CUET PG Medical Laboratory Technology Question Paper with Solutions

Time Allowed :1 hour 45 minutes	**Maximum Marks :**300	**Total questions :**75

General Instructions

Read the following instructions very carefully and strictly follow them:

(i) This question paper comprises 75 questions. All questions are compulsory.

(ii) Each question carries 04 (four) marks.

(iii) For each correct response, candidate will get 04 (four) marks.

(iv) For each incorrect response, 01 (one) mark will be deducted from the total score.

(v) Un-answered/un-attempted response will be given no marks.

(vi) To answer a question, the candidate needs to choose one option as correct option.

(vii) However, after the process of Challenges of the Answer Key, in case there are multiple correct options or change in key, only those candidates who have attempted it correctly as per the revised Final Answer Key will be awarded marks.

(viii) In case a Question is dropped due to some technical error, full marks shall be given to all the candidates irrespective of the fact who have attempted it or not

1. What is the main function of myosin?

1. ATPase activity
2. Storage of nutrients
3. Synthesis of protein
4. ADPase activity

Correct Answer: 1. ATPase activity.

Solution:

Myosin is a motor protein that is central to muscle contraction and intracellular transport. It binds to actin filaments and hydrolyzes ATP through its ATPase activity to generate energy. This energy drives conformational changes in myosin, allowing it to ”walk” along actin filaments. This walking mechanism is crucial for the sliding filament model of muscle contraction, where myosin heads pull actin filaments closer to the center of the sarcomere, leading to muscle shortening. Myosin is not only vital for movement in skeletal muscles but also plays roles in cell division, vesicle transport, and maintaining cell shape.

Quick Tip

Remember, ATPase activity in myosin is the biochemical process that translates chemical energy (ATP) into mechanical work, making movement possible in both muscle and non-muscle cells.

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2. Which heart sound is sharp, short and caused by the sudden closure of semilunar valves?

1. First heart sound
2. Second heart sound
3. Third heart sound
4. Fourth heart sound

Correct Answer: 2. Second heart sound.

Solution:

The second heart sound (S2), often described as ”dub,” occurs when the semilunar valves (aortic and pulmonary valves) close abruptly at the end of ventricular systole. This closure prevents backflow of blood into the ventricles. The sound is high-pitched and short due to the rapid nature of the valve closure. The timing and intensity of the second heart sound provide critical clinical information about the function of these valves and the state of the cardiovascular system. For instance, variations in the sound can indicate conditions like hypertension or valve stenosis.

Quick Tip

The second heart sound is sharper and shorter than the first, marking the transition from systole to diastole. It's an important diagnostic tool in cardiology.

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3. Which enzyme curdles the milk and converts caseinogens first into paracaseinogen and then into calcium paracaseinate?

1. Ptyalin
2. Pepsin
3. Chymosin
4. Amylase

Correct Answer: 3. Chymosin.

Solution:

Chymosin, or rennin, is an aspartic protease enzyme produced in the stomachs of young ruminants. It specializes in coagulating milk proteins, particularly caseinogen, to facilitate digestion. Chymosin cleaves the kappa-casein protein, stabilizing casein micelles, which then aggregate to form paracasein. When calcium ions are present, paracasein forms calcium paracaseinate, resulting in milk curdling. This process is critical for efficient nutrient absorption and is widely utilized in cheese production to separate curds (solid) from whey (liquid).

Quick Tip

Chymosin's ability to curdle milk makes it indispensable in the dairy industry, particularly in creating cheeses with specific textures and flavors.

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4. What is the main source of energy for skeletal muscle?

1. Enzymes
2. Fat
3. Protein
4. Glucose

Correct Answer: 4. Glucose.

Solution:

Glucose is the primary energy source for skeletal muscles, particularly during high-intensity, short-duration activities like sprinting. Stored as glycogen within muscle fibers, glucose is rapidly mobilized during exercise and metabolized via glycolysis to produce ATP, the energy currency of cells. During extended periods of activity, muscles may also rely on fatty acids and proteins, but glucose is the preferred fuel for anaerobic conditions. Efficient energy use in muscles is critical for maintaining performance and delaying fatigue. The ability of muscles to switch between energy sources based on availability and intensity is a hallmark of metabolic adaptability.

Quick Tip

During high-intensity exercise, glucose is the fastest and most efficient energy source for ATP production, particularly when oxygen availability is limited.

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5. Muscle of forearm is divided into which groups?

1. Anterior and Posterior muscles
2. Lateral and Parietal muscles
3. Superior and Inferior muscles
4. Superficial and Deep muscles

Correct Answer: 1. Anterior and Posterior muscles.

Solution:

The muscles of the forearm are divided into two major groups based on their location and function: the anterior muscles and the posterior muscles. The anterior compartment primarily contains flexor muscles responsible for flexing the wrist and fingers. The posterior compartment contains extensor muscles that extend the wrist and fingers. This anatomical classification aids in understanding their roles in movement and their innervation by specific nerves, such as the median and ulnar nerves for anterior muscles and the radial nerve for posterior muscles.

Quick Tip

Knowing the compartments of forearm muscles helps in diagnosing injuries, such as compartment syndrome, and understanding motor control.

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6. An increase in intraocular tension produced due to excessive collection of aqueous humour is called:

1. Colour blindness
2. Accommodation
3. Myopia
4. Glaucoma

Correct Answer: 4. Glaucoma.

Solution:

Glaucoma is a group of eye conditions characterized by increased intraocular pressure (IOP) due to the accumulation of aqueous humour. This pressure damages the optic nerve, leading to progressive vision loss if untreated. It often develops gradually and is detected via regular eye exams measuring IOP and assessing optic nerve health. Types include open-angle glaucoma, the most common form, and angle-closure glaucoma, which is a medical emergency. Management includes medications, laser treatments, or surgery to reduce IOP.

Quick Tip

Early detection of glaucoma through routine eye check-ups can prevent irreversible vision loss.

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7. Pleura, the covering of lungs, is ____ membrane:

1. Serous
2. Mucous
3. Synovial
4. Nuclear

Correct Answer: 1. Serous.

Solution:

The pleura is a serous membrane that consists of two layers: the visceral pleura, covering the lungs, and the parietal pleura, lining the chest cavity. It secretes pleural fluid into the pleural cavity, reducing friction between the lungs and chest wall during respiration. This membrane is vital for smooth lung expansion and contraction. Disorders of the pleura, such as pleuritis or pleural effusion, can impair respiratory function and cause significant discomfort.

Quick Tip

The pleura's serous nature ensures minimal friction during breathing, essential for efficient lung function.

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8. Which bone is cubical in shape and situated at the roof of the nose and in between the eye orbits?

1. Parietal bone
2. Ethmoid bone
3. Sphenoid bone
4. Temporal bone

Correct Answer: 2. Ethmoid bone.

Solution:

The ethmoid bone is a delicate, cubical-shaped bone located at the roof of the nasal cavity and between the eye orbits. It contributes to the formation of the nasal septum, the medial wall of the orbits, and the roof of the nasal cavity. It also houses the ethmoid air cells, part of the paranasal sinus system. The bone's structure is crucial for supporting the nasal and orbital cavities and for the filtration of air during respiration.

Quick Tip

The ethmoid bone plays a critical role in the structural integrity of the nasal cavity and the orbits, as well as in sinus health.

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9. Resolving power of a microscope is due to which of the following?

1. Eye piece
2. Nose piece
3. Objective lens
4. Electric bulb

Correct Answer: 3. Objective lens.

Solution:

The resolving power of a microscope is its ability to distinguish two closely spaced objects as separate entities. The objective lens primarily determines this, as it gathers light from the specimen and focuses it to create a detailed image. Factors such as numerical aperture and wavelength of light influence the resolving power. A higher numerical aperture and shorter wavelength increase the microscope's ability to resolve fine details, making the objective lens critical in microscopy.

Quick Tip

A high-quality objective lens is essential for enhancing the clarity and detail of microscopic observations.

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10. In which method of Hb estimation, hemoglobin is converted into carboxyhemoglobin?

1. Wu's Method
2. Oxyhemoglobin Method
3. Haldane Gower's Method
4. Cyanmethemoglobin Method

Correct Answer: 1. Wu's Method.

Solution:

Wu's method involves exposing blood to carbon monoxide, which has a high affinity for hemoglobin. The carbon monoxide binds to hemoglobin, forming carboxyhemoglobin. This compound is then measured spectrophotometrically, as it absorbs light at a specific wavelength. The advantage of Wu's method lies in its simplicity and precision, as carboxyhemoglobin is stable and provides a consistent measure of hemoglobin concentration. This method is particularly useful in research and diagnostic settings.

Quick Tip

Wu's method relies on the strong binding affinity of carbon monoxide to hemoglobin, ensuring accurate and reliable Hb measurements.

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11. The dilution factor of blood and RBC diluting fluid is in total erythrocyte count in counting chamber.

1. 50
2. 100
3. 150
4. 200

Correct Answer: 4. 200.

Solution:

In the erythrocyte count procedure, a 1:200 dilution is typically used. This involves mixing 1 part of blood with 199 parts of RBC diluting fluid, such as Hayem's or Gower's solution.

This high dilution is critical for preventing overlapping of red blood cells in the counting chamber, ensuring accurate enumeration. The dilution factor is then accounted for during calculations to estimate the total erythrocyte count per microliter of blood. Proper mixing and filling of the chamber are essential to avoid errors in the count.

Quick Tip

A 1:200 dilution minimizes overlapping of RBCs, ensuring accurate counts in hemocytometer-based methods.

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12. In which condition, there is an idiopathic primary absolute increase in red cell mass associated with panmyelosis?

1. Thalassemia Minor
2. Thalassemia Major
3. Polycythemia Vera
4. Polycythemia

Correct Answer: 3. Polycythemia Vera.

Solution:

Polycythemia Vera is a myeloproliferative disorder caused by mutations in the JAK2 gene, leading to unregulated proliferation of red blood cells, white blood cells, and platelets (panmyelosis). This condition results in increased blood viscosity, reduced blood flow, and a higher risk of thrombosis. Symptoms include headaches, dizziness, and a ruddy complexion. Diagnosis involves elevated hemoglobin/hematocrit levels, low erythropoietin levels, and the presence of the JAK2 mutation. Management includes phlebotomy to reduce red cell mass and medications like hydroxyurea to control cell proliferation.

Quick Tip

Polycythemia Vera is a chronic condition requiring lifelong management to prevent complications like strokes or heart attacks.

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13. A 40 years old male had undergone splenectomy 20 years ago. Peripheral blood smear examination would show the presence of

1. Dohle bodies
2. Hypersegmented neutrophils
3. Spherocytes
4. Howell-Jolly bodies

Correct Answer: 4. Howell-Jolly bodies.

Solution:

Howell-Jolly bodies are small, round nuclear remnants found in red blood cells. These are typically removed by the spleen, but after splenectomy, this filtering function is lost, allowing the remnants to persist in circulation. Howell-Jolly bodies are seen in asplenic patients and indicate an increased risk of infections, especially from encapsulated bacteria like Streptococcus pneumoniae. Regular vaccination and prophylactic antibiotics are often recommended for asplenic patients to mitigate this risk.

Quick Tip

The presence of Howell-Jolly bodies is a hallmark of splenic dysfunction or absence, emphasizing the spleen's role in blood filtration.

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14. Which component is responsible for the survival of cells in the blood?

1. Trisodium citrate
2. Biosodium Monophosphates
3. Dextrose
4. Adenine

Correct Answer: 4. Adenine.

Solution:

Adenine plays a critical role in maintaining the viability of red blood cells during storage. It is a key component of blood preservation solutions, such as CPDA-1 (Citrate-Phosphate-Dextrose-Adenine), which extends the shelf life of stored blood. Adenine

supports the synthesis of ATP, the energy currency of cells, ensuring that red blood cells retain their functionality, such as maintaining ion gradients and membrane integrity. This is crucial for successful blood transfusions, as stored RBCs must survive and function effectively in the recipient's circulation.

Quick Tip

Adenine preserves ATP levels in stored RBCs, ensuring their survival and functionality during storage and after transfusion.

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15. Which time is prolonged in liver disease, congenital deficiency of coagulation factors in the extrinsic pathway, and in oral anticoagulant therapy?

1. Bleeding time
2. Prothrombin time
3. Clot retraction
4. Fibrinolytic activity

Correct Answer: 2. Prothrombin time.

Solution:

Prothrombin time (PT) measures the efficiency of the extrinsic and common coagulation pathways. It assesses the activity of factors I (fibrinogen), II (prothrombin), V, VII, and X. PT is prolonged in conditions like liver disease (reduced synthesis of coagulation factors), congenital deficiencies in these factors, and use of oral anticoagulants like warfarin (which inhibits vitamin K-dependent factors). Monitoring PT is essential in managing anticoagulation therapy and diagnosing coagulopathies. The international normalized ratio (INR) standardizes PT results for better comparability across laboratories.

Quick Tip

Prothrombin time is a critical test in evaluating the extrinsic pathway and monitoring anticoagulant therapies like warfarin.

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16. Which bleeding disorder is caused due to the deficiency of factor IX?

1. Haemophilia B
2. Purpura
3. Haemophilia A
4. Haemophilia C

Correct Answer: 1. Haemophilia B.

Solution:

Haemophilia B, also known as Christmas disease, is an X-linked recessive disorder caused by a deficiency in coagulation factor IX. This deficiency impairs the intrinsic pathway of coagulation, leading to prolonged bleeding, especially in response to trauma or surgery. Patients often present with hemarthroses (bleeding into joints), easy bruising, and prolonged bleeding after injuries. Diagnosis is confirmed through factor IX activity assays. Treatment involves replacement therapy using factor IX concentrates to manage and prevent bleeding episodes.

Quick Tip

Haemophilia B is managed with recombinant or plasma-derived factor IX concentrates to control bleeding.

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17. Which of the following linkages makes cellulose unsuitable for human digestion?

1. Alpha D-Glucosidic linkage
2. Beta D-Glucosidic linkage
3. Alpha L-Glucosidic linkage
4. Beta L-Glucosidic linkage

Correct Answer: 2. Beta D-Glucosidic linkage.

Solution:

Cellulose is a polysaccharide composed of beta-D-glucose units linked by beta-1,4-glycosidic bonds. Humans lack the enzyme cellulase, which is required to hydrolyze these bonds. As a result, cellulose passes undigested through the gastrointestinal

tract and contributes to dietary fiber. This fiber plays a crucial role in promoting healthy bowel movements, maintaining gut health, and preventing conditions like constipation and diverticulosis. Although indigestible, cellulose is vital for dietary health.

Quick Tip

Beta D-glucosidic linkages in cellulose make it resistant to digestion but beneficial as dietary fiber.

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18. Sanger studied in 1955 the structure of insulin. The reagent he used for this purpose and which is named after him is known as

1. Chlorobenzene
2. Nitrobenzene
3. Fluorobenzene
4. Dinitrofluorobenzene

Correct Answer: 4. Dinitrofluorobenzene.

Solution:

Frederick Sanger used dinitrofluorobenzene (DNFB) in 1955 to determine the amino acid sequence of insulin, a breakthrough in protein chemistry. DNFB reacts with the free amino group of the N-terminal amino acid, forming a stable dinitrophenyl (DNP) derivative. This allows identification of the terminal amino acid after hydrolysis of the protein. Sanger's pioneering work with DNFB provided the first complete sequence of a protein and laid the foundation for modern sequencing techniques.

Quick Tip

Dinitrofluorobenzene was crucial in identifying N-terminal amino acids, revolutionizing protein sequencing.

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19. Brucella is described correctly by the statement it is a fungus

1. It is a fungus

2. It is a bacterium

3. It is a vegetative reproduction capsule

4. It is a part of cilia

Correct Answer: 2. It is a bacterium.

Solution:

Brucella is a genus of Gram-negative bacteria that causes brucellosis, a zoonotic disease affecting humans and animals. These bacteria are facultative intracellular pathogens that primarily infect macrophages, evading the immune response. Humans acquire the infection through contact with infected animals, consumption of unpasteurized dairy products, or inhalation of aerosols. Symptoms include fever, joint pain, and fatigue. Diagnosis involves blood culture or serological tests, and treatment typically requires a combination of antibiotics like doxycycline and rifampin.

Quick Tip

Brucella infections are preventable through proper handling of livestock and consumption of pasteurized dairy products.

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20. If the cystine content of double stranded DNA is 20% of the total bases, then the adenine content will be

1. 40%

2. 30%

3. 20%

4. 10%

Correct Answer: 4. 10%.

Solution:

In double-stranded DNA, cytosine (C) pairs with guanine (G), and adenine (A) pairs with thymine (T). If cytosine makes up 20% of the total bases, guanine also constitutes 20%, leaving 60% of the bases for adenine and thymine combined. Since adenine and thymine are

equal, each accounts for half of the remaining 60%, or 30%. Thus, adenine content is 10%. This base pairing reflects Chargaff's rules.

Quick Tip

Chargaff's rules ensure that the total purines (A + G) equal the total pyrimidines (T + C) in double-stranded DNA.

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21. The terminal reaction in heme synthesis, where $Fe^{3}+$ from transferrin is introduced into protoporphyrin IX, is catalyzed by

1. Fermochelatase
2. Ferolyase
3. Ferro oxidase
4. Ferro reductase

Correct Answer: 1. Fermochelatase.

Solution:

Fermochelatase is an essential enzyme in the final step of heme biosynthesis. It catalyzes the incorporation of iron ($Fe^{3}+$) into protoporphyrin IX to form heme. This reaction occurs in the mitochondria and is crucial for producing functional heme, which is a key component of hemoglobin, myoglobin, and various cytochromes. Dysregulation of fermochelatase activity can result in disorders like porphyria.

Quick Tip

Fermochelatase ensures efficient incorporation of iron into heme, a process critical for oxygen transport and energy metabolism.

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22. The first symptom of vitamin A deficiency is

1. Xerosis conjunctivae
2. Xerosis cornea
3. Nyctalopia

4. Bitot's spots

Correct Answer: 3. Nyctalopia.

Solution:

Nyctalopia, or night blindness, is a hallmark of early vitamin A deficiency. Vitamin A is integral to the synthesis of rhodopsin, a visual pigment necessary for low-light vision. A deficiency leads to impaired regeneration of rhodopsin in the retinal rods, causing difficulty seeing in dim light. Early intervention with vitamin A supplementation can reverse this symptom and prevent progression to more severe ocular conditions like xerophthalmia or keratomalacia.

Quick Tip

Nyctalopia is an early indicator of vitamin A deficiency; prompt supplementation can prevent long-term visual impairment.

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23. The enzyme that is concerned in the conversion of All-trans retinal to 11-cis retinal belongs to the class of

1. Transferases
2. Isomerases
3. Oxidoreductases
4. Hydrolases

Correct Answer: 2. Isomerases.

Solution:

The enzyme responsible for the conversion of all-trans retinal to 11-cis retinal is an isomerase. This conversion is critical in the visual cycle, as 11-cis retinal is a key component of rhodopsin, the photoreceptor pigment. Upon exposure to light, 11-cis retinal undergoes isomerization back to all-trans retinal, triggering a cascade that leads to visual signal transduction. The recycling of retinal between these forms is essential for sustained vision, particularly in dim lighting.

Quick Tip

Isomerases are crucial in the visual cycle, ensuring continuous regeneration of the active pigment for vision.

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24. The site of oxidative phosphorylation in the cell is

1. Cytoplasm
2. Mitochondria
3. Golgi apparatus
4. Endoplasmic reticulum

Correct Answer: 2. Mitochondria.

Solution:

Oxidative phosphorylation occurs in the inner mitochondrial membrane, where the electron transport chain (ETC) is located. Electrons from NADH and $FADH_2$ are transferred through the ETC, generating a proton gradient across the membrane. This gradient powers ATP synthase to produce ATP from ADP and inorganic phosphate. Mitochondria, often called the ”powerhouse of the cell,” play a central role in energy production through this process.

Quick Tip

The mitochondria are vital for producing ATP, the cell's main energy currency, via oxidative phosphorylation.

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25. The enzyme-cofactor associated with muscle glycogen phosphorylase is

1. Pyridoxal phosphate
2. $NADP^+$
3. NAD^+
4. FMN

Correct Answer: 1. Pyridoxal phosphate.

Solution:

Pyridoxal phosphate (PLP), a derivative of vitamin B6, serves as a cofactor for muscle glycogen phosphorylase. This enzyme catalyzes the breakdown of glycogen into glucose-1-phosphate, which can then be converted into glucose-6-phosphate for energy production in glycolysis. PLP binds to the enzyme's active site and plays a structural and catalytic role, enabling the cleavage of glycosidic bonds in glycogen.

Quick Tip

Pyridoxal phosphate is essential for glycogenolysis, facilitating energy production during muscle activity.

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26. Who introduced the vaccination method for the prevention of smallpox?

1. Edward Jenner
2. Joseph Lister
3. Robert Koch
4. Louis Pasteur

Correct Answer: 1. Edward Jenner.

Solution:

Edward Jenner pioneered the concept of vaccination in 1796 when he used material from cowpox lesions to immunize a young boy against smallpox. This innovative approach was based on the observation that milkmaids who had contracted cowpox were immune to smallpox. Jenner's work laid the foundation for modern immunology and ultimately led to the global eradication of smallpox, one of history's most deadly diseases.

Quick Tip

Edward Jenner's method marked the beginning of vaccination, revolutionizing disease prevention and public health.

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27. All are the spore-forming bacteria except

1. Clostridium botulinum

2. Bacillus subtilis

3. Bacillus anthracis

4. Pseudomonas aeruginosa

Correct Answer: 4. Pseudomonas aeruginosa.

Solution:

Spore-forming bacteria, such as Clostridium botulinum, Bacillus subtilis, and Bacillus anthracis, form endospores to survive adverse environmental conditions. These endospores are highly resistant to heat, desiccation, and chemicals. In contrast, Pseudomonas aeruginosa does not form spores but adapts to various environments using biofilm formation and other survival mechanisms. It is an opportunistic pathogen commonly associated with infections in immunocompromised individuals.

Quick Tip

Spore formation enables certain bacteria to withstand extreme conditions, ensuring their survival in hostile environments.

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28. Culture medium with low redox potential is required for growth of

1. Anaerobic bacteria

2. Escherichia coli

3. Pseudomonas aeruginosa

4. Aerobic bacteria

Correct Answer: 1. Anaerobic bacteria.

Solution:

Anaerobic bacteria thrive in environments with low redox potential, as they cannot tolerate oxygen. Low redox potential media, such as thioglycolate broth, create oxygen-free conditions that are ideal for the growth of obligate anaerobes. The absence of oxygen prevents the formation of reactive oxygen species, which these bacteria are unable to detoxify due to the lack of enzymes like superoxide dismutase and catalase.

Quick Tip

Low redox potential in culture media is essential for cultivating anaerobic bacteria like Clostridium species.

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29. Which of the following bacteria can survive in the Holder method of pasteurization?

1. Bordetella pertussis
2. Coxiella burnetii
3. Salmonella typhi
4. Mycobacterium bovis

Correct Answer: 2. Coxiella burnetii.

Solution:

Coxiella burnetii, the causative agent of Q fever, is a highly heat-resistant bacterium. It can survive the Holder pasteurization method (63°C for 30 minutes). This resistance poses challenges for ensuring complete microbial safety in dairy products. Ultra-high temperature (UHT) pasteurization is often required to eliminate such pathogens effectively. The resilience of Coxiella burnetii underscores the importance of strict quality control in food processing.

Quick Tip

Coxiella burnetii's heat resistance highlights the need for stringent pasteurization techniques to ensure food safety.

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30. Which enrichment medium is preferred to grow Vibrio cholerae?

1. Tetrathionate broth
2. Selenite F broth
3. Alkaline peptone water
4. Glucose broth

Correct Answer: 3. Alkaline peptone water.

Solution:

Alkaline peptone water (APW) is an ideal enrichment medium for Vibrio cholerae due to its high pH, which inhibits the growth of most other bacteria while promoting the proliferation of Vibrio species. APW is commonly used to isolate Vibrio cholerae from stool samples in suspected cases of cholera. The enriched culture is then subcultured onto selective agar, such as thiosulfate-citrate-bile salts-sucrose (TCBS) agar, for confirmation.

Quick Tip

Alkaline peptone water provides a selective environment to isolate Vibrio cholerae from clinical and environmental samples.

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31. Which of the following bacteria produce saccharolytic reaction in cooked meat broth (CMB)?

(1) Clostridium perfringens

(2) Clostridium tetani

(3) Pseudomonas aeruginosa

(4) Klebsiella sp.

Correct Answer: (1) Clostridium perfringens.

Solution:

Clostridium perfringens is known to produce a saccharolytic reaction in cooked meat broth (CMB), where it ferments carbohydrates to produce acid and gas. This is helpful for identifying the bacterium in laboratory settings.

Quick Tip

Clostridium perfringens is commonly associated with foodborne illness and can be differentiated from other bacteria using saccharolytic activity in CMB.

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32. The mutation in which a purine is replaced by pyrimidine and vice versa is known as

(1) Transversion

(2) Transition

(3) Induced mutation

(4) Transformation

Correct Answer: (1) Transversion.

Solution:

A transversion mutation occurs when a purine is substituted by a pyrimidine or a pyrimidine is substituted by a purine. This contrasts with transition mutations, where purines replace purines or pyrimidines replace pyrimidines.

Quick Tip

Transversion mutations are more disruptive to the DNA sequence than transition mutations due to the structural differences between purines and pyrimidines.

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33. Which biochemical test is done to differentiate Streptococcus agalactiae from other streptococci?

(1) Bile tolerance test

(2) Carbohydrate assimilation test

(3) CAMP test

(4) Citrate utilization test

Correct Answer: (3) CAMP test.

Solution:

The CAMP test is used to identify Streptococcus agalactiae, as it produces a specific synergistic hemolysis pattern when cultured with Staphylococcus aureus.

Quick Tip

The CAMP test is a simple and reliable method for distinguishing Streptococcus agalactiae from other streptococcal species.

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34. Which test is done to diagnose Rickettsial infection?

(1) Widal test

(2) Weil-felix test

(3) ASO test

(4) CRP test

Correct Answer: (2) Weil-felix test.

Solution:

The Weil-Felix test is used to diagnose Rickettsial infections by detecting agglutination of patient sera with certain Proteus antigens, which cross-react with Rickettsia.

Quick Tip

The Weil-Felix test relies on antigenic cross-reactivity between Rickettsia and Proteus species for diagnosis.

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35. Which class of immunoglobulin has maximum concentration in the human body?

(1) IgG

(2) IgM

(3) IgA

(4) IgE

Correct Answer: (1) IgG.

Solution:

IgG is the most abundant immunoglobulin in the human body and plays a key role in the immune response, particularly in defending against bacterial and viral infections.

Quick Tip

IgG is crucial for long-term immunity and is the most commonly found antibody in the blood.

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36. Frozen section is used to demonstrate inclusion

1. Secretory granules
2. Glycogen
3. Lipid
4. Pigments

Correct Answer: 3. Lipid.

Solution:

Frozen sections are ideal for demonstrating lipids in tissues because standard paraffin embedding processes dissolve lipids. By rapidly freezing the tissue, lipids remain intact and can be visualized using lipid-specific stains like Sudan III or Oil Red O. This method is particularly important in diagnosing lipid storage diseases or assessing fatty changes in tissues. Frozen sectioning is also widely used for intraoperative consultations due to its quick preparation time.

Quick Tip

Frozen sections preserve lipids in tissues, making them essential for lipid demonstration and rapid histological evaluation.

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37. Aggregation of basophilic material which are scattered throughout the nucleus is called

1. Nucleolus
2. Centrioles
3. Chromatin granules
4. Secretory granules

Correct Answer: 3. Chromatin granules.

Solution:

Chromatin granules are basophilic (acidic dye-attracting) materials composed of DNA and associated proteins, scattered throughout the nucleus. They represent euchromatin and heterochromatin regions, where euchromatin is actively involved in transcription, while

heterochromatin is transcriptionally inactive. Chromatin organization is vital for regulating gene expression and DNA replication, reflecting the cell's metabolic activity.

Quick Tip

Chromatin granules indicate the level of transcriptional activity in a cell, with euchromatin representing active regions.

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38. Which fixative is used for the sections cut by cryostat?

1. Cold acetone
2. Buffered formal saline
3. Absolute ethyl alcohol
4. Formalin

Correct Answer: 1. Cold acetone.

Solution:

Cold acetone is commonly used as a fixative for frozen tissue sections prepared with a cryostat. It preserves tissue morphology by precipitating proteins while maintaining enzymatic activity and antigenicity, which is crucial for immunohistochemical staining. Cryostat sections are typically used for rapid diagnosis during surgery or for specialized staining techniques that require minimal fixation artifacts.

Quick Tip

Cold acetone is ideal for cryostat sections, preserving enzyme activity and antigenicity for diagnostic staining.

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39. In Heidenhain's Susa fixative, the shrinkage produced by Mercuric Chloride is compensated by the addition of which solution?

1. Chromic acid
2. Acetic acid
3. Potassium Dichromate

4. Picric acid

Correct Answer: 2. Acetic acid.

Solution:

Mercuric chloride in Heidenhain's Susa fixative causes significant tissue shrinkage. Acetic acid is added to counterbalance this shrinkage by swelling tissues, thereby preserving their natural morphology. This combination ensures optimal preservation of nuclear and cytoplasmic structures, making the fixative suitable for high-detail histological studies, especially in lymphatic and hematopoietic tissues.

Quick Tip

Acetic acid is critical in Heidenhain's Susa fixative for compensating mercuric chloride-induced tissue shrinkage.

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40. In which type of decalcification method, the positively charged calcium ions are attracted to a negatively charged electrode?

1. Ion exchange resins
2. Ultrasonic decalcification
3. Electrolyte decalcification
4. By using chelating agents

Correct Answer: 3. Electrolyte decalcification.

Solution:

Electrolyte decalcification involves applying an electric current to remove calcium ions from tissues. Positively charged calcium ions migrate toward a negatively charged electrode, effectively decalcifying the tissue. This method is rapid and efficient, preserving tissue morphology for histological studies. It is particularly useful for processing bone and other calcified tissues while maintaining their structural integrity.

Quick Tip

Electrolyte decalcification is fast and preserves tissue structure, making it ideal for histological analysis of calcified tissues.

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41. The penetration of the paraffin wax in the tissue occurs more readily if part of the cell is

(1) Fat

(2) Carbohydrate

(3) Protein

(4) Enzyme

Correct Answer: (3) Protein.

Solution:

Protein content in tissues facilitates the penetration of paraffin wax during tissue processing, enhancing embedding quality and sectioning precision. Protein-rich structures provide a uniform matrix that improves wax adherence and reduces artifacts in the final sample.

Quick Tip

Protein-dense tissues yield better results in histological processing due to enhanced wax infiltration.

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42. In which microtome is a double concave knife used?

(1) Sliding microtome

(2) Sledge microtome

(3) Cambridge rocking microtome

(4) Rotary microtome

Correct Answer: (3) Cambridge rocking microtome.

Solution:

The Cambridge rocking microtome uses a double concave knife, ideal for producing thin and uniform tissue sections. Its unique rocking motion accommodates delicate tissues and minimizes compression artifacts, which are critical for precise microscopic analysis.

Quick Tip

A double concave knife ensures consistent sectioning in microtomes, especially for fragile samples.

---

43. In honing technique, what is used to prevent the hone from slipping during use?

(1) Damp cloth

(2) Wooden box

(3) Metallic object

(4) Filter paper

Correct Answer: (1) Damp cloth.

Solution:

A damp cloth stabilizes the hone during use, preventing slippage and ensuring consistent sharpening of cutting instruments. This simple technique enhances precision and safety, crucial for maintaining the effectiveness of microtome knives.

Quick Tip

Using a damp cloth ensures a firm grip on the hone, leading to better sharpening results.

---

44. First component of complement which binds to antigen-antibody complex in classical pathway is

(1) C1q

(2) C1r

(3) C1s

(4) C3

Correct Answer: (1) C1q.

Solution:

C1q binds to the Fc region of immunoglobulins in the antigen-antibody complex, initiating the classical complement cascade. This binding triggers sequential activation of other complement components, amplifying the immune response.

Quick Tip

C1q plays a pivotal role in starting the classical complement pathway, enhancing phagocytosis and lysis.

---

45. The widely accepted theory of antibody formation is

(1) Direct template theory

(2) Indirect template theory

(3) Natural selection theory

(4) Clonal selection theory

Correct Answer: (4) Clonal selection theory.

Solution:

The clonal selection theory proposes that specific lymphocytes are activated and proliferate in response to an antigen. Each clone produces antibodies uniquely suited to neutralize the antigen, forming the basis of adaptive immunity.

Quick Tip

Clonal selection theory underscores the specificity and adaptability of the immune system.

---

46. Match List-I with List-II

List-I	List-II
(A) Cellulose	(I) Measurement of GFR
(B) Inulin	(II) Component of diet of diabetics
(C) Starch	(III) Anticoagulant
(D) Heparin	(IV) Principal carbohydrate of diet

Choose the correct answer from the options given below:

(1) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

(2) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

(3) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

(4) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)

Correct Answer: (2) (A) - (II), (B) - (I), (C) - (IV), (D) - (III).

Solution:

- Cellulose: Indigestible dietary fiber used in diets for diabetics (II).

- Inulin: A polysaccharide used to measure Glomerular Filtration Rate (I).

- Starch: The principal carbohydrate source in most diets (IV).

- Heparin: A naturally occurring anticoagulant (III).

Understanding these associations is essential for both clinical and nutritional applications.

Quick Tip

Identifying functional roles of biochemicals helps integrate knowledge across physiology and biochemistry.

---

47. Match List-I with List-II

List-I	List-II
(A) Semiconservative replication of DNA	(I) Embden
(B) Double helical structure of DNA	(II) Meselson and Stahl
(C) Adenosine Mono Phosphate	(III) H. Khorana
(D) Synthesis of Alanine tRNA	(IV) Watson, Crick, and Wilkins

Choose the correct answer from the options given below:

(1) (A) - (II), (B) - (IV), (C) - (I), (D) - (III)

(2) (A) - (III), (B) - (IV), (C) - (II), (D) - (I)

(3) (A) - (IV), (B) - (II), (C) - (I), (D) - (III)

(4) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)

Correct Answer: (1) (A) - (II), (B) - (IV), (C) - (I), (D) - (III).

Solution:

- Semiconservative replication of DNA: Demonstrated by Meselson and Stahl (II).
- Double helical structure of DNA: Discovered by Watson, Crick, and Wilkins (IV).
- Adenosine Mono Phosphate synthesis: Studied extensively by Embden (I).
- Synthesis of Alanine tRNA: Groundbreaking work by H. Khorana (III).

These findings form the foundation of modern molecular biology.

Quick Tip

Historical contributions in genetics highlight key advances in understanding life processes.

---

48. Match List-I with List-II

List-I	List-II
(A) The end of the lag phase	(I) Involution forms are common
(B) In the log phase	(II) Cells are Gram-variable and show irregular staining
(C) In the stationary phase	(III) Cells are smaller and stain uniformly
(D) In the phase of decline	(IV) Bacteria have maximum cell size

Choose the correct answer from the options given below:

(1) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

(2) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)

(3) (A) - (IV), (B) - (I), (C) - (II), (D) - (III)

(4) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)

Correct Answer: (4) (A) - (IV), (B) - (III), (C) - (II), (D) - (I).

Solution:

- Lag phase: Marked by maximum cell size (IV).

- Log phase: Characterized by smaller, uniformly staining cells (III).

- Stationary phase: Cells become Gram-variable and show irregular staining (II).

- Decline phase: Involution forms and cellular degeneration dominate (I).

These stages illustrate the dynamics of bacterial population growth.

Quick Tip

Growth phase analysis aids in understanding bacterial metabolism and antibiotic response.

---

49. Match List-I with List-II

Immunoglobulins	Functions
(A) IgG	(I) Protects the body surface
(B) IgA	(II) Mediates reaginic hypersensitivity
(C) IgM	(III) Protects the body fluids
(D) IgE	(IV) Protects the blood stream

Choose the correct answer from the options given below:

(a) (A) - (IV), (B) - (I), (C) - (II), (D) - (III)

(b) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

(c) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)

(d) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (b) (A) - (III), (B) - (I), (C) - (IV), (D) - (II).

Solution:

- IgG: Found abundantly in blood and extracellular fluid, it provides long-term immunity by neutralizing toxins and pathogens (III).

- IgA: Found in mucosal areas like the respiratory and gastrointestinal tracts, it plays a vital role in protecting body surfaces (I).

- IgM: The first antibody produced in response to infection, it primarily protects the blood stream (IV).

- IgE: Involved in allergic reactions and mediates reaginic hypersensitivity by triggering histamine release from mast cells (II).

Quick Tip

Understanding the specific functions of immunoglobulins helps in diagnosing immune disorders and allergic conditions.

---

50. Match List-I with List-II

Deficiency Syndrome	**Associated Condition**
(A) C1 inhibitor	(II) Hereditary angioneurotic oedema
(B) C1, C2, C4 components	(III) Systemic lupus erythematosus and other collagen vascular diseases
(C) C3 and its regulatory protein	(IV) Recurrent pyogenic infections
(D) C5, C6, C7, C8, C9 components	(I) Bacteremia, mainly with Gram-negative diplococci and toxoplasmosis

Choose the correct answer from the options given below:

(a) (A) - (IV), (B) - (I), (C) - (II), (D) - (III)

(b) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

(c) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)

(d) (A) - (II), (B) - (IV), (C) - (I), (D) - (III)

Correct Answer: (c) (A) - (II), (B) - (III), (C) - (IV), (D) - (I).

Solution:

- C1 inhibitor deficiency: Leads to hereditary angioneurotic oedema, characterized by recurrent swelling of tissues (II).
- C1, C2, C4 deficiencies: These components of the classical complement pathway are associated with systemic lupus erythematosus and other autoimmune disorders (III).
- C3 and its regulatory proteins: Their deficiency impairs opsonization, leading to recurrent pyogenic infections caused by encapsulated bacteria (IV).
- C5–C9 deficiencies: Known as terminal pathway components, their absence leads to an inability to form the membrane attack complex, resulting in susceptibility to infections, particularly with Gram-negative diplococci (I).

Quick Tip

Complement deficiencies have distinct clinical manifestations; diagnosing them requires a combination of clinical evaluation and complement assays.

---

51. Match List-I with List-II

Microtome Knives	**Use**
(A) Plano Concave	(IV) It has one surface plane and other concave
(B) Tool Edge profile	(I) It has got both surfaces flat with a steep cutting edge
(C) Biconcave	(II) Its both surfaces are concave
(D) Plane edge/Wedge shaped	(III) Both the surface are flat

Choose the correct answer from the options given below:

(1) (A) - (IV), (B) - (I), (C) - (II), (D) - (III)

(2) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

(3) (A) - (III), (B) - (I), (C) - (II), (D) - (IV)

(4) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)

Correct Answer: (1) (A) - (IV), (B) - (I), (C) - (II), (D) - (III).

Solution:

- Plano Concave: It has one surface plane and another concave, useful for sectioning softer tissues.

- Tool Edge Profile: It has both surfaces flat with a steep cutting edge, providing precision for harder samples.

- Biconcave: Both surfaces are concave, suitable for cutting small and delicate specimens.

- Plane Edge/Wedge Shaped: Both surfaces are flat, ideal for general-purpose sectioning in routine histology.

Quick Tip

Choosing the right microtome knife depends on the tissue type and the sectioning requirement.

52. Match List-I with List-II

Stain	Component/Tissue
(A) Periodic acid-Schiff	(I) Extracellular collagen
(B) Mucicarmine	(II) Elastic fibers
(C) Van Gieson's	(III) Carbohydrate
(D) Verhoeff's elastic	(IV) Acidic mucin

Choose the correct answer from the options given below:

(1) (A) - (II), (B) - (IV), (C) - (I), (D) - (III)

(2) (A) - (IV), (B) - (III), (C) - (I), (D) - (I)

(3) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

(4) (A) - (IV), (B) - (I), (C) - (III), (D) - (II)

Correct Answer: (3) (A) - (III), (B) - (IV), (C) - (I), (D) - (II).

Solution:

- Periodic acid-Schiff: Stains carbohydrates (e.g., glycogen) and highlights basement membranes.
- Mucicarmine: Stains acidic mucins, commonly used for epithelial tissue examination.
- Van Gieson's: Stains extracellular collagen fibers, distinguishing them from muscle fibers.
- Verhoeff's Elastic: Highlights elastic fibers, providing insight into connective tissue disorders.

Quick Tip

Mastery of histological stains allows for accurate identification of tissue components under a microscope.

53. Match List-I with List-II

Term(s)	Description
(A) Glycolysis	(I) Production of pyruvate
(B) Anaerobic	(II) Division carried out by bacteria
(C) Binary fission	(III) Metabolic activities without oxygen
(D) Conjugation	(IV) Production of tube to connect two bacteria

Choose the correct answer from the options given below:

(1) (A) - (IV), (B) - (I), (C) - (II), (D) - (III)

(2) (A) - (II), (B) - (IV), (C) - (I), (D) - (III)

(3) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

(4) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)

Correct Answer: (4) (A) - (I), (B) - (III), (C) - (II), (D) - (IV).

Solution:

- Glycolysis: A metabolic pathway producing pyruvate and ATP from glucose (I).

- Anaerobic: Refers to metabolic processes that occur without oxygen (III).

- Binary fission: A simple form of asexual reproduction in bacteria, leading to cell division (II).

- Conjugation: Involves the formation of a pilus to facilitate the transfer of genetic material between bacterial cells (IV).

Quick Tip

Understanding these terms is critical for exploring microbial physiology and genetics.

---

54. Match List-I with List-II

Vertebrae	Number
(A) Cervical Vertebrae	(I) They are 4 in number
(B) Thoracic Vertebrae	(II) They are 7 in number
(C) Lumbar Vertebrae	(III) They are 12 in number
(D) Coccygeal Vertebrae	(IV) They are 5 in number

Choose the correct answer from the options given below:

(1) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)

(2) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)

(3) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)

(4) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (3) (A) - (II), (B) - (III), (C) - (IV), (D) - (I).

Solution:

- Cervical Vertebrae (A): There are 7 cervical vertebrae that support the neck and allow head movement (II).
- Thoracic Vertebrae (B): There are 12 thoracic vertebrae, each associated with a rib pair (III).
- Lumbar Vertebrae (C): Comprising 5 vertebrae, these are larger to support the lower back (IV).
- Coccygeal Vertebrae (D): There are typically 4 fused vertebrae forming the coccyx or tailbone (I).

Quick Tip

Remember the sequence: 7 cervical, 12 thoracic, 5 lumbar, 4 coccygeal vertebrae in the human vertebral column.

---

55. Match List-I with List-II

Condition	**Symptoms**
(A) Glomerulonephritis	(I) Cessation of urine secretion
(B) Anuria	(II) An infection of kidney leading to inflammation
(C) Polyuria	(III) Inflammation of urinary bladder
(D) Cystitis	(IV) Secretion of large quantities of urine

Choose the correct answer from the options given below:

(1) (A) - (II), (B) - (IV), (C) - (I), (D) - (III)

(2) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

(3) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)

(4) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (2) (A) - (II), (B) - (I), (C) - (IV), (D) - (III).

Solution:

- Glomerulonephritis (A): Characterized by kidney inflammation often due to an infection (II).
- Anuria (B): Defined as the cessation of urine secretion, a severe condition requiring urgent intervention (I).
- Polyuria (C): Involves excessive urine output, often a symptom of diabetes or kidney dysfunction (IV).
- Cystitis (D): Inflammation of the urinary bladder, usually caused by bacterial infection (III).

Quick Tip

Understanding renal and urinary conditions helps in early diagnosis and appropriate treatment.

---

56. Identify the metalloproteins from the following

(A) Ceruloplasmin

(B) Albumin

(C) Transferrin

(D) Mucin

Choose the correct answer from the options given below:

(1) (A) and (C) only.

(2) (C) and (D) only.

(3) (B) and (D) only.

(4) (A) and (D) only.

Correct Answer: (1) (A) and (C) only.

Solution:

- Ceruloplasmin (A): A copper-binding metalloprotein that plays a role in iron metabolism.
- Transferrin (C): An iron-binding metalloprotein responsible for iron transport in the blood.

- Albumin (B) and Mucin (D): These are not metalloproteins but serve other biochemical functions such as maintaining osmotic pressure and providing lubrication, respectively.

Quick Tip

Metalloproteins like ceruloplasmin and transferrin are critical for metal ion transport and storage.

---

57. The Hydrogen peroxide formed in the erythrocyte is converted into water by which of the following?

(A) G6PD

(B) Catalase

(C) Methemoglobin reductase

(D) Glutathione peroxidase

Choose the correct answer from the options given below:

(1) (A) and (B) only.

(2) (B) and (D) only.

(3) (A) and (C) only.

(4) (C) and (D) only.

Correct Answer: (2) (B) and (D) only.

Solution:

- Catalase (B): Breaks down hydrogen peroxide into water and oxygen, protecting cells from oxidative stress.
- Glutathione peroxidase (D): Converts hydrogen peroxide into water using reduced glutathione, providing cellular defense against oxidative damage.
- G6PD (A) and Methemoglobin reductase (C): Play roles in other biochemical pathways but are not directly involved in hydrogen peroxide breakdown.

Quick Tip

Catalase and glutathione peroxidase are essential for neutralizing reactive oxygen species in erythrocytes.

58. Excess niacin administration may cause

(A) Lowering of blood pressure

(B) Hypertension

(C) Flushing syndrome

(D) Vasoconstriction

Choose the correct answer from the options given below:

(1) (A) and (D) only.

(2) (B) and (C) only.

(3) (C) and (D) only.

(4) (A) and (C) only.

Correct Answer: (4) (A) and (C) only.

Solution:

- Lowering of blood pressure (A): Excess niacin can cause vasodilation, leading to a drop in blood pressure.
- Flushing syndrome (C): A common side effect where skin redness and warmth occur, particularly on the face and neck.
- Hypertension (B) and vasoconstriction (D): These effects are not typically associated with niacin overdose.

Quick Tip

Be cautious with high doses of niacin; flushing syndrome and hypotension are frequent adverse effects.

59. What are the identical urinary findings in both metabolic acidosis and respiratory acidosis?

(A) pH: acidic

(B) $NaHPO_4$: Increased

(C) Titrable acidity: Increased

(D) NH_4Cl: Decreased

Choose the correct answer from the options given below:

(1) (A), (B) and (D) only.

(2) (A), (B) and (C) only.

(3) (B), (C) and (D) only.

(4) (A), (C) and (D) only.

Correct Answer: (2) (A), (B) and (C) only.

Solution:

- Acidic pH (A): Indicates compensatory mechanisms for acidosis in both metabolic and respiratory conditions.
- Increased $NaHPO_4$ (B): Reflects renal buffering of excess hydrogen ions.
- Increased titrable acidity (C): Indicates enhanced excretion of hydrogen ions as part of acid-base balance.
- NH_4Cl (D): Typically increased, not decreased, as ammonium excretion compensates for acidosis.

Quick Tip

Monitoring urinary parameters is key in diagnosing and managing acid-base disorders effectively.

---

60. De novo synthesis of purines is not operative in

(A) Liver

(B) Erythrocytes

(C) Kidney

(D) Brain

Choose the correct answer from the options given below:

(1) (B) and (D) only.

(2) (A) and (C) only.

(3) (A) and (B) only.

(4) (C) and (D) only.

Correct Answer: (a) (B) and (D) only.

Solution:

- Erythrocytes (B): Lack the organelles necessary for purine synthesis and rely on salvage pathways.
- Brain (D): Primarily utilizes the salvage pathway for purine nucleotides due to limited de novo synthesis.
- Liver (A) and Kidney (C): Major sites of de novo purine synthesis, supporting systemic nucleotide needs.

Quick Tip

Tissues lacking de novo purine synthesis depend on salvage pathways for nucleotide availability.

---

61. Read the following statements and choose the correct answers from the options given below:

(A). In Neisser's stain, Neisser's methylene blue is used as a counter stain.

(B). Granular part stains blue-black in color by Neisser's stain in bacteria.

(C). Negative staining is used for the identification of the capsule.

(D). By using Hiss method of capsule stain, capsules stain yellowish-green in color.

Choose the correct answer from the options given below:

(1) (B) and (D) only.

(2) (A) and (C) only.

(3) (A) and (B) only.

(4) (B) and (C) only.

Correct Answer: (d) (B) and (C) only.

Solution:

- Statement (B): Neisser's stain highlights granular parts in bacteria with a blue-black color.
- Statement (C): Negative staining is a reliable technique for capsule identification.
- Statement (A): Neisser's methylene blue is not used as a counter stain, making this

statement incorrect.

- Statement (D): Capsules do not stain yellowish-green with Hiss method, making it incorrect as well.

Quick Tip

Negative staining is ideal for visualizing structures like bacterial capsules.

---

62. Read the following statement and choose the correct answer from the options given below:

(A). In MacConkey agar, Escherichia coli is used as +ve control organism.

(B). Clostridium botulinum, an anaerobic organism, may produce some growth on the surface of an aerobic bacteria supporting agar plate.

(C). In Candle Jar method, carbon dioxide gas is produced inside the Candle Jar, which stimulates the growth of bacteria.

(D). The popular but ineffective anaerobic culture method is biological method.

Choose the correct answer from the options given below:

(1) (A) and (D) only.

(2) (B) and (C) only.

(3) (A) and (C) only.

(4) (C) and (D) only.

Correct Answer: (c) (A) and (C) only.

Solution:

- Statement (A): Escherichia coli is a commonly used positive control in MacConkey agar due to its lactose-fermenting properties.

- Statement (C): The Candle Jar method generates CO_2 to foster the growth of capnophilic bacteria.

- Statement (B): Clostridium botulinum does not grow on aerobic agar plates, making this statement incorrect.

- Statement (D): Biological methods are not commonly considered anaerobic culture methods.

Quick Tip

The Candle Jar method is a straightforward technique for culturing bacteria that require elevated CO_2 levels.

---

63. Read the following statements and choose the correct answer from the options given below:

(A). In heavy bacterial infection, toxic granules are present in neutrophils.

(B). Basophilia is observed in all conditions except myxedema.

(C). Charcot-Leyden crystals are formed by degeneration of eosinophils.

(D). Human leukocyte antigen test is done to determine donor/recipient compatibility for tissue transplantation.

Choose the correct answer from the options given below:

(1) (A), (B) and (C) only.

(2) (A), (B) and (D) only.

(3) (A), (C) and (D) only.

(4) (B), (C) and (D) only.

Correct Answer: (3) (A), (C) and (D) only.

Solution:

- Statement (A): Neutrophils show toxic granules during severe bacterial infections.
- Statement (C): Charcot-Leyden crystals result from eosinophil degeneration, often seen in allergic responses.
- Statement (D): HLA testing is critical for assessing compatibility in organ and tissue transplantation.
- Statement (B): Basophilia can occur in myxedema, making this statement incorrect.

Quick Tip

HLA testing ensures successful organ transplants by minimizing rejection risks.

---

64. Read the following statements and choose the correct answer from the options given

below:

(A). After the telophase stage of cell division, two daughter cells are formed.

(B). The process of cell division is called osmosis.

(C). Network formed by reticular fibers supports cells, capillaries & nerve fibers.

(D). Granulomas are typically soft in Gumma.

Choose the correct answer from the options given below:

(1) (A) and (D) only.

(2) (A) and (C) only.

(3) (B) and (D) only.

(4) (C) and (D) only.

Correct Answer: (2) (A) and (C) only.

Solution:

- Statement (A): Telophase culminates in cytokinesis, forming two daughter cells.

- Statement (C): Reticular fibers provide structural support to cells and capillaries.

- Statement (B): Osmosis refers to water movement across membranes and is unrelated to cell division.

- Statement (D): Granulomas are typically firm, not soft, in Gumma.

Quick Tip

Reticular fibers form the framework for hematopoietic and lymphoid tissues.

---

65. Read the following statements and choose the correct answer from the options given below:

(A). Sphenoid bone is at the back and lower part of the cranial cavity.

(B). Ethmoid bone lies at the base of the skull.

(C). Frontal bone forms the forehead and the roof of the orbit.

(D). Parietal bone forms the roofs and sides of the skull.

Choose the correct answer from the options given below:

(1) (A) and (D) only.

(2) (B) and (C) only.

(3) (A) and (B) only.

(4) (C) and (D) only.

Correct Answer: (4) (C) and (D) only.

Solution:

- Frontal bone (C): Forms the forehead and roof of the orbit, providing protection and structural support.
- Parietal bone (D): Covers the roofs and sides of the skull, contributing to cranial strength.
- Sphenoid bone (A): Incorrect, as it is located centrally within the cranial cavity, not at the back and lower part.
- Ethmoid bone (B): Incorrect, as it lies between the nasal cavity and the orbits.

Quick Tip

Understanding the anatomical roles of cranial bones is vital for studying head injuries and neurological conditions.

---

66. Arrange the following in proper sequence:

(A). Counter stain

(B). Mordant

(C). Primary stain

(D). Decolorization

Choose the correct answer from the options given below:

(1) (C), (B), (D), (A)

(2) (A), (B), (D), (C)

(3) (B), (A), (D), (C)

(4) (C), (B), (A), (D)

Correct Answer: (1) (C), (B), (D), (A).

Solution:

The correct sequence of staining is:

1. Primary stain (C): Stains all cells.

2. Mordant (B): Fixes the stain.

3. Decolorization (D): Removes the primary stain from certain cells.

4. Counter stain (A): Stains decolorized cells.

Quick Tip

Mastering the staining sequence is essential for differentiating between cell types in microscopy.

---

67. Arrange the following steps of sporulation in correct order from initial stage:

(A). Engulfment of fore spore

(B). Axial filament formation

(C). Septum formation

(D). Cortex formation

Choose the correct answer from the options given below:

(1) (A), (B), (D), (C)

(2) (B), (C), (A), (D)

(3) (C), (D), (B), (A)

(4) (B), (A), (C), (D)

Correct Answer: (2) (B), (C), (A), (D).

Solution:

Sporulation involves: 1. Axial filament formation (B): Chromosome aligns.

2. Septum formation (C): Divides the cell into two compartments.

3. Engulfment of fore spore (A): Membranes enclose the spore.

4. Cortex formation (D): Protective layers develop.

Quick Tip

Sporulation is a survival mechanism enabling bacteria to withstand adverse conditions.

---

68. Arrange the following events in inflammatory response in correct sequence:

(A). Phagocytes migration

(B). Tissue damage release mediators that include capillary permeability

(C). Leakage of fluid (exudate) and cells

(D). Phagocytes and exudate destroy bacteria

Choose the correct answer from the options given below:

(1) (A), (C), (B), (D)

(2) (A), (D), (B), (C)

(3) (B), (C), (A), (D)

(4) (C), (B), (D), (A)

Correct Answer: (3) (B), (C), (A), (D).

Solution:

Inflammatory response progresses as: 1. Tissue damage releases mediators (B): Increases capillary permeability.

2. Leakage of fluid and cells (C): Leads to swelling and redness.

3. Phagocytes migration (A): Attracted to the site of injury.

4. Phagocytes and exudate destroy bacteria (D): Completes the response.

Quick Tip

The inflammatory response is a vital defense mechanism against infection.

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69. Arrange the following steps of tissue processing in histopathology lab in correct sequence:

(A). Dehydration

(B). Fixation

(C). Clearing

(D). Infiltration Impregnation

Choose the correct answer from the options given below:

(1) (A), (B), (D), (C)

(2) (D), (A), (C), (B)

(3) (B), (A), (C), (D)

(4) (C), (B), (D), (A)

Correct Answer: (3) (B), (A), (C), (D).

Solution:

Histological tissue processing follows these steps:

1. Fixation (B): Preserves tissue architecture.

2. Dehydration (A): Removes water.

3. Clearing (C): Prepares tissue for embedding.

4. Infiltration & Impregnation (D): Embeds tissue in paraffin.

Quick Tip

Accurate tissue processing ensures optimal microscopic examination.

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70. Arrange the following steps of phagocytosis in sequence:

(A). Phagosome fuses with lysosome

(B). Bacterium is ingested, forming phagosome

(C). Bacterium is killed by lysosomal enzymes

(D). Bacterium becomes attached to pseudopodia

Choose the correct answer from the options given below:

(1) (D), (B), (A), (C)

(2) (A), (C), (B), (D)

(3) (B), (A), (D), (C)

(4) (C), (B), (D), (A)

Correct Answer: (1) (D), (B), (A), (C).

Solution:

Phagocytosis occurs as follows:

1. Attachment (D): Bacterium adheres to pseudopodia.

2. Ingestion (B): Forms a phagosome.

3. Fusion (A): Phagosome merges with lysosome.

4. Killing (C): Lysosomal enzymes destroy the bacterium.

Quick Tip

Phagocytosis is a critical component of innate immunity.

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71. Arrange the following steps of immune response in correct sequence:

(A). T cells receptors recognize antigen bound to MHC molecule

(B). Internalized antigen digested by cell

(C). Bound antigen - MHC activates T cells

(D). Altered self - cell presents antigen

Choose the correct answer from the options given below:

(1) (A), (B), (D), (C)

(2) (A), (C), (B), (D)

(3) (B), (A), (D), (C)

(4) (B), (D), (A), (C)

Correct Answer: (4) (B), (D), (A), (C).

Solution:

The immune response follows this sequence:

1. Internalized antigen is digested by the cell (B).
2. The altered self-cell presents the antigen (D).
3. T cell receptors recognize the antigen bound to MHC (A).
4. The antigen-MHC complex activates T cells (C).

Quick Tip

Antigen presentation by MHC molecules is a crucial step in activating adaptive immunity.

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72. Arrange the following steps for WBC counting in correct order:

(A). Draw the blood sample, fill venous blood till 0.5 mark

(B). Place the cover slip on the counting chamber at the right place

(C). Use a WBC pipette of a hemocytometer

(D). Draw WBC diluting fluid, fill the fluid till 11 mark, mix with blood

Choose the correct answer from the options given below:

(1) (A), (C), (B), (D)

(2) (D), (B), (C), (A)

(3) (C), (A), (D), (B)

(4) (C), (A), (B), (D)

Correct Answer: (3) (C), (A), (D), (B).

Solution:

The correct sequence for WBC counting:

1. Use a WBC pipette (C).
2. Draw the blood sample to the 0.5 mark (A).
3. Add WBC diluting fluid to the 11 mark and mix with blood (D).
4. Place the cover slip on the counting chamber (B).

Quick Tip

Accurate technique is essential for reliable WBC counting using a hemocytometer.

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73. Arrange the following steps in degradation of uric acid in animals other than man in correct sequence:

(A). Allantoin

(B). Uric acid

(C). Urea

(D). Allantoin acid

(E). Ammonia

Choose the correct answer from the options given below:

(1) (B), (A), (D), (C), (E)

(2) (D), (B), (C), (E), (A)

(3) (B), (E), (D), (A), (C)

(4) (E), (B), (C), (A), (D)

Correct Answer: (1) (B), (A), (D), (C), (E).

Solution:

The degradation of uric acid in animals follows this sequence:

1. Uric acid (B) is converted into allantoin (A).
2. Allantoin acid (D) is formed next.
3. Urea (C) is produced.
4. Finally, ammonia (E) is released.

Quick Tip

The uric acid degradation pathway varies across species, influencing nitrogen metabolism.

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74. Arrange the following reactions of the citric acid cycle in correct order:

(A). Formation of Alpha-ketoglutarate

(B). Conversion of Alpha-ketoglutarate to succinyl CoA

(C). Formation of citrate

(D). Citrate is isomerized to isocitrate

(E). Formation of succinate

Choose the correct answer from the options given below:

(1) (D), (B), (C), (E), (A)

(2) (C), (B), (D), (A), (E)

(3) (C), (D), (A), (B), (E)

(4) (A), (C), (D), (E), (B)

Correct Answer: (3) (C), (D), (A), (B), (E).

Solution:

The steps of the citric acid cycle in order:

1. Formation of citrate (C).
2. Citrate is isomerized to isocitrate (D).
3. Formation of alpha-ketoglutarate (A).

4. Conversion of alpha-ketoglutarate to succinyl CoA (B).

5. Formation of succinate (E).

Quick Tip

The citric acid cycle is central to cellular respiration, providing energy and intermediates for biosynthesis.

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75. Arrange the following in order from top to bottom lateral view of adult skull (Frontal bone):

(A). Lacrimal bone

(B). Maxilla

(C). Supra-orbital foramen

(D). Infra-orbital foramen

(E). Nasal bone

Choose the correct answer from the options given below:

(1) (A), (D), (B), (E), (C)

(2) (C), (A), (E), (D), (B)

(3) (D), (A), (B), (E), (C)

(4) (C), (E), (A), (D), (B)

Correct Answer: (4) (C), (E), (A), (D), (B).

Solution:

The top-to-bottom order of structures in the lateral view of the adult skull:

1. Supra-orbital foramen (C).

2. Nasal bone (E).

3. Lacrimal bone (A).

4. Infra-orbital foramen (D).

5. Maxilla (B).

Quick Tip

Knowing the anatomical layout of the skull aids in clinical assessments and surgeries.