



## SUMMER– 2023 EXAMINATION

## MODEL ANSWER - ONLY FOR THE USE OF RAC ASSESSORS

Subject Title: HUMAN ANATOMY &amp; PHYSIOLOGY- THEORY

Subject Code: 20114

**Important Instructions to examiners:**

- 1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
- 2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
- 3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills).
- 4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
- 5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
- 6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
- 7) For programming language papers, credit may be given to any other program based on equivalent concept.
- 8) As per the policy decision of Maharashtra State Government, teaching in English/Marathi and Bilingual (English + Marathi) medium is introduced at first year of AICTE diploma Programme from academic year 2021-2022. Hence if the students write answers in Marathi or bilingual language (English +Marathi), the Examiner shall consider the same and assess the answer based on matching of concepts with model answer.

Q. No.	Sub No.	Answers	Marking Scheme
1		<b>Answer any <u>SIX</u> of the following:</b>	<b>30M</b>
1	a	<b>Describe the process of blood clotting.</b> <b>Marking Scheme: Three step for 3 marks, 1 mark for blood clotting factors, 1 mark for showing both intrinsic and extrinsic pathway</b> <b>Answer:</b> Blood coagulation is a protective process to stop the loss of blood. When blood vessel damaged after injury, a blood loss stops by a sequence of overlapping processes—in which platelets play a crucial role—lead to repair. Coagulation can start as soon as 15 seconds after injury, depending on how much the vessel wall is injured. The conversion of blood to semisolid mass is known as blood coagulation which occurs in following way. <ol style="list-style-type: none"><li>1) <b>Vasoconstriction:</b> Very first platelets come in contact with the damaged blood vessels, their surfaces become sticky, and they adhere to the damaged walls. Then they release serotonin that causes vasoconstriction, reducing or stopping blood flow through it.</li><li>2) <b>Platelet plug formation:</b> The adhered platelets attract more platelets which form platelet plug. This forms a temporary seal. Platelet plug formation is usually complete within 6 minutes of injury.</li><li>3) <b>Coagulation-</b> (blood clotting): Coagulation takes place by conversion of various coagulation factors (as given in table) to their active form and a series of cascade to a clot. Both intrinsic and extrinsic pathway are operated on their own as per the situation and both are responsible to activate the X factor. This then stimulates the conversion of prothrombin to thrombin with the help of platelet phospholipid and</li></ol>	<b>5 M</b>

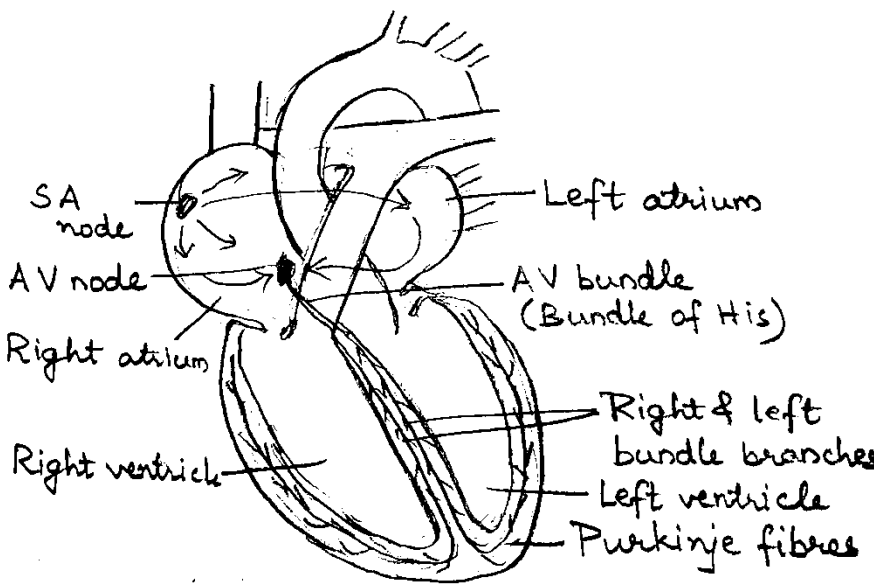


Q. No.	Sub No.	Answers	Marking Scheme																								
		<p>calcium. Thrombin helps to convert the fibrinogen to insoluble fibrin which forms a mesh like structure, where more blood cells are get trapped to form a clot. The cascade of coagulation process is given below:</p> <p style="text-align: center;">OR</p> <p><b>Blood coagulation factors:</b></p> <table border="1"> <tr> <td>I</td> <td>Fibrinogen</td> </tr> <tr> <td>II</td> <td>Prothrombin</td> </tr> <tr> <td>III</td> <td>Tissue factor (thromboplastin)</td> </tr> <tr> <td>IV</td> <td>Calcium (Ca<sup>2+</sup>)</td> </tr> <tr> <td>V</td> <td>Labile factor, proaccelerin, Ac-globulin</td> </tr> <tr> <td>VII</td> <td>Stable factor, proconvertin</td> </tr> <tr> <td>VIII</td> <td>Antihaemophilic globulin (AHG), antihemophilic factor A</td> </tr> <tr> <td>IX</td> <td>Christmas factor, plasma thromboplastin component (PTA), antihemophilic factor B</td> </tr> <tr> <td>X</td> <td>Stuart Prower factor</td> </tr> <tr> <td>XI</td> <td>Plasma thromboplastin antecedent (PTA), antihemophilic factor C</td> </tr> <tr> <td>XII</td> <td>Hageman factor</td> </tr> <tr> <td>XIII</td> <td>Fibrin stabilising factor</td> </tr> </table>	I	Fibrinogen	II	Prothrombin	III	Tissue factor (thromboplastin)	IV	Calcium (Ca <sup>2+</sup> )	V	Labile factor, proaccelerin, Ac-globulin	VII	Stable factor, proconvertin	VIII	Antihaemophilic globulin (AHG), antihemophilic factor A	IX	Christmas factor, plasma thromboplastin component (PTA), antihemophilic factor B	X	Stuart Prower factor	XI	Plasma thromboplastin antecedent (PTA), antihemophilic factor C	XII	Hageman factor	XIII	Fibrin stabilising factor	
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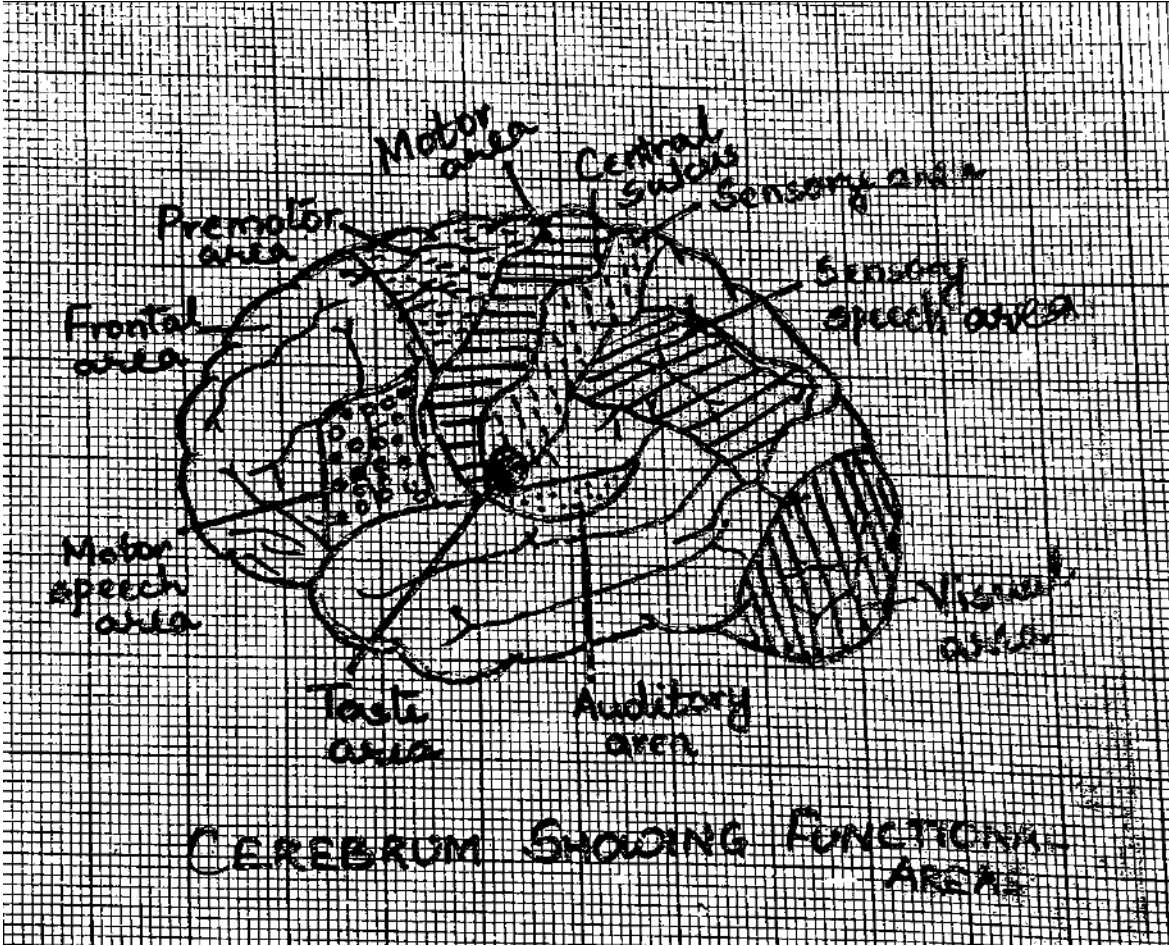


Q. No.	Sub No.	Answers	Marking Scheme
1	b	<p><b>Explain conducting system of the heart with neat diagram.</b></p> <p><b>Marking Scheme: Explanation 3M, Diagram with conducting system 2 M</b></p> <p><b>Answer:</b></p> <p>The cardiac conduction system consists of nodes and specialised conduction cells-</p> <div style="text-align: center;"><pre>graph TD; A["Sinoatrial node - Action potential generation"] --&gt; B["Atrioventricular node - action potential slightly delayed"]; B --&gt; C["Atrioventricular bundle (bundle of His) - wave further transmitted to"]; C --&gt; D["Purkinje fibres - Impulses transmitted to ventricles"];</pre></div> <p>1) <b>Sinoatrial Node</b> (pacemaker): The sinoatrial (SA) node is a group of specialised cells, located in the upper wall of the right atrium near the superior vena cava. These cells can spontaneously generate electrical impulses. The wave of excitation created by the SA node spreads to the atria, resulting in atrial contraction (atrial systole).</p> <p>2) <b>Atrioventricular Node:</b> The impulses then reach atrioventricular node – located within the atrioventricular septum, near the opening of the coronary sinus. The AV node acts to delay the impulses, to ensure the atria have enough time to fully eject blood into the ventricles.</p> <p>3) <b>Atrioventricular Bundle:</b> The atrioventricular bundle (bundle of His) is a continuation of the specialised tissue of the AV node. It helps to transmit the electrical impulse from the AV node to the Purkinje fibres. It descends down the interventricular septum, then divides into two bundles: right and left.</p> <p>4) <b>Purkinje Fibres:</b> They are a network of specialised cells located in the subendocardial surface of the ventricular walls and help in ventricular contraction. The blood flows from the right and left ventricles to the pulmonary artery and aorta respectively.</p>	5M



Q. No.	Sub No.	Answers	Marking Scheme														
		 <p style="text-align: center;">CONDUCTING SYSTEM OF HEART</p>															
1	c	<p><b>Write the composition and functions of gastric juice. Name the three phases of gastric juice secretion.</b></p> <p><b>Marking Scheme: Each composition with function 1M (4M), Phases 1M</b></p> <p><b>Answer:</b></p> <p><b>Composition and functions</b></p> <table border="1" data-bbox="244 1310 1385 1921"> <thead> <tr> <th>Composition of Gastric juice</th> <th>Functions of Gastric Juice</th> </tr> </thead> <tbody> <tr> <td>Water</td> <td>Liquefies the food</td> </tr> <tr> <td>Mineral salts</td> <td>Helps in buffering action</td> </tr> <tr> <td>Mucus</td> <td>Prevents mechanical injury to the stomach wall</td> </tr> <tr> <td>Hydrochloric acid</td> <td>Acidifies food &amp; stops the action of salivary amylase. Kills the microbes. Provides acidic pH for active pepsin</td> </tr> <tr> <td>Pepsinogen enzyme</td> <td>Helps in digestion of proteins to peptones and peptides</td> </tr> <tr> <td>Intrinsic factor</td> <td>Helps in absorption of vit. B<sub>12</sub> from small intestine</td> </tr> </tbody> </table> <p><b>Phases of gastric secretion</b></p> <ol style="list-style-type: none"> <li>1. Cephalic phase</li> <li>2. Gastric phase</li> <li>3. Intestinal phase</li> </ol>	Composition of Gastric juice	Functions of Gastric Juice	Water	Liquefies the food	Mineral salts	Helps in buffering action	Mucus	Prevents mechanical injury to the stomach wall	Hydrochloric acid	Acidifies food & stops the action of salivary amylase. Kills the microbes. Provides acidic pH for active pepsin	Pepsinogen enzyme	Helps in digestion of proteins to peptones and peptides	Intrinsic factor	Helps in absorption of vit. B <sub>12</sub> from small intestine	5M
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1	d	<p><b>Explain the functions of cerebrum. Name the functional areas of cerebrum with diagram.</b></p> <p><b>Marking Scheme: Functions 1.5M, Names 1.5M, Diagram with any four areas 2M</b></p> <p><b>Answer:</b></p> <p><b>Functions of cerebrum includes.</b></p> <ol style="list-style-type: none"><li>1. Mental activities involving memory, intelligence, sense of responsibility, thinking, will power, personality, moral sense, and learning.</li><li>2. Sensory functions like sense of smell, taste, touch, hearing, sight, pain and temperature</li><li>3. Initiation and control of skeletal muscle contraction (movement)</li></ol> <p><b>Names of functional areas of cerebrum</b></p> <ol style="list-style-type: none"><li>1. Speech area</li><li>2. Visual area</li><li>3. Auditory area</li><li>4. Taste area</li><li>5. Sensory area</li><li>6. Motor area</li></ol>  <p><b>CEREBRUM SHOWING FUNCTIONAL AREAS</b></p>	5M



Q. No.	Sub No.	Answers	Marking Scheme
1	e	<p><b>Describe the process of urine formation.</b></p> <p><b>Marking Scheme: Steps with explanation 4M, Diagram of nephron 1 M</b></p> <p><b>Answer:</b></p> <p>There are three processes in urine formation which takes place in the nephron in kidneys:</p> <ol style="list-style-type: none"><li>1. Glomerular filtration / Ultra filtration</li><li>2. Selective reabsorption</li><li>3. Tubular secretion.</li></ol> <p><b>1. Filtration:</b></p> <p>Filtration take place through the semipermeable walls of the glomerulus. Although some are later reabsorbed, tiny molecules like water and other substances can easily pass through. Big molecules such as blood cells, plasma proteins, and other big molecules cannot pass through the capillaries and stay there instead. With the notable exceptions of plasma proteins and blood cells, the filtrate in the glomerulus shares a lot in common with plasma in terms of composition.</p> <p>Filtration takes place because there is a difference between the blood pressure in the glomerulus and the pressure of the filtrate in the glomerular capsule. Because the efferent arteriole is narrower than the afferent arteriole, a capillary hydrostatic pressure is greater which is opposed by blood osmotic pressure and the filtrate hydrostatic pressure in the glomerular capsule.</p> <p>The glomerular filtration rate (GFR) is the amount of filtrate that both kidneys produce each minute. The GFR of an adult in good health is around 125 mL/min, meaning that the two kidneys produce 180 litres of filtrate per day. Less than 1%, or 1-1.5 litres, of the filtrate is eventually expelled as urine, with the remainder being reabsorbed almost entirely from the renal tubules. The selective reabsorption of some filtrate elements and tubular secretion of others are what cause the variations in volume and concentration.</p> <p><b>2. Selective Reabsorption:</b></p> <p>It is the process by which composition and volume of filtrate are changed during its passage through the tubule. The constituents required by the body are reabsorbed. Components like glucose, amino acids, vitamins are completely reabsorbed into the blood. These are called high-threshold substances. Low-threshold substances like urea, uric acid is absorbed slightly. Some substances for e.g. creatinine are not at all absorbed.</p>	5M



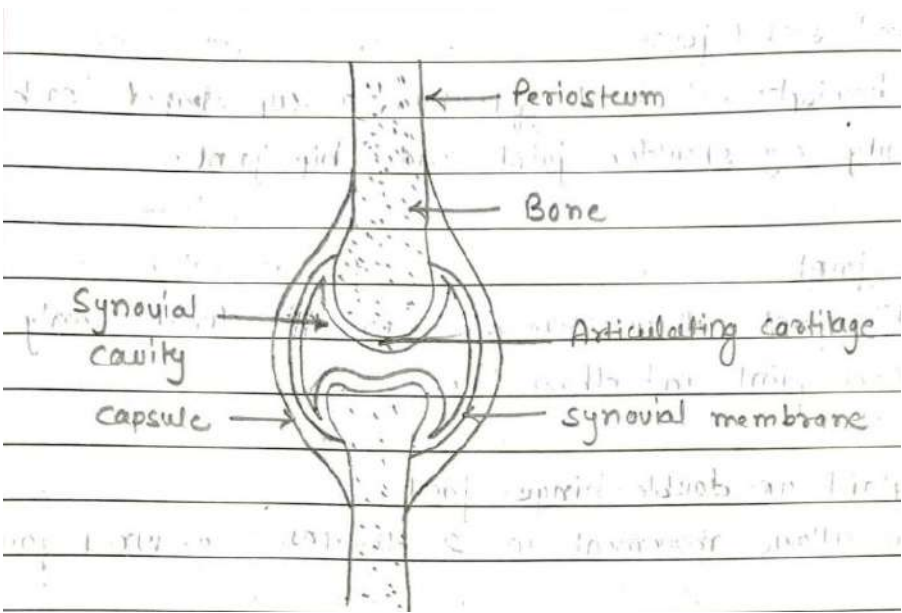
Q. No.	Sub No.	Answers	Marking Scheme
		<p>Various hormones influence the selective reabsorption like parathyroid hormone increases the blood calcium level and calcitonin lower it. Antidiuretic hormone, ADH increases the permeability of the distal convoluted tubules and collecting tubules, increasing water reabsorption. Aldosterone secreted by the adrenal cortex, this hormone increases the reabsorption of sodium and water, and the excretion of potassium. Atrial natriuretic peptide decreases reabsorption of sodium and water from the proximal convoluted tubules and collecting ducts.</p> <p><b>3. Tubular Secretion:</b></p> <p>As blood passes through the glomerulus, filtering takes place. Because blood spends so little time in the glomerulus, it may not be completely filtered of unnecessary and alien substances, such as medications like aspirin and penicillin. Such chemicals are eliminated via secretion into the filtrate within the convoluted tubules from the peritubular capillaries. Hydrogen ion (H<sup>+</sup>) production from the tubules is crucial for preserving a normal blood pH.</p> <p><b>Nephron</b></p> <p>The diagram is a hand-drawn sketch of a nephron. It starts with an afferent arteriole entering a glomerulus where ultrafiltration occurs. The filtrate then moves into the proximal convoluted tubule, where selective reabsorption is indicated. The tubule then descends into a U-shaped loop labeled 'Loop of Henle'. After the loop, the tubule becomes the distal convoluted tubule, where tubular secretion is shown. Finally, the filtrate enters a collecting duct. The entire structure is captioned 'Nephron Showing stages of urine formation'.</p>	



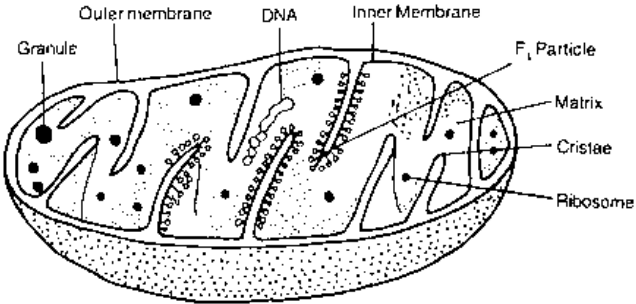
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1	f	<p><b>Write the functions of skin.</b></p> <p><b>Marking Scheme: Each function 1 M (Consider any five functions)</b></p> <p><b>Answer:</b></p> <p><b>Functions of skin</b></p> <ol style="list-style-type: none"><li><b>1. Protection</b>-It forms the waterproof layer &amp; protects the inner delicate structures. It acts as the barrier against the invasion of the microbes, chemicals &amp; dehydration. The melanin pigment protects against the harmful UV rays.</li><li><b>2. Regulation of body temperature</b> -The human body temperature is constant at 36.8° C. When the metabolic rate of the body increases, the body temperature increases &amp; vice versa. To ensure consistent body temperature a balance between heat production &amp; heat loss is maintained by the skin.</li><li><b>3. Formation of vitamin D.</b> - 7-dehydroxycholesterol is present in the skin. UV light from the sun converts it to vitamin D.</li><li><b>4. Sensation</b>- There are different sensations like touch, pain, pressure, etc. are felt due to the presence of sensory receptors in the skin.</li><li><b>5. Absorption</b>- Some drugs &amp; chemicals are absorbed through the skin.</li><li><b>6. Excretion</b>- Skin is a minor excretory organ &amp; excretes NaCl, urea &amp; substances like alcohol.</li><li><b>7. Blood reservoir</b>- The dermis houses an extensive network of blood vessels that carry 8–10% of the total blood flow in a resting adult. For this reason, the skin acts as a blood reservoir.</li></ol>	5M
1	g	<p><b>Classify bones. Explain anatomical features of synovial joint with diagram.</b></p> <p><b>Marking Scheme: Classification 2M (Each class with example 0.5 M), Diagram of Synovial joint 1.5 M, Explanation 1.5M</b></p> <p><b>Answer:</b></p> <p>Bones are classified according to their shape.</p> <ol style="list-style-type: none"><li>1. Long bones - These are elongated bones found mostly in the limbs. They have a shaft and two extremities. E.g., Humerus, femur, radius, etc.</li><li>2. Short bones - These are box shaped bones. E.g., carpals, tarsals etc.</li><li>3. Flat bones - These are curved thin bones. Eg skull bones</li><li>4. Irregular bones - These have complex shape/ irregular shape. Eg vertebrae</li><li>5. Sesamoid bones - These bones form within a tendon. Eg patella</li></ol>	5M



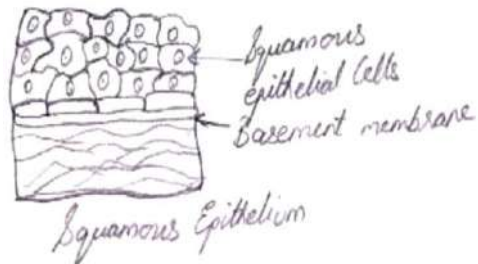
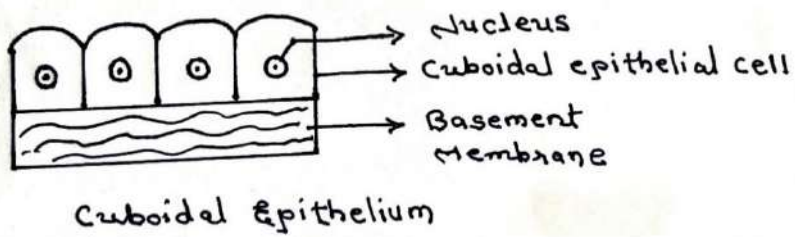
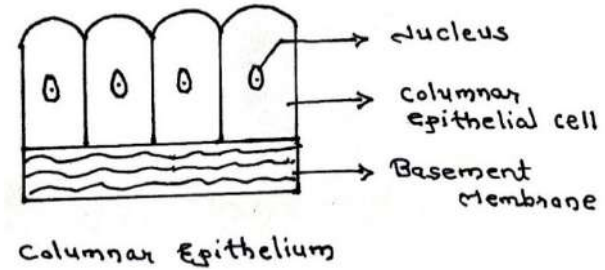


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		<p><b>Synovial Joint</b></p> <p>A synovial joint has anatomical features as synovial membrane, synovial cavity, cartilage, and synovial capsule.</p> <p>A space or capsule between the articulating bones is a distinguishing feature of synovial joints. A sleeve of fibrous tissue and a little quantity of fluid hold the ends of the bones together tightly. The body's synovial joints are the most mobile. The ends of bones are present in a synovial cavity. They are covered in smooth cartilage and are protected by a capsule. The capsule is lined with a synovial membrane that produces synovial fluid which helps in lubrication.</p> <p><b>Articular or hyaline cartilage:</b></p> <p>Hyaline cartilage covers the portions of the bones that are in touch with one another. This offers a friction-free articular surface, is robust enough to withstand compression pressures, and can support the weight of the body. Age causes the cartilage lining, which in youth can be up to 7 mm thick, to thin down and become less compressible. Other joint structures are put under more stress as a result. Since cartilage lacks a blood supply, synovial fluid serves as its only source of nutrition.</p> <p><b>Capsule or capsular ligament:</b></p> <p>A sleeve of fibrous tissue encircles and covers the joint, holding the bones together. It is robust enough to keep it from getting hurt yet sufficiently loose to allow for freedom of movement.</p> <p><b>Synovial membrane:</b></p> <p>All non-weight-bearing surfaces inside the joint are covered by this epithelial layer, which also lines the capsule. Synovial fluid is secreted by it.</p> 	

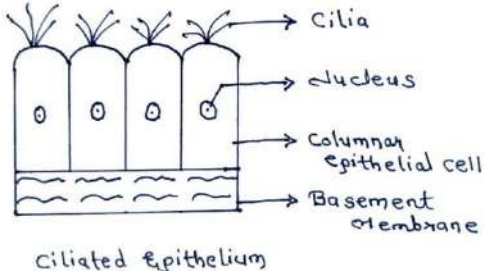


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2		Answer any <b>TEN</b> of the following:	30 M
2	a	<p><b>Write anatomy and functions of the mitochondria.</b></p> <p><b>Marking Scheme: Anatomy: 1M, Functions: 1M, Diagram 1M</b></p> <p><b>Answer:</b></p> <p><b>Structure:</b></p> <ul style="list-style-type: none"> <li>• They are sausage shaped structure present in cytoplasm.</li> <li>• It has a double unit membrane where the inner membrane contains folds known as cristae, forms shelves on which oxidative enzymes are present.</li> <li>• The fluid filled cavity is known as matrix.</li> <li>• They contain a special type of DNA, which is self-replicative.</li> </ul> <p><b>Function:</b></p> <ul style="list-style-type: none"> <li>• It is known as powerhouse of cell.</li> <li>• They are involved in cellular respiration, the process by which chemical energy is made available in the cell. When nutrients and oxygen come in contact with the enzyme, they combine to form CO<sub>2</sub>, water &amp; energy.</li> <li>• This is in the form of ATP (aerobic oxidation).</li> <li>• This ATP is used by the cell to do cellular functions.</li> </ul> 	3M
2	b	<p><b>Give an account of simple epithelium.</b></p> <p><b>Marking Scheme: Explanation of any 3 types with diagram – 3M</b></p> <p><b>Answer:</b></p> <p>Simple epithelial tissues consist of single layer of cells. It can be classified into 4 subtypes:</p> <ol style="list-style-type: none"> <li>1. <b>Squamous/pavement epithelium: -</b> Composed of single layer of flattened cells, fit like flat stones, and forms a smooth membrane. This tissue provides a thin smooth, inactive lining for heart, blood vessels, alveoli of lungs and lymph vessels. In lungs, blood vessels and lymph vessels, it is called <b>Endothelium</b> and in heart it is called <b>Endocardium</b>.</li> </ol>	3M



Q. No.	Sub No.	Answers	Marking Scheme
		<div data-bbox="574 353 1053 616"></div> <p data-bbox="271 649 606 694">2. <b>Cuboidal epithelium:</b></p> <p data-bbox="319 705 1404 828">Composed of cube shaped cells and forms the basement membrane. Involved in secretion and absorption. Present in some simple secretive glands. Forms basement membrane in tubules of kidney.</p> <div data-bbox="414 851 1212 1086"></div> <p data-bbox="271 1086 622 1131">3. <b>Columnar epithelium:</b></p> <p data-bbox="319 1142 1404 1310">Formed by single layer of rectangular shaped cells and situated on a basement membrane. Found lining the organs of alimentary tract and special columnar cells called 'goblet cells', in GIT secretes sticky substances called mucus. Function- absorption.</p> <div data-bbox="558 1332 1165 1601"></div> <p data-bbox="271 1646 606 1691">4. <b>Ciliated epithelium:</b> -</p> <p data-bbox="319 1691 1404 1915">This is formed by columnar cells with fine hair like protoplasmic processes called cilia, capable of wave like movements. They move the contents in a particular direction. Found at the lining of most of the respiratory passages and uterine tubes. In respiratory passages, it propels mucous towards throat and in the uterine tube, it propels ova towards the uterus.</p>	



Q. No.	Sub No.	Answers	Marking Scheme
		 <p style="text-align: center;">ciliated epithelium</p>	
2	c	<p><b>Describe the functions of lymphatic system.</b></p> <p><b>Marking Scheme: Each function with description: 1M</b></p> <p><b>Answer:</b></p> <p>The Lymphatic system has three primary functions.</p> <ol style="list-style-type: none"> <li>1) <b>Fluid Balance:</b> -Lymphatic vessels drain excess interstitial fluid from tissues spaces and return it to the blood.</li> <li>2) <b>Fat Absorption:</b> -The lymphatic system absorbs and transport fatty acids and fats from the digestive system. It ensures absorption of dietary lipids and lipid soluble vitamins like A, D, E and K.</li> <li>3) <b>Defence:</b> - Lymphatic system has important role in defence mechanism by way of filtration of lymph &amp; trapping microorganism. Lymph node forms antibodies and lymphocytes to protect body against infection.</li> </ol> <p style="text-align: center;"><b>OR</b></p> <p><b>Marking Scheme: 6 Functions: 0.5M each</b></p> <p><b>Answer:</b></p> <ol style="list-style-type: none"> <li>1) It collects and returns tissue fluids from the intercellular spaces to the blood.</li> <li>2) It plays an important role in returning plasma proteins to the blood.</li> <li>3) Lymphatic node produces &amp; transports lymphocytes to the circulatory system.</li> <li>4) Antibodies formation by lymph node to protect body against infection.</li> <li>5) It absorbs and transport fatty acids and fats from the digestive system.</li> <li>6) Lymph nodes play an important role in defence mechanism by way of filtration of lymph &amp; trapping microorganism.</li> </ol>	3M
2	d	<p><b>Name the parts of respiratory system. Write applications of a peak flow meter.</b></p> <p><b>Marking Scheme: Any 4 parts: 2M, Applications: 1M (0.5 M each)</b></p> <p><b>Answer:</b></p> <p><b>Parts of respiratory system:</b></p> <p>Nose, pharynx, Larynx, trachea, Bronchi (Two), bronchioles, alveoli, and two lungs covered with pleura. Muscles of respiration- Intercostal muscles &amp; Diaphragm.</p>	3M

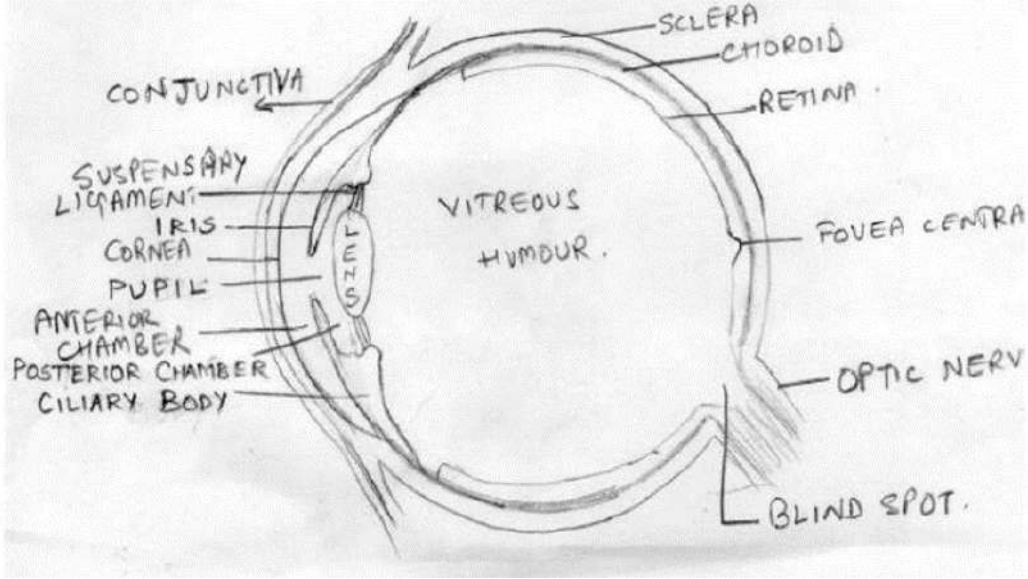


Q. No.	Sub No.	Answers	Marking Scheme
		<p><b>Applications of a peak flow meter:</b></p> <ul style="list-style-type: none"> <li>• Peak flow meter is a portable device that measures peak expiratory flow rate (PEFR).</li> <li>• It is useful in detecting changes in airway function.</li> <li>• It is used to monitor Asthma, effects of air pollutant and COPD.</li> <li>• It evaluates how efficiently lungs can exhale air.</li> </ul>	
2	e	<p><b>Create a flow diagram that describes the sequence of events that causes contraction of ventricles and ejection of blood flow from heart.</b></p> <p><b>Marking Scheme: Correct Sequential flow diagram with any 6 points: 3M (Consider only correct sequence)</b></p> <p><b>Answer:</b></p> <pre> graph TD     A1[Superior &amp; Inferior vena cava transport deoxygenated blood to Right atrium (RA)] --&gt; A2[SA node emits impulse]     A2[4 Pulmonary veins transport oxygenated blood to Left atrium (LA)] --&gt; A2     A2 --&gt; A3[Impulse spread to both atria – RA &amp; LA]     A3 --&gt; A4[Atrial systole – Contraction of both atria]     A4 --&gt; A5[Pressure increases in both atria – RA &amp; LA]     A5 --&gt; A6[Tricuspid valve opens]     A5 --&gt; A7[Bicuspid valve opens]     A6 --&gt; A8[Blood flow from RA to Right ventricle (RV) &amp; from LA to Left ventricle (LV)]     A7 --&gt; A8     A8 --&gt; A9[Impulse transfer from AV node to bundle branches &amp; Purkinje fibres]     A9 --&gt; A10[Wave of contraction sweeps from apex to walls of RV &amp; LV]     A10 --&gt; A11[Ventricular systole – Contraction of both ventricles (RV &amp; LV)]     A11 --&gt; A12[Pressure increases in both ventricles – RV &amp; LV]     A12 --&gt; A13[Tricuspid valve closes &amp; Pulmonary semilunar valve opens]     A12 --&gt; A14[Bicuspid valve closes &amp; Aortic semilunar valve opens]     A13 --&gt; A15[Blood flow from RV to Pulmonary artery – to Pulmonary circulation]     A14 --&gt; A16[Blood flow from LV to Aorta – to systemic circulation]     </pre>	3M



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2	f	<p><b>Write physiology of carbohydrate digestion.</b></p> <p><b>Marking Scheme: Each point 0.5M</b></p> <p><b>Answer:</b></p> <p><b>Carbohydrate digestion:</b></p> <ol style="list-style-type: none"> <li>1. Digestion of carbohydrate involves formation of simple and absorbable sugars from carbohydrates by action of enzymes. It takes place in mouth and small intestine.</li> <li>2. Salivary amylase converts polysaccharides to disaccharides.</li> <li>3. Pancreatic amylase converts polysaccharides to disaccharides.</li> <li>4. Sucrase converts sucrose to glucose and fructose.</li> <li>5. Maltase converts maltose to glucose.</li> <li>6. Lactase converts lactose to glucose and galactose.</li> </ol> <table border="1"> <thead> <tr> <th>S no</th> <th>Organ</th> <th>Secretion</th> <th>Enzyme</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Mouth</td> <td>Saliva</td> <td>Salivary amylase</td> <td>Starch → Polysaccharides</td> </tr> <tr> <td>2</td> <td>Small intestine</td> <td>Pancreatic juice</td> <td>Amylase</td> <td>Polysaccharides → Disaccharides</td> </tr> <tr> <td>3</td> <td>Small intestine</td> <td>Intestinal juice</td> <td>Sucrase Lactase Maltase</td> <td>Sucrose → Glucose + Fructose Lactose → Glucose + Galactose Maltose → Glucose + Glucose</td> </tr> </tbody> </table>	S no	Organ	Secretion	Enzyme	Action	1	Mouth	Saliva	Salivary amylase	Starch → Polysaccharides	2	Small intestine	Pancreatic juice	Amylase	Polysaccharides → Disaccharides	3	Small intestine	Intestinal juice	Sucrase Lactase Maltase	Sucrose → Glucose + Fructose Lactose → Glucose + Galactose Maltose → Glucose + Glucose	3M
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2	g	<p><b>Differentiate between sympathetic and parasympathetic nervous system.</b></p> <p><b>Marking Scheme: Any 6 differences: 0.5M each</b></p> <p><b>Answer:</b></p> <table border="1"> <thead> <tr> <th>Sympathetic nervous system</th> <th>Parasympathetic nervous system</th> </tr> </thead> <tbody> <tr> <td>This system enables the individual to adjust to exciting and stressful conditions (fight or flight)</td> <td>This system acts as a peacemaker for the body allowing restoration processes to occur quietly and peacefully</td> </tr> <tr> <td>It is also called thoraco-lumbar outflow</td> <td>It is also called cranio-sacral outflow</td> </tr> <tr> <td>The preganglionic nerve fibre is short while the post ganglionic fibre which ends in effector organ is long</td> <td>The preganglionic nerve fibre is long while the post ganglionic fibre is short</td> </tr> <tr> <td>The post ganglionic nerve fibre secretes neurotransmitter called adrenaline or noradrenaline</td> <td>The post ganglionic nerve fibre secretes neurotransmitter called acetylcholine</td> </tr> <tr> <td>It is also known as adrenergic nervous system</td> <td>It is also known as cholinergic nervous system</td> </tr> <tr> <td>It has Alfa &amp; beta receptors</td> <td>It has muscarinic &amp; nicotinic receptors</td> </tr> <tr> <td>It is involved in expenditure of energy</td> <td>It deals with restoration of body energy</td> </tr> </tbody> </table>	Sympathetic nervous system	Parasympathetic nervous system	This system enables the individual to adjust to exciting and stressful conditions (fight or flight)	This system acts as a peacemaker for the body allowing restoration processes to occur quietly and peacefully	It is also called thoraco-lumbar outflow	It is also called cranio-sacral outflow	The preganglionic nerve fibre is short while the post ganglionic fibre which ends in effector organ is long	The preganglionic nerve fibre is long while the post ganglionic fibre is short	The post ganglionic nerve fibre secretes neurotransmitter called adrenaline or noradrenaline	The post ganglionic nerve fibre secretes neurotransmitter called acetylcholine	It is also known as adrenergic nervous system	It is also known as cholinergic nervous system	It has Alfa & beta receptors	It has muscarinic & nicotinic receptors	It is involved in expenditure of energy	It deals with restoration of body energy	3M				
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2	h	<p><b>Name the three layers of the Eye. Draw well labelled vertical section of an Eyeball.</b></p> <p><b>Marking Scheme: Layers of the Eye: 1M, Eye-Ball Diagram: 2M</b></p> <p><b>Answer:</b></p> <p>The sclera, choroid, and retina are the three layers of the eyeball wall.</p> <p>Vertical section of an Eye- ball.</p> 	3M
2	i	<p><b>Name the hormones secreted by pancreas. Explain physiological role of Insulin.</b></p> <p><b>Marking Scheme: Any 2 Hormones secreted by pancreas:1M (0.5M each), Any 4 physiological role of Insulin: 2M (0.5M each)</b></p> <p><b>Answer:</b></p> <p><b>Hormones secreted by pancreas:</b> Insulin, Glucagon, Somatostatin, and pancreatic polypeptide.</p> <p><b>Physiological role of Insulin:</b></p> <p>The main function of insulin is to lower blood glucose level, this can be achieved by</p> <ol style="list-style-type: none"><li>1. Increases the uptake of glucose by the cells.</li><li>2. Increases the conversion of glucose to glycogen in the liver &amp; skeletal muscles.</li><li>3. It increases the uptake of amino acids by the cells.</li><li>4. It promotes the synthesis of fatty acids &amp; storage of fats in adipose tissue.</li><li>5. Decreases glycogenolysis.</li><li>6. Prevents breakdown of protein, fat &amp; gluconeogenesis.</li></ol>	3M



Q. No.	Sub No.	Answers	Marking Scheme
2	j	<p><b>Describe the phases of menstrual cycle.</b></p> <p><b>Marking Scheme: Any 3 Phases of Menstrual cycle with description: 3M (1M each)</b></p> <p><b>Answer:</b></p> <p><b>1) Menstrual phase (Bleeding phase) – 4 days</b></p> <ul style="list-style-type: none"><li>• Takes 3-4 days.</li><li>• Bleeding through vagina takes place.</li><li>• Destruction of endometrium and blood vessels.</li><li>• Menstrual flow consists of 50-100 ml Blood, Mucus, Endometrial strips, WBCs and Unfertilised ovum.</li><li>• Indicates failure of fertilisation. Corpus luteum degenerate and sudden reduction in oestrogen and progesterone.</li></ul> <p><b>2) Proliferative phase – 9 to 10 days</b></p> <ul style="list-style-type: none"><li>• In this phase proliferation of endometrium takes place and it gets renewed in this period.</li><li>• FSH stimulates ovarian follicle, produces oestrogen which causes proliferation of endometrium.</li><li>• Endometrial thickness increases up to 2mm.</li><li>• Also known as follicular phase – development and maturation of graafian follicle. Lasts up to 13<sup>th</sup> day.</li><li>• This phase ends when ovulation occurs and oestrogen production declines.</li></ul> <p><b>3) Ovulatory phase – 1 day</b></p> <ul style="list-style-type: none"><li>• Graafian follicle of one ovary rupture to release ovum.</li><li>• Body temp increases.</li><li>• Graafian follicle is converted into corpus luteum which increases progesterone.</li><li>• Increased progesterone level maintains endometrium &amp; helps for implantation.</li><li>• Takes place on 14<sup>th</sup> day.</li></ul> <p><b>4) Secretory phase – about 14 days</b></p> <ul style="list-style-type: none"><li>• Under influence of progesterone secretory glands produce large amount of mucus.</li><li>• There is similar increase in secretion of watery mucus by glands of uterine</li></ul>	3M





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		<p>tubes &amp; cervical glands of vagina.</p> <ul style="list-style-type: none"> <li>• If ovum is fertilised, endometrium and corpus luteum remain intact.</li> <li>• If ovum is not fertilised, degeneration of corpus luteum takes place within 2 weeks.</li> <li>• Levels of progesterone &amp; oestrogens decrease, that causes menstruation &amp; cycle continues.</li> <li>• This phase is most constant part of cycle lasts for 14 days i.e., from 15 to 28 days.</li> </ul>																															
2	k	<p><b>Enlist the endocrine glands with their location in the body.</b></p> <p><b>Marking Scheme: Any 6 endocrine glands with their location: 3M (Each 0.5M)</b></p> <p><b>Answer:</b></p> <table border="1"> <thead> <tr> <th>S.N.</th> <th>Endocrine Gland</th> <th>Location</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Pituitary gland</td> <td>Situated in hypophyseal fossa (Sella turcica portion) of sphenoid bone at the base of the brain.</td> </tr> <tr> <td>2</td> <td>Thyroid gland</td> <td>Situated in the neck in front of trachea &amp; besides thyroid cartilage</td> </tr> <tr> <td>3</td> <td>Parathyroid gland</td> <td>These are small glands two on each side of thyroid gland in neck on posterior side.</td> </tr> <tr> <td>4</td> <td>Adrenal gland</td> <td>Two adrenals situated on the upper pole of each kidney.</td> </tr> <tr> <td>5</td> <td>Islets of Langerhans</td> <td>Irregularly distributed throughout pancreas.</td> </tr> <tr> <td>6</td> <td>Ovaries (2) in females</td> <td>One on each side of uterus &amp; below uterine tubes.</td> </tr> <tr> <td>7</td> <td>Testes (2) in males</td> <td>Present in scrotum</td> </tr> <tr> <td>8</td> <td>Thymus gland</td> <td>In chest, between lungs &amp; Near heart</td> </tr> <tr> <td>9</td> <td>Pineal glands</td> <td>Near the corpus callosum in the brain.</td> </tr> </tbody> </table>	S.N.	Endocrine Gland	Location	1	Pituitary gland	Situated in hypophyseal fossa (Sella turcica portion) of sphenoid bone at the base of the brain.	2	Thyroid gland	Situated in the neck in front of trachea & besides thyroid cartilage	3	Parathyroid gland	These are small glands two on each side of thyroid gland in neck on posterior side.	4	Adrenal gland	Two adrenals situated on the upper pole of each kidney.	5	Islets of Langerhans	Irregularly distributed throughout pancreas.	6	Ovaries (2) in females	One on each side of uterus & below uterine tubes.	7	Testes (2) in males	Present in scrotum	8	Thymus gland	In chest, between lungs & Near heart	9	Pineal glands	Near the corpus callosum in the brain.	3M
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3		<b>Attempt ALL questions</b>	20 M																														
		<b>Important Instructions: In case, multiple answer options are observed for the same sub question of question No. 3, the option (Answer) appearing first in the answer book shall be treated as answer and assessed accordingly.</b>																															
3	a	<p><b>Question Statement</b></p> <p><b>State the meaning of coronal plane.</b></p> <p><b>Answer:</b></p> <p>The coronal / frontal plane is that which divides human body into an anterior and posterior portion.</p>	1M																														



Q. No.	Sub No.	Answers	Marking Scheme
3	b	<b>Mention the tissue that lines blood vessels.</b> <b>Answer:</b> Epithelial tissue.	1M
3	c	<b>List the bones forming ankle joint.</b> <b>Answer:</b> Talus, Tibia and Fibula	1M
3	d	<b>Define cardiac output.</b> <b>Answer:</b> Cardiac output is determined by the stroke volume and heart rate and is measured in liters per minute. <b>OR</b> Cardiac Output: Heart rate (HR) × Stroke volume (SV) <b>OR</b> Cardiac output is the amount of blood pumped out of heart/minute	1M
3	e	<b>State meaning of myopathy.</b> <b>Answer:</b> A disease of muscle tissue.	1M
3	f	<b>Write two functions of CSF.</b> <b>Marking Scheme: 0.5 for each point (Consider any two functions)</b> <b>Answer:</b> 1. It acts as a shock absorber. 2. Provides protection and support to brain and spinal cord from mechanical shocks. 3. It keeps the brain and spinal cord moist. 4. Helps in interchange of substances between CSF and nerve cells, such as nutrients and waste products.	1M
3	g	<b>Classify tissues.</b> <b>Marking Scheme: 0.5 for each point (type)</b> <b>Answer:</b> <ul style="list-style-type: none"><li>▪ Connective tissue,</li><li>▪ Epithelial tissue,</li><li>▪ Muscle tissue,</li><li>▪ Nervous tissue</li></ul>	1M
3	h	<b>Define Tidal Volume</b> <b>Answer:</b> It is the volume of air moved in & out of lungs during normal breathing. Normal value is 500 ml.	1M
3	i	<b>List indications of blood transfusion</b> <b>Marking Scheme: 0.5 for each point</b>	1M



Q. No.	Sub No.	Answers	Marking Scheme
		<b>Answer:</b> <ul style="list-style-type: none"><li>▪ Haemorrhage</li><li>▪ Haemophilia</li><li>▪ Severe anaemia</li><li>▪ Supply necessary blood components like platelets, RBC or clotting factors.</li><li>▪ During major surgeries where blood loss is expected.</li></ul>	
3	j	<b>Write normal values of RBC Count.</b> <b>Marking Scheme: 0.5 M for each</b> <b>Answer:</b> Male: $4.5-5.5 \times 10^6/\text{mm}^3$ Female: $3.8 \text{ to } 4.5 \times 10^6/\text{mm}^3$ <b>OR</b> Male: $4.5-5.5 \times 10^{12}/\text{L}$ Female: $3.8 \text{ to } 4.5 \times 10^{12}/\text{L}$ <i>(Any RBC values from standard reference book will be considered)</i>	1M
3	k	<b>Which statement is correct?</b> <b>Answer:</b> ii) The hip is proximal to knee	1M
3	l	<b>Sperm maturation occurs in the</b> <b>Answer:</b> ii) Epididymis	1M
3	m	<b>Hormones responsible for puberty in females</b> <b>Answer:</b> ii) Follicle stimulating hormone	1M
3	n	<b>The largest bone in the body is _____</b> <b>Answer:</b> ii) Femur	1M
3	o	<b>Classify WBC into its two types.</b> <b>Marking Scheme: 0.5 marks for each type</b> <b>Answer:</b> <ol style="list-style-type: none"><li>1. Granulocytes</li><li>2. Agranulocytes</li></ol>	1M
3	p	<b>The largest blood vessel of body is _____</b> <b>Answer:</b> Dorsal aorta OR aorta OR Arch of aorta OR arc of aorta	1M
3	q	<b>The part of respiratory system mostly affected by COVID 19 is _____</b> <b>Answer:</b> ii) Alveoli	1M



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3	r	<p><b>What does liver do to help digestion.</b></p> <p><b>Marking Scheme: 0.5 marks for each point</b></p> <p><b>Answer:</b></p> <ul style="list-style-type: none"><li>▪ Production and secretion of bile.</li><li>▪ Metabolism of key nutrient.</li><li>▪ Detoxification.</li></ul>	1M
3	s	<p><b>Coughing and sneezing is controlled by which part of brain?</b></p> <p><b>Answer:</b></p> <p>Medulla Oblongata</p>	1M
3	t	<p><b>Name the functional unit of kidney.</b></p> <p><b>Answer:</b></p> <p>Nephron</p>	1M