damage to the nephrons or other parts of the kidney.

7. What major processes occur in the nephron?

- (a) Heartbeat regulation
- (b) Blood clotting
- (c) Filtration, reabsorption, secretion
- (d) Hemoglobin synthesis

Ans. (c) Filtration, reabsorption, secretion

Exp. In the nephron, three main processes occur: filtration of the blood at the glomerulus, reabsorption of necessary nutrients and water back into the bloodstream, and secretion of additional wastes into the tubular fluid.

8. Where does filtration primarily occur within the nephron?

- (a) Bowman's capsule
- (b) Proximal convoluted tubule
- (c) Distal convoluted tubule
- (d) Collecting duct

Ans. (a) Bowman's capsule

Exp. Filtration in the nephron begins in the Bowman's capsule, where blood pressure forces water and solutes from the blood in the glomerulus into the capsule. This filtrate then passes through the rest of the nephron for further processing.

Ans. (b) By binding to receptors on the cell surface and activating intracellular signaling pathways

Exp. Peptide hormones are not lipid-soluble and cannot pass through the cell membrane. Instead, they bind to specific receptors on the surface of target cells. This binding triggers a series of signaling events within the cell, often involving second messengers, to elicit the appropriate response.

49. What determines the specific response of a cell to a hormone?

- (a) The blood type of the individual
- (b) The presence and type of receptor on the cell's surface
- (c) The concentration of glucose in the cell
- (d) The type of neurotransmitter released by the cell

Ans. (b) The presence and type of receptor on the cell's surface

Exp. The specific response of a cell to a hormone is primarily determined by the presence and type of receptors that the cell expresses. Different cells may have different receptors, and the same hormone can have varied effects depending on the receptor it binds to and the intracellular machinery available.

Reproductive System

1. What is the primary function of the human reproductive system?

- (a) To regulate hormones and maintain homeostasis
- (b) To enable digestion and nutrient absorption
- (c) To produce, store, and transport gametes and nourish offspring
- (d) To provide immune protection against pathogens

Ans. (c) To produce, store, and transport gametes and nourish offspring

Exp. The primary function of the reproductive system is to produce, store, and transport gametes (sperm and eggs), facilitate fertilization, and support the development and nourishment of offspring during pregnancy and after birth in the case of females.

2. Which system works closely with the reproductive system to influence its functions?

- (a) The skeletal system
- (b) The endocrine system
- (c) The respiratory system
- (d) The digestive system

Ans. (b) The endocrine system

Exp. The endocrine system works closely with the reproductive system by producing hormones that regulate sexual development, reproductive cycles, and reproductive structures. Hormones such as estrogen, testosterone, and progesterone play critical roles in reproductive health and function.

3. What is the role of genetic material in the reproductive system?

- (a) To provide energy for gamete production
- (b) To repair damaged cells within reproductive organs
- (c) To transmit genetic information to offspring
- (d) To synthesize hormones necessary for reproduction

Ans. (c) To transmit genetic information to offspring

Exp. The reproductive system is crucial for transmitting genetic information from parents to offspring through gametes. Sperm and eggs each carry half the genetic material required, which combine during fertilization to form a genetically unique individual.

4. What is the primary male reproductive organ that produces sperm and hormones?

- (a) Urethra
- (b) Penis
- (c) Testis
- (d) Prostate gland

Ans. (c) Testis

Exp. The testes are the primary male reproductive organs responsible for producing sperm, the male gametes, and hormones such as testosterone, which regulates male secondary sexual characteristics and reproductive functions.

5. What role does the prostate gland play in the male reproductive system?

- (a) It controls the temperature of the testes.
- (b) It produces a fluid that is part of semen.
- (c) It stores sperm until maturation.
- (d) It transports sperm directly to the penis.

Ans. (b) It produces a fluid that is part of semen

Haematology and Blood Banking

Introduction to Haematology

1. What is the primary focus of Haematology?

- (a) Study of blood and blood-forming organs
- (b) Study of heart and circulatory system
- (c) Study of the nervous system
- (d) Study of the immune system

Ans. (a) Study of blood and blood-forming organs

Exp. Haematology is the branch of medicine concerning the study of blood, the blood-forming organs, and blood diseases.

2. Which of the following is the key importance of Haematology in medical science?

- (a) It aids in understanding cardiac diseases
- (b) It helps in the diagnosis and treatment of blood disorders
- (c) It is used to study neural connections
- (d) It is primarily used for metabolic studies

Ans. (b) It helps in the diagnosis and treatment of blood disorders

Exp. Haematology plays a crucial role in diagnosing and treating various blood disorders such as anemia, leukemia, and clotting disorders.

3. Which equipment is primarily used in a haematology laboratory for cell counting?

- (a) Centrifuge
- (b) Microscope
- (c) Hemocytometer
- (d) Electrophoresis apparatus

Ans. (c) Hemocytometer

Exp. A hemocytometer is a device used to count cells in a blood sample, which is essential in haematology labs for tasks like total blood counts.

4. In Haematology, why is a microscope important?

- (a) It is used for DNA sequencing
- (b) It is used for visualizing and identifying blood cells
- (c) It is used for protein analysis
- (d) It is used for measuring blood pressure

Ans. (b) It is used for visualizing and identifying blood cells

Exp. Microscopes are essential in haematology for examining blood smears and identifying different types of blood cells.

5. Which of the following is a significant advantage of understanding Haematology?

- (a) Early detection of blood-related disorders
- (b) Improved digestion
- (c) Enhanced memory function
- (d) Faster muscle recovery

Ans. (a) Early detection of blood-related disorders

Exp. Knowledge of haematology enables the early detection and treatment of various blood disorders, which can be critical for patient outcomes.

6. Which haematology equipment is essential for determining the blood's oxygen-carrying capacity?

- (a) Electrophoresis apparatus
- (b) Hemoglobinometer
- (c) Centrifuge
- (d) Spectrophotometer

Ans. (b) Hemoglobinometer

Ans. (a) Low MCV and low MCH

Exp. Microcytic hypochromic anemia, such as that caused by iron deficiency, is characterized by low MCV (small cell size) and low MCH (less hemoglobin per cell).

24. Which condition is least likely to be associated with high MCV?

- (a) Alcoholism
- (b) Hemolysis
- (c) Myelodysplastic syndrome
- (d) Vitamin B12 deficiency

Ans. (b) Hemolysis

Exp. Hemolysis does not typically cause high MCV. Conditions like alcoholism, myelodysplastic syndrome, and vitamin B12 deficiency are more commonly associated with macrocytic anemia (high MCV).

25. Which of the following conditions might present with both high MCV and high RDW?

- (a) Megaloblastic anemia
- (b) Iron deficiency anemia
- (c) Chronic liver disease
- (d) Acute blood loss

Ans. (a) Megaloblastic anemia

Exp. Megaloblastic anemia, often due to vitamin B12 or folate deficiency, typically presents with high MCV (macrocytosis) and high RDW (variation in cell size).

Absolute Eosinophil Count (AEC)

1. What is the primary function of eosinophils in the immune system?

- (a) Phagocytosis of bacteria
- (b) Response to parasitic infections and allergic reactions
- (c) Production of antibodies
- (d) Clot formation

Ans. (b) Response to parasitic infections and allergic reactions

Exp. Eosinophils play a key role in the immune response to parasitic infections and are involved in allergic reactions, where they release enzymes and toxic proteins to combat pathogens.

2. How is the Absolute Eosinophil Count (AEC) calculated?

- (a) Multiplying the total white blood cell count by the percentage of eosinophils
- (b) Counting eosinophils in a stained blood smear
- (c) Measuring eosinophil concentration using flow cytometry
- (d) Dividing the total white blood cell count by the number of eosinophils

Ans. (a) Multiplying the total white blood cell count by the percentage of eosinophils

Exp. AEC is calculated by multiplying the total white blood cell count by the percentage of eosinophils identified in a differential count.

3. What is considered a normal range for Absolute Eosinophil Count in adults?

- (a) 50-400 cells/ μ L
- (b) 500-1,000 cells/ μ L
- (c) 1,000-2,000 cells/ μ L
- (d) 5-50 cells/ μ L

Ans. (a) 50-400 cells/ μ L

Exp. The normal range for AEC in adults is typically between 50-400 cells per microliter, though slight variations may occur based on laboratory standards.

4. What type of stain is typically used for eosinophil morphology?

- (a) Romanowsky stain
- (b) Haematoxylin and eosin (H&E)
- (c) Wright's stain
- (d) Giemsa stain

Ans. (c) Wright's stain

Exp. Wright's stain is commonly used for blood smears to differentiate eosinophils based on their granules staining red-orange.

5. Eosinophils are best recognized by which of the following morphological features?

- (a) Bilobed nucleus and large, red granules
- (b) Multilobed nucleus and small granules
- (c) Kidney-shaped nucleus and blue granules
- (d) Round nucleus and clear cytoplasm

Ans. (a) Bilobed nucleus and large, red granules

Exp. Eosinophils have a distinctive bilobed nucleus and large, red-orange granules in their cytoplasm.

Ans. (c) Myelodysplastic syndrome

Exp. Ringed sideroblasts, which are abnormal erythroblasts with iron-loaded mitochondria forming a ring around the nucleus, are a characteristic finding in myelodysplastic syndromes.

Osmotic Fragility Test

1. What is the osmotic fragility test primarily used to assess?

- (a) Platelet aggregation
- (b) White blood cell count
- (c) Red blood cell membrane stability
- (d) Hemoglobin concentration

Ans. (b) Red blood cell membrane stability

Exp. The osmotic fragility test evaluates the stability of red blood cell membranes in hypotonic solutions, helping to diagnose conditions like hereditary spherocytosis where membrane integrity is compromised.

2. Which condition is associated with increased osmotic fragility?

- (a) Chronic lymphocytic leukemia
- (b) Iron deficiency anemia
- (c) Polycythemia vera
- (d) Hereditary spherocytosis

Ans. (d) Hereditary spherocytosis

Exp. In hereditary spherocytosis, red blood cells are more fragile due to abnormalities in their membranes, making them more prone to rupture in hypotonic solutions, which increases osmotic fragility.

3. How does the osmotic fragility test work?

- (a) It measures red blood cell destruction in hypotonic solutions
- (b) It counts red blood cells under a microscope
- (c) It calculates hemoglobin content
- (d) It evaluates the size of red blood cells

Ans. (a) It measures red blood cell destruction in hypotonic solutions

Exp. The osmotic fragility test exposes red blood cells to decreasing concentrations of saline, and the degree of hemolysis is measured, indicating the stability of the cell membrane.

4. Which type of solution is used in the osmotic fragility test?

- (a) Distilled water
- (b) Isotonic saline solution
- (c) Hypertonic saline solution
- (d) Hypotonic saline solution

Ans. (d) Hypotonic saline solution

Exp. Hypotonic saline solutions are used in the osmotic fragility test to stress the red blood cells' membranes, causing cells with weaker membranes to lyse more readily.

5. What is the normal range of osmotic fragility for red blood cells?

- (a) Hemolysis begins at 0.35% saline and is complete at 0.25% saline
- (b) Hemolysis begins at 0.55% saline and is complete at 0.65% saline
- (c) Hemolysis begins at 0.45% saline and is complete at 0.35% saline
- (d) Hemolysis begins at 0.65% saline and is complete at 0.75% saline

Ans. (c) Hemolysis begins at 0.45% saline and is complete at 0.35% saline

Exp. In a normal osmotic fragility test, hemolysis typically begins at 0.45% saline and is complete at 0.35% saline. Variations from this range suggest membrane abnormalities.

6. In the osmotic fragility test, red blood cells are most likely to lyse in:

- (a) Hypertonic solutions
- (b) Neutral solutions
- (c) Isotonic solutions
- (d) Hypotonic solutions

Ans. (d) Hypotonic solutions

Exp. RBCs are more prone to lyse in hypotonic solutions as water enters the cells, causing them to swell and burst.

7. A right shift in the osmotic fragility test curve indicates:

- (a) Increased fragility
- (b) Decreased fragility
- (c) Normal fragility
- (d) No fragility

Ans. (b) Decreased fragility

Exp. A rightward shift on the OFT graph indicates decreased fragility of red blood cells.

Clinical Pathology

Urine Analysis

1. What is the primary waste product excreted in urine?

- (a) Urea (b) Glucose
(c) Albumin (d) Hemoglobin

Ans. (b) Urea

Exp. Urea, a byproduct of protein metabolism, is the major nitrogenous waste excreted in urine, accounting for around 90% of the total nitrogen in urine.

2. Which of the following is correct regarding the collection of urine specimens?

- (a) Urine should be collected midstream
(b) First-morning urine is discarded
(c) Urine is best collected in the afternoon
(d) Urine should be stored at room temperature for 24 hours

Ans. (a) Urine should be collected midstream

Exp. Midstream urine collection reduces contamination from the urethra and external genitalia.

3. Which component of urine gives it a characteristic yellow color?

- (a) Urobilinogen (b) Hemoglobin
(c) Bilirubin (d) Urochrome

Ans. (d) Urochrome

Exp. Urochrome is a pigment that gives urine its yellow color, formed from the breakdown of hemoglobin.

4. What is the normal pH range for freshly voided urine?

- (a) 2.0-3.0 (b) 4.5-8.0
(c) 9.0-10.0 (d) 11.0-12.0

Ans. (b) 4.5-8.0

Exp. The normal urine pH ranges from 4.5 to 8.0, depending on diet and systemic conditions.

5. Which chemical test is used to detect glucose in urine?

- (a) Benedict's test (b) Iodine test
(c) Biuret test (d) Sulkowitch test

Ans. (a) Benedict's test

Exp. Benedict's test detects reducing sugars like glucose in urine, commonly used in diabetes testing.

6. What is the typical specific gravity of urine?

- (a) 1.005-1.030 (b) 1.030-1.050
(c) 1.000-1.010 (d) 1.050-1.100

Ans. (a) 1.005-1.030

Exp. The specific gravity reflects the concentration of solutes in urine, with normal ranges from 1.005 to 1.030.

7. Which of the following is NOT typically found in normal urine?

- (a) Urea (b) Creatinine
(c) Glucose (d) Chloride

Ans. (c) Glucose

Exp. Glucose is not normally present in urine and may indicate conditions like diabetes if found.

8. Which cells are commonly seen during microscopic examination of urine?

- (a) Red blood cells (b) White blood cells
(c) Epithelial cells (d) Platelets

Ans. (c) Epithelial cells

Exp. Epithelial cells, shed from the lining of the urinary tract, are commonly found in urine samples.

9. The presence of ketones in urine suggests what underlying condition?

19. A 40-year-old woman with known liver cirrhosis presents with fever and abdominal pain. Ascitic fluid analysis reveals a white blood cell count of 350 cells/ μL , predominantly neutrophils. What is the next step in management?

- (a) Administer broad-spectrum antibiotics
- (b) Perform a liver biopsy
- (c) Order a CT scan of the abdomen
- (d) Repeat the ascitic fluid analysis in 48 hours

Ans. (a) Administer broad-spectrum antibiotics

Exp. A neutrophil count above 350 cells/ μL in ascitic fluid suggests spontaneous bacterial peritonitis (SBP), which requires immediate treatment with broad-spectrum antibiotics.

20. A 55-year-old male presents with shortness of breath and pleural effusion. Pleural fluid analysis shows a milky appearance and elevated triglycerides. What is the most likely diagnosis?

- (a) Empyema
- (b) Chylothorax
- (c) Pneumonia
- (d) Pulmonary embolism

Ans. (b) Chylothorax

Exp. A milky appearance and elevated triglycerides in pleural fluid are characteristic of chylothorax, caused by lymphatic obstruction or trauma.

**General Principles of
Histo-Pathological Work:
Collection of Specimen,
Numbering, and Giving Tissue Bits**

1. What is the first step in the histopathology specimen collection process?

- (a) Numbering
- (b) Fixation
- (c) Documentation
- (d) Trimming

Ans. (c) Documentation

Exp. The first step is proper documentation, which involves identifying the specimen, recording patient information, and ensuring correct labeling. This is critical to prevent errors later in the process.

2. Why is accurate labeling important in histopathology?

- (a) To track the specimen's origin
- (b) To avoid contamination
- (c) To ensure correct diagnosis
- (d) To maintain temperature

Ans. (a) To track the specimen's origin

Exp. Accurate labeling ensures that the specimen can be traced back to the correct patient and anatomical site. Any mislabeling can lead to incorrect diagnosis and treatment.

3. What is the role of tissue numbering in histopathology?

- (a) To categorize tissue size
- (b) To assign unique identifiers
- (c) To record the weight
- (d) To count the cells

Ans. (b) To assign unique identifiers

Exp. Each specimen is given a unique number to ensure proper identification throughout the processing and reporting phases, preventing mix-ups or errors.

4. Why is the selection of tissue bits important during sampling?

- (a) To preserve cells
- (b) To avoid excess tissue
- (c) To represent the lesion
- (d) To minimize chemicals

Ans. (c) To represent the lesion

Exp. Tissue bits must be representative of the lesion or disease area. If unrepresentative tissue is chosen, it can lead to misdiagnosis.

5. What is the most common method for collecting a specimen in histopathology?

- (a) Biopsy
- (b) Fine-needle aspiration
- (c) Punch biopsy
- (d) Surgical excision

Ans. (a) Biopsy

Exp. A biopsy is the most common method where a small piece of tissue is removed for examination under a microscope to determine the presence or extent of disease.

6. What does the term "grossing" refer to in histopathology?

- (a) Macroscopic examination
- (b) Viewing under a microscope
- (c) Weighing the specimen
- (d) Cutting tissue

Ans. (a) Macroscopic examination

Exp. Grossing refers to the macroscopic examination of the specimen to describe its size, color, texture, and any visible lesions. This step is crucial for selecting the area for microscopic analysis.

Exp. Leuk-Hart moulds can be sterilized by autoclaving, as they are heat-resistant and can withstand high temperatures without deforming.

Microtome : Types and uses

1. What is the primary function of a microtome in histopathology?

- (a) Staining tissue samples
- (b) Embedding tissue samples
- (c) Cutting thin sections of tissue
- (d) Fixing tissue samples

Ans. (c) Cutting thin sections of tissue

Exp. A microtome is used to cut very thin slices of tissue for microscopic examination.

2. Which part of the microtome holds the knife or blade in place?

- (a) Knife holder (b) Stage
- (c) Rotary wheel (d) Specimen clamp

Ans. (a) Knife holder

Exp. The knife holder securely holds the microtome blade, ensuring precise cutting of tissue sections.

3. What is the most commonly used type of microtome in routine histopathology?

- (a) Cryostat
- (b) Rotary microtome
- (c) Sliding microtome
- (d) Ultramicrotome

Ans. (b) Rotary microtome

Exp. The rotary microtome is widely used in laboratories for cutting paraffin-embedded tissue sections.

4. Which part of a rotary microtome is responsible for moving the specimen forward for each cut?

- (a) Specimen holder
- (b) Coarse adjustment knob
- (c) Micrometer screw
- (d) Knife guard

Ans. (c) Micrometer screw

Exp. The micrometer screw advances the specimen holder, allowing the tissue to be moved forward by a precise amount for each slice.

5. Which of the following is NOT a type of microtome used in histopathology?

- (a) Rotary microtome
- (b) Sliding microtome
- (c) Electron microtome
- (d) Freezing microtome

Ans. (c) Electron microtome

Exp. Electron microtomes are used in electron microscopy, not conventional histopathology.

6. In a sliding microtome, which part moves during sectioning?

- (a) Blade (b) Specimen
- (c) Knife holder (d) Rotary wheel

Ans. (a) Blade

Exp. In a sliding microtome, the knife slides over a stationary specimen block to produce sections.

7. Which type of microtome is best suited for cutting frozen tissue sections?

- (a) Rotary microtome
- (b) Vibrating microtome
- (c) Cryostat
- (d) Sliding microtome

Ans. (c) Cryostat

Exp. Cryostats are specialized microtomes used for cutting frozen tissue sections, ideal for quick diagnosis.

8. Which microtome is primarily used for ultra-thin sections, often for electron microscopy?

- (a) Rotary microtome
- (b) Sliding microtome
- (c) Ultramicrotome
- (d) Cryostat

Ans. (c) Ultramicrotome

Exp. Ultramicrotomes are used for cutting sections thinner than 100 nm, suitable for electron microscopy.

9. Which part of the microtome holds the tissue block?

- (a) Blade holder (b) Specimen clamp
- (c) Stage (d) Rotary wheel

Ans. (b) Specimen clamp

Exp. The specimen clamp holds the tissue block in place during sectioning.

10. Which of the following is adjusted to change the thickness of the sections in a microtome?

- (a) Blade angle
- (b) Specimen holder
- (c) Thickness adjustment knob
- (d) Knife guard

Ans. (c) Thickness adjustment knob

Biochemistry

Solution : Normal, Molar, Saturated, Unsaturated & Buffer

1. What is a normal solution?

- (a) A solution with 1 mole of solute in 1 liter of solvent
- (b) A solution containing 1 equivalent of solute in 1 liter of solvent
- (c) A solution with 1 gram of solute in 1 liter of solvent
- (d) A solution with an unknown concentration of solute

Ans. (b) A solution containing 1 equivalent of solute in 1 liter of solvent

Exp. A normal solution contains one equivalent of solute per liter of solvent.

2. Which of the following defines a molar solution?

- (a) 1 mole of solute dissolved in 1 liter of solution
- (b) 1 equivalent of solute dissolved in 1 liter of solution
- (c) 1 mole of solute in 500 mL of solution
- (d) A solution that has variable solute concentration

Ans. (a) 1 mole of solute dissolved in 1 liter of solution

Exp. A molar solution consists of 1 mole of solute in 1 liter of solution.

3. A saturated solution is.

- (a) A solution with more solvent than solute
- (b) A solution with 1 mole of solute in 1 liter of solvent
- (c) A solution that is diluted
- (d) A solution that cannot dissolve more solute at a given temperature

Ans. (d) A solution that cannot dissolve more solute at a given temperature

Exp. A saturated solution cannot dissolve any more solute under specific conditions.

4. What is an unsaturated solution?

- (a) A solution with excess solute dissolved
- (b) A solution that can still dissolve more solute at a given temperature
- (c) A solution with less solute than solvent
- (d) A solution that is highly concentrated

Ans. (b) A solution that can still dissolve more solute at a given temperature

Exp. An unsaturated solution has the capacity to dissolve more solute at a particular temperature.

5. Which one of the following describes a buffer solution?

- (a) A solution that changes pH rapidly when an acid is added
- (b) A solution that resists changes in pH when small amounts of acid or base are added
- (c) A solution that has no change in temperature
- (d) A solution with high solute concentration

Ans. (b) A solution that resists changes in pH when small amounts of acid or base are added

Exp. A buffer solution maintains its pH when small amounts of acids or bases are introduced.

6. The concentration of a molar solution is expressed in.

- (a) Moles per liter
- (b) Milligrams per liter
- (c) Grams per liter
- (d) Kilograms per liter

Ans. (a) Moles per liter

Exp. Molar concentration is expressed in moles per litre.

lipids

1. **The primary function of lipids in the body is to.**

- (a) Store energy
- (b) Provide immediate energy
- (c) Synthesize DNA
- (d) Facilitate oxygen transport

Ans. (a) Store energy

Exp. Lipids, primarily in the form of triglycerides, are used for long-term energy storage in the body.

2. **Which of the following is a lipid that serves as a precursor for steroid hormones?**

- (a) Cholesterol
- (b) Phospholipids
- (c) Triglycerides
- (d) Glycogen

Ans. (a) Cholesterol

Exp. Cholesterol is the precursor for steroid hormones such as estrogen, testosterone, and cortisol.

3. **Which of the following lipoproteins is responsible for transporting cholesterol from the liver to peripheral tissues?**

- (a) HDL
- (b) LDL
- (c) VLDL
- (d) Chylomicrons

Ans. (b) LDL

Exp. Low-density lipoprotein (LDL) transports cholesterol from the liver to peripheral tissues and is often referred to as “bad cholesterol.”

4. **Lipid digestion begins in the.**

- (a) Mouth
- (b) Stomach
- (c) Small intestine
- (d) Large intestine

Ans. (c) Small intestine

Exp. Lipid digestion primarily begins in the small intestine with the help of bile salts and pancreatic lipase.

5. **Which of the following is a ketone body produced during the breakdown of fatty acids?**

- (a) Acetone
- (b) Glucose
- (c) Urea
- (d) Glycerol

Ans. (a) Acetone

Exp. Acetone is one of the three ketone bodies produced during the breakdown of fatty acids for energy, especially during fasting or carbohydrate restriction.

6. **Which of the following lipoproteins is involved in reverse cholesterol transport, carrying cholesterol from tissues back to the liver?**

- (a) Chylomicrons
- (b) LDL
- (c) VLDL
- (d) HDL

Ans. (d) HDL

Exp. High-density lipoprotein (HDL) is involved in reverse cholesterol transport, carrying cholesterol from peripheral tissues back to the liver for excretion.

7. **Triglycerides are composed of.**

- (a) Three fatty acids and one glycerol molecule
- (b) Two fatty acids and one glucose molecule
- (c) Three glucose molecules and one fatty acid
- (d) One amino acid and one fatty acid

Ans. (a) Three fatty acids and one glycerol molecule

Exp. Triglycerides consist of three fatty acid chains attached to one glycerol molecule and are the primary form of fat stored in the body.

8. **Which enzyme is responsible for breaking down triglycerides in the small intestine?**

- (a) Amylase
- (b) Lipase
- (c) Pepsin
- (d) Lactase

Ans. (b) Lipase

Exp. Pancreatic lipase breaks down triglycerides into fatty acids and glycerol in the small intestine.

9. **Which of the following is considered “good cholesterol” because it helps remove cholesterol from the bloodstream?**

- (a) LDL
- (b) HDL
- (c) VLDL
- (d) Triglycerides

Ans. (b) HDL

Exp. HDL is known as “good cholesterol” because it helps remove cholesterol from the bloodstream and transport it to the liver for excretion.

10. **A patient’s blood test shows elevated levels of LDL cholesterol. This increases the risk of.**

- (a) Atherosclerosis
- (b) Hypoglycemia
- (c) Hypertension
- (d) Liver disease

Ans. (a) Atherosclerosis

Exp. Elevated levels of LDL cholesterol are associated with an increased risk of atherosclerosis, which can lead to cardiovascular diseases like heart attacks and strokes.

11. **Which process describes the breakdown of lipids for energy during periods of fasting or carbohydrate restriction?**

Exp. SGPT (ALT) is another enzyme elevated in bile duct obstruction, often used alongside alkaline phosphatase to assess liver dysfunction.

77. In cases of suspected bone disease with elevated alkaline phosphatase, which enzyme is typically NOT elevated?

- (a) Amylase
- (b) Creatine kinase
- (c) Acid phosphatase
- (d) SGPT (ALT)

Ans. (d) SGPT (ALT)

Exp. SGPT (ALT) is more specific to liver damage and is not typically elevated in bone diseases like osteoporosis or Paget's disease.

78. A patient presents with severe muscle pain and a diagnosis of rhabdomyolysis. Which enzyme is used to monitor muscle damage in this condition?

- (a) Lipase
- (b) Alkaline phosphatase
- (c) SGOT (AST)
- (d) Creatine kinase

Ans. (d) Creatine kinase

Exp. Creatine kinase levels are significantly elevated in rhabdomyolysis due to muscle breakdown and are monitored to assess the extent of muscle damage.

Vitamins

Vitamin : A

1. What is the common name for Vitamin A?

- (a) Phylloquinone
- (b) Ascorbic acid
- (c) Tocopherol
- (d) Retinol

Ans. (d) Retinol

Exp. Vitamin A is commonly known as Retinol.

2. Which of the following is a precursor of Vitamin A?

- (a) Thiamine
- (b) Niacin
- (c) $\hat{\alpha}$ -carotene
- (d) Riboflavin

Ans. (c) $\hat{\alpha}$ -carotene

Exp. $\hat{\alpha}$ -carotene is a provitamin that is converted into Vitamin A in the body.

3. Which of the following is the active form of Vitamin A?

- (a) Retinal
- (b) Retinol
- (c) Retinoic acid
- (d) All of the above

Ans. (d) All of the above

Exp. Retinal, Retinol, and Retinoic acid are all active forms of Vitamin A with distinct functions.

4. Vitamin A can be classified as.

- (a) Protein-soluble
- (b) Water-soluble
- (c) Fat-soluble
- (d) Alcohol-soluble

Ans. (c) Fat-soluble

Exp. Vitamin A is a fat-soluble vitamin, meaning it is stored in the body's fatty tissues.

5. Which of the following statements about Vitamin A synthesis by intestinal bacteria is correct?

- (a) Vitamin A is synthesized by intestinal bacteria
- (b) Vitamin A is not synthesized by intestinal bacteria
- (c) Only $\hat{\alpha}$ -carotene is synthesized by bacteria
- (d) Intestinal bacteria synthesize active Retinol

Ans. (b) Vitamin A is not synthesized by intestinal bacteria

Exp. Unlike some B vitamins and Vitamin K, Vitamin A is not synthesized by intestinal bacteria.

6. Which of the following is a primary function of Vitamin A in the body?

- (a) Blood clotting
- (b) Vision in low light
- (c) Collagen synthesis
- (d) Calcium absorption

Ans. (b) Vision in low light

Exp. Vitamin A is essential for the formation of rhodopsin, a pigment in the retina that helps in low-light vision.

7. Retinoic acid, a derivative of Vitamin A, primarily affects.

- (a) Eye function
- (b) Glucose metabolism
- (c) Muscle contraction
- (d) Cell differentiation

Ans. (d) Cell differentiation

Exp. Retinoic acid plays a crucial role in regulating cell growth and differentiation.

8. Which of the following is the richest dietary source of Vitamin A?

- (a) Liver
- (b) Spinach
- (c) Milk
- (d) Whole grains

Ans. (a) Liver

Exp. Liver is an exceptionally rich source of preformed Vitamin A (Retinol).

9. Carrots are a good source of which form of Vitamin A?

- (a) Gallbladder disease
- (b) Pancreatic cancer
- (c) Hepatitis
- (d) Kidney failure

Ans. (a) Gallbladder disease

Exp. Elevated amylase levels with normal lipase levels may suggest a condition like gallbladder disease, as lipase is more specific to pancreatic inflammation.

21. A patient with chronic pancreatitis has reduced levels of amylase. What does this suggest about the progression of the disease?

- (a) Improved pancreatic function
- (b) Ongoing pancreatic inflammation
- (c) Severe pancreatic damage
- (d) Liver failure

Ans. (c) Severe pancreatic damage

Exp. Reduced amylase levels in chronic pancreatitis suggest severe pancreatic damage, where the pancreas is no longer able to produce sufficient enzymes.

22. A patient with elevated lipase and normal amylase levels is diagnosed with pancreatitis. What is the significance of the elevated lipase?

- (a) It indicates a chronic condition
- (b) It confirms gallbladder disease
- (c) It indicates severe pancreatic inflammation
- (d) It suggests liver dysfunction

Ans. (c) It indicates severe pancreatic inflammation

Exp. Elevated lipase levels in the absence of elevated amylase indicate severe pancreatic inflammation, which is more specific for diagnosing pancreatitis.

23. A patient with acute pancreatitis has elevated lipase levels that remain high for several days. What is the most appropriate next step in monitoring the patient's condition?

- (a) Perform a liver biopsy
- (b) Continue monitoring enzyme levels and symptoms
- (c) Administer corticosteroids
- (d) Perform cardiac enzymes

Ans. (b) Continue monitoring enzyme levels and symptoms

Exp. Continued monitoring of enzyme levels and symptoms is necessary in cases of acute pancreatitis to assess the progression and response to treatment.

24. A patient with chronic pancreatitis presents with malabsorption and weight loss. Which pancreatic enzyme supplementation would be most beneficial?

- (a) Lipase
- (b) Amylase
- (c) Trypsin
- (d) Protease

Ans. (a) Lipase

Exp. Lipase supplementation is commonly used in chronic pancreatitis to aid in fat digestion and improve symptoms of malabsorption and weight loss.

Hemoglobin Biosynthesis, Breakdown and Porphyrins

1. Hemoglobin is composed of.

- (a) One heme group and two globin chains
- (b) Four heme groups and four globin chains
- (c) Two heme groups and two globin chains
- (d) Three heme groups and two globin chains

Ans. (b) Four heme groups and four globin chains

Exp. Hemoglobin consists of four heme groups and four globin chains, which bind oxygen for transport in the blood.

2. The primary function of hemoglobin is to.

- (a) Transport glucose
- (b) Transport oxygen
- (c) Transport carbon dioxide
- (d) Transport lipids

Ans. (b) Transport oxygen

Exp. Hemoglobin's primary function is to transport oxygen from the lungs to the tissues.

3. Heme is synthesized in which of the following organs?

- (a) Liver and bone marrow
- (b) Kidneys and liver
- (c) Lungs and bone marrow
- (d) Spleen and kidneys

Ans. (a) Liver and bone marrow

Exp. Heme is synthesized primarily in the liver and bone marrow, where red blood cells are produced.

4. The globin chains in hemoglobin are composed of.

- (a) Carbohydrates
- (b) Lipids
- (c) Amino acids
- (d) Nucleotides

Microbiology

Historical Introduction

1. **Who is considered the father of microbiology?**

- (a) Louis Pasteur (b) Joseph Lister
(c) Robert Koch (d) Paul Ehrlich

Ans. (a) Louis Pasteur

Exp. Louis Pasteur made significant contributions to the field of microbiology, including the development of pasteurization and vaccines.

2. **Which scientist is known for his work in antiseptic surgery?**

- (a) Louis Pasteur (b) Joseph Lister
(c) Robert Koch (d) Paul Ehrlich

Ans. (b) Joseph Lister

Exp. Joseph Lister is famous for introducing antiseptic surgical techniques, reducing postoperative infections.

3. **Robert Koch is best known for his discovery of:**

- (a) Penicillin (b) Tuberculosis bacillus
(c) Polio vaccine (d) Smallpox vaccine

Ans. (b) Tuberculosis bacillus

Exp. Robert Koch identified the causative agents of tuberculosis, cholera, and anthrax.

4. **Who discovered the first effective treatment for syphilis?**

- (a) Louis Pasteur (b) Joseph Lister
(c) Robert Koch (d) Paul Ehrlich

Ans. (d) Paul Ehrlich

Exp. Paul Ehrlich developed Salvarsan, the first effective treatment for syphilis along with sahachiro hata.

5. **Louis Pasteur disproved the theory of:**

- (a) Germ theory
(b) Spontaneous generation
(c) Evolution
(d) Cell theory

Ans. (b) Spontaneous generation

Exp. Pasteur's experiments with swan-neck flasks demonstrated that microorganisms are not spontaneously generated.

6. **The method of preventing disease by exposure to a weakened or killed pathogen is known as:**

- (a) Vaccination (b) Sterilization
(c) Antisepsis (d) Chemotherapy

Ans. (a) Vaccination

Exp. Vaccine against small pox is the 1st discovered vaccine known and was discovered by Edward Jenner.

7. **Joseph Lister's contribution to microbiology primarily involved:**

- (a) Vaccine development
(b) Antibiotic discovery
(c) Antiseptic surgery
(d) Bacterial classification

Ans. (c) Antiseptic surgery

Exp. Lister's use of carbolic acid as an antiseptic greatly reduced infections in surgical patients.

8. **Paul Ehrlich's work led to the development of:**

- (a) Vaccines (b) Antibiotics
(c) Chemotherapy (d) Antiseptics

Ans. (c) Chemotherapy

Exp. Ehrlich's work on selective toxicity laid the foundation for chemotherapy.

- A. Kingdom B. Phylum
C. Genus D. Species

List II:

1. A group of similar species
 2. The highest taxonomic rank
 3. A group of similar genera
 4. A group of strains sharing high genetic similarity
- (a) A-2, B-3, C-1, D-4
(b) A-2, B-4, C-1, D-3
(c) A-2, B-1, C-3, D-4
(d) A-3, B-1, C-4, D-2

Ans. (a) A-2, B-3, C-1, D-4

Exp. Kingdom is the highest taxonomic rank, phylum is a group of similar genera, genus is a group of similar species, and species is a group of strains sharing high genetic similarity.

43. Match the method with its type of classification:

List I:

- A. Biochemical tests
B. DNA-DNA hybridization
C. 16S rRNA sequencing
D. Adansonian classification

List II:

1. Genetic classification
 2. Phenotypic classification
 3. Numerical classification
 4. Evolutionary classification
- (a) A-2, B-3, C-4, D-1
(b) A-3, B-4, C-2, D-1
(c) A-2, B-1, C-4, D-3
(d) A-2, B-4, C-1, D-3

Ans. (c) A-2, B-1, C-4, D-3

Exp. Biochemical tests are used in phenotypic classification, DNA-DNA hybridization in genetic classification, 16S rRNA sequencing in evolutionary classification, and Adansonian classification in numerical classification.

44. Match the classification level with its example:

List I:

- A. Phylum
B. Genus
C. Species
D. Strain

List II:

1. Escherichia coli
2. Enterobacteriaceae
3. Escherichia
4. E. coli K-12

- (a) A-2, B-4, C-3, D-1
(b) A-2, B-3, C-4, D-1
(c) A-2, B-3, C-1, D-4
(d) A-2, B-4, C-1, D-3

Ans. (c) A-2, B-3, C-1, D-4

Exp. Enterobacteriaceae is an example of a phylum, Escherichia is a genus, Escherichia coli is a species, and E. coli K-12 is a strain.

Bacterial Genetics

1. Bacterial chromosomes are typically:

- (a) Linear (b) Circular
(c) Multiple (d) Diploid

Ans. (b) Circular

Exp. Most bacteria have a single, circular chromosome.

2. The process by which bacterial DNA is transferred from one cell to another by a bacteriophage is called:

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

Ans. (c) Transduction

Exp. Transduction involves the transfer of bacterial DNA by a bacteriophage.

3. Which enzyme is responsible for synthesizing new DNA strands during DNA replication in bacteria?

- (a) DNA polymerase (b) RNA polymerase
(c) Ligase (d) Reverse transcriptase

Ans. (a) DNA polymerase

Exp. DNA polymerase synthesizes new DNA strands by adding nucleotides to a growing DNA chain.

4. The uptake of naked DNA from the environment by a bacterial cell is known as:

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

Ans. (c) Transformation

Exp. Transformation involves the uptake of naked DNA from the environment by a bacterial cell.

5. Which process involves the direct transfer of genetic material between two bacterial cells that are temporarily joined?

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

Ans. (b) Conjugation

Exp. Conjugation is the process by which genetic material is directly transferred between two bacterial cells that are temporarily joined.

1. Blood typing
 2. Peripheral blood film examination
 3. Crossmatching
 4. Screening for infectious diseases
- (a) 1, 2 and 3 (b) 2, 3 and 4
(c) 1, 3 and 4 (d) 1, 2, and 4

Ans. (c) 1, 3 and 4

Exp. Ensuring blood transfusion safety involves blood typing, crossmatching, and screening for infectious diseases.

44. Match the blood group with its corresponding antibodies:

List I:

- A. Type A
- B. Type B
- C. Type AB
- D. Type O

List II:

1. Anti-B antibodies
 2. Anti-A antibodies
 3. No antibodies against A or B
 4. Both anti-A and anti-B antibodies
- (a) A-1, B-2, C-3, D-4
(b) A-2, B-1, C-4, D-3
(c) A-1, B-4, C-2, D-3
(d) A-2, B-1, C-3, D-4

Ans. (a) A-1, B-2, C-3, D-4

Exp. Type A has anti-B antibodies, Type B has anti-A antibodies, Type AB has no antibodies against A or B, and Type O has both anti-A and anti-B antibodies.

45. Match the blood transfusion reaction with its description:

List I:

- A. Hemolytic transfusion reaction
- B. Febrile non-hemolytic transfusion reaction
- C. Allergic transfusion reaction
- D. Transfusion-related acute lung injury (TRALI)

List II:

1. Reaction involving donor leukocytes causing fever
 2. Severe immune reaction with hemolysis
 3. Allergic reaction to plasma proteins
 4. Acute lung injury due to immune response
- (a) A-2, B-1, C-3, D-4
(b) A-1, B-2, C-3, D-4
(c) A-2, B-4, C-1, D-3
(d) A-4, B-3, C-2, D-1

Ans. (a) A-2, B-1, C-3, D-4

Exp. Hemolytic transfusion reaction involves severe immune reaction with hemolysis, febrile non-hemolytic transfusion reaction involves donor leukocytes causing fever, allergic transfusion reaction involves reaction to plasma proteins, and TRALI involves acute lung injury due to immune response.

46. Match the test with its purpose in blood transfusion:

List I:

- A. Blood typing
- B. Crossmatching
- C. Direct Coombs test
- D. Indirect Coombs test

List II:

1. Ensure compatibility between donor and recipient
 2. Identify blood group antigens
 3. Detect antibodies bound to red blood cells
 4. Detect free antibodies in the serum
- (a) A-1, B-2, C-4, D-3
(b) A-2, B-1, C-3, D-4
(c) A-2, B-1, C-4, D-3
(d) A-4, B-3, C-2, D-1

Ans. (b) A-2, B-1, C-3, D-4

Exp. Blood typing identifies blood group antigens, crossmatching ensures compatibility between donor and recipient, the direct Coombs test detects antibodies bound to red blood cells, and the indirect Coombs test detects free antibodies in the serum.

47. Match the type of blood donation with its description:

List I:

- A. Autologous donation
- B. Allogeneic donation
- C. Directed donation
- D. Apheresis donation

List II:

1. Blood donation from one person for another
 2. Blood donation from the same individual for future use
 3. Donation of specific blood components
 4. Blood donation from a specific donor for a specific recipient
- (a) A-4, B-3, C-2, D-1
(b) A-2, B-1, C-3, D-4
(c) A-3, B-4, C-1, D-2
(d) A-2, B-1, C-4, D-3

Ans. (d) A-2, B-1, C-4, D-3

Exp. Autologous donation is blood donation from the same individual for future use, allogeneic donation is from one person for another, directed donation is from a specific donor for a specific recipient, and apheresis donation involves the donation of specific blood components.

Staphylococcus

1. What is the typical arrangement of Staphylococcus aureus?

- (a) Chains (b) Pairs
(c) Clusters (d) Single cells

Ans. (c) Clusters

Exp. Staphylococcus aureus typically forms grape-like clusters.

2. Which of the following tests is used to differentiate Staphylococcus aureus from other Staphylococci?

- (a) Coagulase test (b) Catalase test
(c) Oxidase test (d) Urease test

Ans. (a) Coagulase test

Exp. The coagulase test is used to differentiate Staphylococcus aureus, which is coagulase-positive, from other Staphylococci, which are coagulase-negative.

3. Which pigment is produced by Staphylococcus aureus?

- (a) Pyocyanin (b) Prodigiosin
(c) Staphyloxanthin (d) Green

Ans. (c) Staphyloxanthin

Exp. Staphyloxanthin is a carotenoid pigment that is produced by some strains of Staphylococcus aureus, and is responsible for the characteristic golden yellow color.

4. What is the primary habitat of Staphylococcus epidermidis?

- (a) Soil (b) Water
(c) Human skin (d) Air

Ans. (c) Human skin

Exp. Staphylococcus epidermidis is primarily found on human skin.

5. Which of the following enzymes is produced by Staphylococcus aureus and contributes to its virulence?

- (a) Thermoneuclease
(b) DNase
(c) Coagulase
(d) All of the above

Ans. (d) All of the above

Exp. Staphylococcus aureus produces various enzymes like thermoneuclease, DNase, and coagulase, contributing to its virulence.

6. Which of the following antibiotics is Staphylococcus aureus commonly resistant to?

- (a) Penicillin (b) Vancomycin
(c) Ciprofloxacin (d) Amoxicillin

Ans. (a) Penicillin

Exp. Staphylococcus aureus is commonly resistant to penicillin due to the production of beta-lactamase.

7. The mecA gene in Staphylococcus aureus is responsible for resistance to which antibiotic?

- (a) Erythromycin (b) Methicillin
(c) Tetracycline (d) Gentamicin

Ans. (b) Methicillin

Exp. The mecA gene encodes a penicillin-binding protein (PBP2a) that confers resistance to methicillin and other beta-lactam antibiotics.

8. Which toxin produced by Staphylococcus aureus causes scalded skin syndrome?

- (a) Exfoliative toxin
(b) Enterotoxin
(c) Toxic shock syndrome toxin
(d) Hemolysin

Ans. (a) Exfoliative toxin

Exp. Exfoliative toxin produced by Staphylococcus aureus is responsible for scalded skin syndrome.

9. What is the shape of Staphylococcus aureus cells?

- (a) Rod-shaped (b) Spiral
(c) Coccus (d) Filamentous

Ans. (c) Coccus

Exp. Staphylococcus aureus cells are spherical (coccus) in shape.

10. Staphylococcus saprophyticus is most commonly associated with which type of infection?

- (a) Respiratory infections

Bacillus

1. **What is the Gram stain characteristic of Bacillus anthracis?**

- (a) Gram-positive rods
- (b) Gram-negative rods
- (c) Gram-positive cocci
- (d) Gram-negative cocci

Ans. (a) Gram-positive rods

Exp. Bacillus anthracis appears as Gram-positive rods.

2. **Which medium is used to culture Bacillus anthracis?**

- (a) MacConkey agar
- (b) Blood agar
- (c) Chocolate agar
- (d) Loeffler's medium

Ans. (b) Blood agar

Exp. Bacillus anthracis is typically cultured on blood agar.

3. **Which test is used to confirm the presence of Bacillus anthracis in a clinical specimen?**

- (a) Gram stain
- (b) PCR for toxin genes
- (c) Capsule staining
- (d) All of the above

Ans. (d) All of the above

Exp. Gram stain, PCR for toxin genes, Capsule staining, and are used to confirm Bacillus anthracis.

4. **What is the primary virulence factor of Bacillus anthracis?**

- (a) Capsule
- (b) Anthrax toxin
- (c) Endotoxin
- (d) Pilus

Ans. (b) Anthrax toxin

Exp. Anthrax toxin is the primary virulence factor of Bacillus anthracis.

5. **Which enzyme is produced by Bacillus anthracis and contributes to its pathogenesis?**

- (a) Hyaluronidase
- (b) DNase
- (c) Lethal factor
- (d) Coagulase

Ans. (c) Lethal factor

Exp. Lethal factor is a component of anthrax toxin and contributes to the pathogenesis of Bacillus anthracis.

6. **What is the habitat of Bacillus anthracis?**

- (a) Soil
- (b) Water
- (c) Air
- (d) All of the above

Ans. (d) All of the above

Exp. Bacillus anthracis primarily resides in the soil, water and air.

7. **Which of the following is a common complication of inhalational anthrax?**

- (a) Pneumonia
- (b) Tuberculosis
- (c) Infectious mononucleosis
- (d) Meningitis

Ans. (a) Pneumonia

Exp. Pneumonia is a common complication of inhalational anthrax.

8. **What type of vaccine is available for anthrax?**

- (a) Subunit vaccine
- (b) Inactivated vaccine
- (c) Toxoid vaccine
- (d) Live attenuated vaccine

Ans. (a) Subunit vaccine

Exp. The anthrax vaccine is a subunit vaccine that contains protective antigen.

9. **Which test is used to detect the protective antigen of Bacillus anthracis?**

- (a) Elek test
- (b) Schick test
- (c) ELISA
- (d) Coagulase test

Ans. (c) ELISA

Exp. ELISA is used to detect the protective antigen of Bacillus anthracis.

10. **What is the primary mode of transmission for Bacillus anthracis infections?**

- (a) Airborne transmission
- (b) Direct contact
- (c) Vector-borne transmission
- (d) Ingestion

Ans. (a) Airborne transmission

Exp. Bacillus anthracis is primarily transmitted through inhalation of spores.

11. **Which of the following conditions is NOT typically caused by Bacillus anthracis?**

- (a) Cutaneous anthrax
- (b) Inhalational anthrax
- (c) Gastrointestinal anthrax
- (d) Endocarditis

Ans. (d) Endocarditis

Exp. Bacillus anthracis is not typically associated with endocarditis.

12. **Which of the following antibiotics is commonly used to treat anthrax?**

- (a) Penicillin
- (b) Ciprofloxacin
- (c) Vancomycin
- (d) Erythromycin

Ans. (b) Ciprofloxacin

Exp. Ciprofloxacin is commonly used to treat anthrax.

List I:

- A. Rocky Mountain spotted fever
- B. Q fever
- C. Cat-scratch disease
- D. Scrub typhus

List II:

- 1. Fever, rash, and headache
- 2. Fever, lymphadenopathy, and papule at site of scratch
- 3. Fever, chills, and cough
- 4. Fever, headache, and maculopapular rash
- (a) A-1, B-2, C-3, D-4
- (b) A-1, B-3, C-2, D-4
- (c) A-4, B-1, C-3, D-2
- (d) A-1, B-4, C-2, D-3

Ans. (b) A-1, B-3, C-2, D-4

Exp. Rocky Mountain spotted fever presents with fever, rash, and headache. Q fever presents with fever, chills, and cough. Cat-scratch disease presents with fever, lymphadenopathy, and a papule at the site of the scratch. Scrub typhus presents with fever, headache, and maculopapular rash.

47. Match the following organisms with their primary habitat:

List I:

- A. *Rickettsia rickettsii*
- B. *Coxiella burnetii*
- C. *Bartonella henselae*
- D. *Orientia tsutsugamushi*

List II:

- 1. Arthropods (ticks)
- 2. Mites
- 3. Cats
- 4. Livestock
- (a) A-1, B-2, C-3, D-4
- (b) A-1, B-4, C-3, D-2
- (c) A-4, B-1, C-2, D-3
- (d) A-2, B-3, C-4, D-1

Ans. (b) A-1, B-4, C-3, D-2

Exp. *Rickettsia rickettsii* is found in arthropods (ticks). *Coxiella burnetii* is associated with livestock. *Bartonella henselae* is found in cats. *Orientia tsutsugamushi* is associated with mites.

48. Match the disease with the corresponding pathogen:

List I:

- A. Rocky Mountain spotted fever
- B. Q fever
- C. Cat-scratch disease
- D. Scrub typhus

List II:

- 1. *Rickettsia rickettsii*
- 2. *Coxiella burnetii*
- 3. *Bartonella henselae*
- 4. *Orientia tsutsugamushi*
- (a) A-1, B-2, C-3, D-4
- (b) A-2, B-1, C-3, D-4
- (c) A-3, B-2, C-4, D-1
- (d) A-4, B-3, C-2, D-1

Ans. (a) A-1, B-2, C-3, D-4

Exp. Rocky Mountain spotted fever is caused by *Rickettsia rickettsii*. Q fever is caused by *Coxiella burnetii*. Cat-scratch disease is caused by *Bartonella henselae*. Scrub typhus is caused by *Orientia tsutsugamushi*.

Chlamydia and Chlamydophila

1. What is the Gram stain characteristic of *Chlamydia trachomatis*?

- (a) Gram-positive rods
- (b) Gram-negative rods
- (c) Gram-positive cocci
- (d) Gram-negative cocci

Ans. (b) Gram-negative rods

Exp. *Chlamydia trachomatis* are Gram-negative rods.

2. Which medium is commonly used to culture *Chlamydia trachomatis*?

- (a) Blood agar
- (b) MacConkey agar
- (c) McCoy cells
- (d) Chocolate agar

Ans. (c) McCoy cells

Exp. *Chlamydia trachomatis* is commonly cultured in McCoy cells.

3. Which test is used to confirm the presence of *Chlamydia trachomatis* in a clinical specimen?

- (a) Gram stain
- (b) ELISA
- (c) Catalase test
- (d) Coagulase test

Ans. (b) ELISA

Exp. ELISA is commonly used to confirm the presence of *Chlamydia trachomatis*.

Exp. Trachoma is caused by *Chlamydia trachomatis*. Psittacosis is caused by *Chlamydophila psittaci*. Atypical pneumonia is caused by *Chlamydophila pneumoniae*. Pelvic inflammatory disease is associated with *Mycoplasma genitalium*.

General Properties of Viruses

1. What is the typical size range of viruses?

- (a) 20-300 nm (b) 1-2 μ m
(c) 10-20 cm (d) 5-10 mm

Ans. (a) 20-300 nm

Exp. Most viruses range from 20 to 300 nanometers in size, making them much smaller than bacteria.

2. Which of the following structures is a common feature of all viruses?

- (a) Ribosomes (b) Nucleus
(c) Nucleic acid (d) Mitochondria

Ans. (c) Nucleic acid

Exp. All viruses contain nucleic acid (either DNA or RNA) as their genetic material.

3. Viruses can have different shapes. Which of the following is NOT a common shape of viruses?

- (a) Helical (b) Icosahedral
(c) Spherical (d) Cuboidal

Ans. (d) Cuboidal

Exp. Common shapes of viruses include helical, icosahedral, and complex, but not cuboidal.

4. What type of nucleic acid is found in retroviruses?

- (a) Double-stranded DNA
(b) Single-stranded DNA
(c) Single-stranded RNA
(d) Double-stranded RNA

Ans. (c) Single-stranded RNA

Exp. Retroviruses contain single-stranded RNA as their genetic material.

5. Which chemical component is a major part of viral envelopes?

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

Ans. (b) Lipid

Exp. The viral envelope is primarily composed of lipid bilayer derived from the host cell membrane.

6. How does the temperature affect virus stability?

- (a) Viruses are more stable at higher temperatures
(b) Viruses are more stable at lower temperatures
(c) Temperature has no effect on virus stability
(d) Viruses disintegrate at any temperature change

Ans. (b) Viruses are more stable at lower temperatures

Exp. Most viruses are more stable and can remain infectious for longer periods at lower temperatures.

7. Which of the following agents can effectively inactivate viruses?

- (a) High pH (b) Ultraviolet radiation
(c) Lipid solvents (d) All of the above

Ans. (d) All of the above

Exp. High pH, lipid solvents, and ultraviolet radiation are all effective in inactivating viruses.

8. Which viral protein is responsible for the ability of some viruses to cause red blood cells to clump together?

- (a) Capsid (b) Hemagglutinin
(c) Integrase (d) Reverse transcriptase

Ans. (b) Hemagglutinin

Exp. Hemagglutinin is a viral protein that causes red blood cells to clump (hemagglutination).

9. Which phase is NOT part of the viral replication cycle?

- (a) Attachment (b) Penetration
(c) Conjugation (d) Release

Ans. (c) Conjugation

Exp. Conjugation is a process in bacteria, not a part of the viral replication cycle.

10. Animal inoculation, embryonated egg inoculation, and tissue culture are methods used for what purpose in virology?

- (a) Virus isolation (b) Virus enumeration
(c) Virus inactivation (d) Virus destruction

Ans. (a) Virus isolation

Exp. These methods are used to isolate and cultivate viruses in a laboratory setting.

11. What is the purpose of viral assays?

- (a) To count total viral particles
(b) To assay for viral proteins
(c) To measure infectious virions
(d) To observe pH change in viruses

Ans. Both (a) and (c)

30. Match the virus with its associated disease:

List I

- A. Human papillomavirus (HPV)
- B. Epstein-Barr virus (EBV)
- C. Cytomegalovirus (CMV)
- D. Parvovirus B19

List II

- 1. Infectious mononucleosis
- 2. Genital warts
- 3. Fifth disease
- 4. Congenital infections
- (a) A-3, B-2, C-4, D-1
- (b) A-2, B-1, C-3, D-4
- (c) A-2, B-2, C-4, D-3
- (d) A-2, B-1, C-4, D-3

Ans. (d) A-2, B-1, C-4, D-3

Exp. Human papillomavirus (HPV) causes genital warts, Epstein-Barr virus (EBV) causes infectious mononucleosis, cytomegalovirus (CMV) is associated with congenital infections, and parvovirus B19 causes Fifth disease.

31. Match the virus with its diagnostic method:

List I

- A. PCR
- B. Serology
- C. Viral culture
- D. Gram staining

List II

- 1. Detects viral RNA or DNA
- 2. Identifies specific antibodies
- 3. Grows the virus in the lab
- 4. Used for bacteria
- (a) A-1, B-2, C-3, D-4
- (b) A-2, B-1, C-4, D-3
- (c) A-1, B-3, C-4, D-2
- (d) A-1, B-2, C-3, D-4

Ans. (d) A-1, B-2, C-3, D-4

Exp. PCR detects viral RNA or DNA, serology identifies specific antibodies, viral culture grows the virus in the lab, and Gram staining is used for bacteria.

Oncogenic Viruses

1. Which of the following viruses is most strongly associated with cervical cancer?

- (a) Epstein-Barr virus (EBV)
- (b) Hepatitis B virus (HBV)
- (c) Human papillomavirus (HPV)
- (d) Human T-cell leukemia virus (HTLV)

Ans. (c) Human papillomavirus (HPV)

Exp. Human papillomavirus (HPV), particularly types 16 and 18, is strongly associated with the development of cervical cancer.

2. Which virus is associated with Burkitt's lymphoma, particularly in African populations?

- (a) Human papillomavirus (HPV)
- (b) Epstein-Barr virus (EBV)
- (c) Hepatitis C virus (HCV)
- (d) Human T-cell leukemia virus (HTLV)

Ans. (b) Epstein-Barr virus (EBV)

Exp. Epstein-Barr virus (EBV) is associated with Burkitt's lymphoma, especially in African populations where malaria is endemic.

3. What type of genetic material is found in human T-cell leukemia virus (HTLV)?

- (a) Double-stranded DNA
- (b) Single-stranded DNA
- (c) Double-stranded RNA
- (d) Single-stranded RNA

Ans. (d) Single-stranded RNA

Exp. Human T-cell leukemia virus (HTLV) contains single-stranded RNA as its genetic material.

4. Which hepatitis virus is associated with an increased risk of hepatocellular carcinoma?

- (a) Hepatitis A virus (HAV)
- (b) Hepatitis B virus (HBV)
- (c) Hepatitis E virus (HEV)
- (d) Epstein-Barr virus (EBV)

Ans. (b) Hepatitis B virus (HBV)

Exp. Hepatitis B virus (HBV) is associated with an increased risk of hepatocellular carcinoma, particularly in chronic carriers.

5. Which virus is associated with adult T-cell leukemia/lymphoma (ATLL)?

- (a) Epstein-Barr virus (EBV)
- (b) Human papillomavirus (HPV)
- (c) Human T-cell leukemia virus type 1 (HTLV-1)
- (d) Hepatitis C virus (HCV)

Ans. (c) Human T-cell leukemia virus type 1 (HTLV-1)

- (a) A-1, B-2, C-3, D-4
- (b) A-4, B-2, C-3, D-1
- (c) A-4, B-3, C-2, D-1
- (d) A-3, B-4, C-1, D-2

Ans. (b) A-4, B-2, C-3, D-1

Exp. PCR detects viral RNA or DNA, serology identifies specific antibodies, Western blot confirms protein expression, and viral culture grows the virus in the lab.

36. Match the oncogenic virus with its primary mode of transmission:

List I

- A. Human papillomavirus (HPV)
- B. Hepatitis B virus (HBV)
- C. Human T-cell leukemia virus (HTLV-1)
- D. Epstein-Barr virus (EBV)

List II

- 1. Sexual contact
 - 2. Blood and body fluids
 - 3. Saliva
 - 4. Vertical transmission (mother to child)
- (a) A-1, B-2, C-3, D-4
 - (b) A-3, B-4, C-2, D-1
 - (c) A-2, B-1, C-4, D-3
 - (d) A-1, B-2, C-4, D-3

Ans. (d) A-1, B-2, C-4, D-3

Exp. Human papillomavirus (HPV) is primarily transmitted through sexual contact, hepatitis B virus (HBV) through blood and body fluids, human T-cell leukemia virus (HTLV-1) through vertical transmission, and Epstein-Barr virus (EBV) through saliva.

37. Match the oncogenic virus with its prevention strategy:

List I

- A. Hepatitis B virus (HBV)
- B. Human papillomavirus (HPV)
- C. Human T-cell leukemia virus (HTLV-1)
- D. Epstein-Barr virus (EBV)

List II

- 1. Safe sex practices
 - 2. Vaccination
 - 3. Avoiding sharing personal items
 - 4. Blood screening
- (a) A-1, B-2, C-3, D-4
 - (b) A-2, B-1, C-4, D-3
 - (c) A-2, B-4, C-1, D-3
 - (d) A-2, B-1, C-3, D-4

Ans. (b) A-2, B-1, C-4, D-3

Exp. Hepatitis B virus (HBV) prevention is through vaccination, human papillomavirus (HPV) through safe sex practices, human T-cell leukemia virus (HTLV-1) through blood screening, and Epstein-Barr virus (EBV) through avoiding sharing personal items that can carry saliva.

Medical Mycology

1. What is the primary structural component of fungal cell walls?

- (a) Cellulose
- (b) Peptidoglycan
- (c) Chitin
- (d) Lignin

Ans. (c) Chitin

Exp. Fungal cell walls are primarily composed of chitin, a long-chain polymer of N-acetylglucosamine, which provides rigidity and structural support.

2. How do fungi differ from bacteria in terms of cellular structure?

- (a) Fungi are prokaryotic, while bacteria are eukaryotic
- (b) Fungi lack a cell wall, while bacteria have one
- (c) Fungi are eukaryotic, while bacteria are prokaryotic
- (d) Fungi have ribosomes, while bacteria do not

Ans. (c) Fungi are eukaryotic, while bacteria are prokaryotic

Exp. Fungi are eukaryotic organisms with a true nucleus and membrane-bound organelles, while bacteria are prokaryotic and lack these structures.

3. Which classification of fungi includes molds and yeasts based on their morphology?

- (a) Taxonomical classification
- (b) Morphological classification
- (c) Reproductive classification
- (d) Ecological classification

Ans. (b) Morphological classification

Exp. Fungi are classified morphologically into molds, yeasts, and dimorphic fungi based on their appearance and growth characteristics.

4. Which fungal structure is responsible for sexual reproduction in fungi?

15. What is the first-line treatment for FUO caused by temporal arteritis?

- (a) Antiviral therapy
- (b) Empirical antibiotics
- (c) High-dose corticosteroids
- (d) Nonsteroidal anti-inflammatory drugs (NSAIDs)

Ans. (c) High-dose corticosteroids

Exp. High-dose corticosteroids are the first-line treatment for temporal arteritis, which can present as FUO.

16. Which conditions are commonly associated with FUO?

- 1. Tuberculosis
 - 2. Lymphoma
 - 3. Systemic lupus erythematosus (SLE)
 - 4. Hypertension
- (a) 1, 3 and 4 (b) 1, 2, and 3
(c) 1, 2 and 4 (d) 2, 3 and 4

Ans. (b) 1, 2, and 3

Exp. Tuberculosis, lymphoma, and SLE are commonly associated with FUO; hypertension is not typically associated with FUO.

17. Which diagnostic tests are useful in evaluating FUO?

- 1. Blood cultures
 - 2. Chest X-ray
 - 3. Urinalysis
 - 4. CT scan
- (a) 1 and 3 (b) 1, 2, and 3
(c) 1, 2 and 4 (d) 2, 3 and 4

Ans. (c) 1, 2, and 4

Exp. Blood cultures, chest X-ray, and CT scan are commonly used to evaluate FUO and identify potential causes.

18. Match the cause of FUO with its typical clinical feature:

List I

- A. Tuberculosis
- B. Lymphoma
- C. Systemic lupus erythematosus (SLE)
- D. Temporal arteritis

List II

- 1. Night sweats and weight loss
- 2. High ESR and unilateral headache
- 3. Pleuritis and arthralgia
- 4. Pulmonary infiltrates and cavitation

(a) A-4, B-3, C-1, D-2

(b) A-1, B-2, C-4, D-3

(c) A-4, B-1, C-2, D-3

(d) A-4, B-1, C-3, D-2

Ans. (d) A-4, B-1, C-3, D-2

Exp. Tuberculosis presents with pulmonary infiltrates and cavitation, lymphoma with night sweats and weight loss, SLE with pleuritis and arthralgia, and temporal arteritis with high ESR and unilateral headache.

Sexually Transmitted Diseases

1. What is the first-line treatment for gonorrhea?

- (a) Penicillin (b) Azithromycin
- (c) Doxycycline (d) Ceftriaxone

Ans. (a) Penicillin

Exp. Penicillin is the first-line treatment for gonorrhea, often administered with azithromycin to cover possible co-infection with Chlamydia.

2. Which pathogen is responsible for causing genital warts?

- (a) Human papillomavirus (HPV)
- (b) Herpes simplex virus (HSV)
- (c) Treponema pallidum
- (d) Neisseria gonorrhoeae

Ans. (a) Human papillomavirus (HPV)

Exp. Human papillomavirus (HPV) is the causative agent of genital warts.

3. Which stage of syphilis is characterized by a painless chancre at the site of infection?

- (a) Tertiary syphilis (b) Secondary syphilis
- (c) Latent syphilis (d) Primary syphilis

Ans. (d) Primary syphilis

Exp. Primary syphilis is characterized by the presence of a painless chancre at the site of infection.

4. Which sexually transmitted infection is commonly associated with a frothy, greenish-yellow vaginal discharge?

- (a) Gonorrhea (b) Trichomoniasis
- (c) Chlamydia (d) Syphilis

Ans. (b) Trichomoniasis

Exp. Trichomoniasis is commonly associated with a frothy, greenish-yellow vaginal discharge.

Laboratory Management

Laboratory Planning

1. Laboratory planning should focus on:

- (a) Efficiency of services
- (b) Operational costs
- (c) Accessibility of laboratory services
- (d) All of the above

Ans. (d) All of the above

Exp. Laboratory planning aims to ensure efficient services, cost-effective operations, and accessible services.

2. The primary goal of laboratory planning is:

- (a) To increase competition
- (b) To provide quality health services
- (c) To reduce staff workload
- (d) To introduce new equipment

Ans. (b) To provide quality health services

Exp. Quality health services are the core focus in laboratory planning to ensure the best outcomes for patients.

3. Market potential in laboratory planning refers to:

- (a) The current demand for laboratory services
- (b) The future growth and opportunities for laboratory services
- (c) The number of laboratories available
- (d) The type of services offered

Ans. (b) The future growth and opportunities for laboratory services

Exp. Market potential is about future growth prospects and opportunities in laboratory services.

4. Operational data in laboratory planning includes:

- (a) Competitor analysis
- (b) Staff requirements
- (c) Costs of running laboratory operations
- (d) Hospital services offered

Ans. (c) Costs of running laboratory operations

Exp. Operational data includes costs, staff, and equipment needs for running the lab efficiently.

5. Guiding principles for planning a hospital laboratory service include all of the following EXCEPT:

- (a) Ensuring patient safety
- (b) Increasing laboratory revenues
- (c) Improving workflow efficiency
- (d) Utilizing available resources effectively

Ans. (b) Increasing laboratory revenues

Exp. Increasing revenue is not a primary principle; focus should be on safety, efficiency, and resource utilization.

6. Planning for a basic health laboratory requires consideration of:

- (a) Availability of skilled personnel
- (b) Proximity to healthcare centers
- (c) Equipment costs
- (d) All of the above

Ans. (d) All of the above

Exp. A basic health laboratory must consider equipment costs, personnel, and its location for effective service.

7. Laboratory trends focus on:

- (a) The introduction of new technology
- (b) Patient diagnosis rate
- (c) Laboratory equipment wear and tear
- (d) Number of staff hired annually