



WINTER-15 EXAMINATION

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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.



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Q 1 Solve any Eight of the following

(16 marks)

(a) Define term cytology and Hematology. (1 mark each)

Ans: **Cytology**- Study of structure and function of cell.

Haematology – Study of blood, its composition, functions and disorders.

(b) What is menopause? (1 mark definition & 1 mark explanation)

Ans: **Definition** – Cessation of menstruation in a woman's life at about 45 years of age.

Explanation – Change in concentration of sex hormones. Ovary becomes unresponsive to FSH and LH. Ovulation and menstrual cycle becomes irregular and stops. Symptoms like flushing, sweating, shrinkage of breasts, atrophy of sex organs and mood swings are observed.

(c) Name sutures of cranium. (1/2 mark each)

Ans: 1) Coronal suture 2) Sagittal suture
 3) Lambdoidal suture 4) Squamous suture.

(d) Name types of connective tissue. (2 marks)

Ans: 1) Areolar tissue 2) White Fibrous tissue 3) Yellow Elastic tissue
 4) Adipose tissue 5) Cartilage 6) Bone 7) Blood 8) Lymph

(e) Mention parts of central nervous system. (2 marks)

Ans: Brain – Cerebrum, Midbrain, Pons varoli, medulla oblongata, cerebellum and Spinal cord.

(f) What is haemoglobin? Write its normal value in male and female. (1mark each)

Ans: **Definition** - Haemoglobin is a respiratory pigment containing protein called globin and a pigmented iron containing complex called haem present in the erythrocytes.

Normal Values: - Female – 11.5 – 16.5 g/100ml Male- 13 – 18 g/100ml



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(g) State organs of female reproductive system. (2 marks)

Ans: Organs of female reproductive system are:

- 1) Accessory/Secondary sexual organs- Breasts.
- 2) External genital organs – Mons pubis, Labia majora, Labia minora, Clitoris, Hymen, vestibular gland and perineum.
- 3) Internal genital organs – Vagina, uterus, ovaries and fallopian tubes.

(h) Name types of muscular tissue. (2 marks)

Ans: Types of muscular tissues are:

- 1) Skeletal / Striated muscle/ Voluntary muscle
- 2) Smooth / Non-striated / Involuntary muscle
- 3) Cardiac muscle.

(i) Define true ribs and false ribs. (1 mark each)

Ans: **True ribs** – The first seven pairs of ribs anteriorly articulate directly through costal cartilages with the sternum and are known as true ribs.

False ribs – The 8th, 9th and 10th pair of ribs are indirectly attached to the sternum anteriorly i.e. cartilages of these ribs join immediately with costal cartilage of 7th pair of ribs. These are called false ribs.

(j) Name different layers of skin. (2 marks)

Ans: Epidermis – Stratum corneum, stratum lucidum, stratum granulosum, stratum spinosum, stratum germinativum and dermis

(k) Name types of permanent teeth. (½ mark each)

Ans: 1) Incisors 2) Canines 3) Premolars 4) Molars.



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(I) Enlist organelles present in cytoplasm of cell. (2 marks)

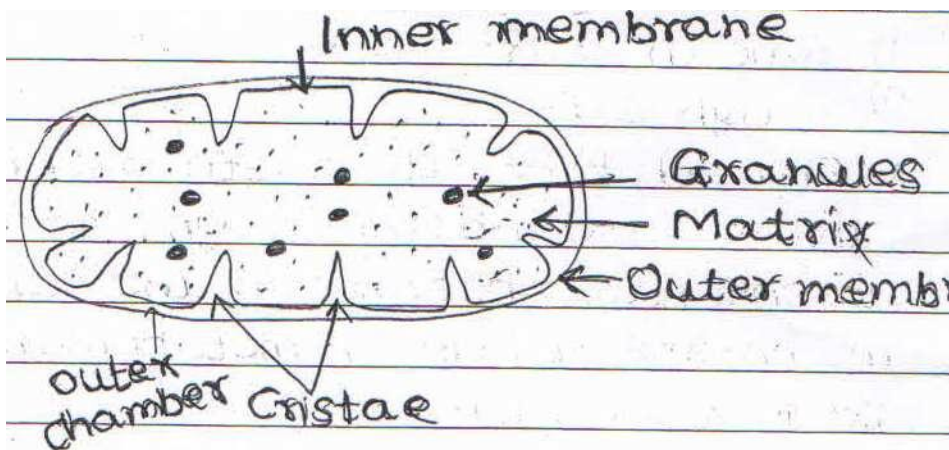
Ans: Organelles present in cytoplasm of cell are Nucleus, Mitochondria, Endoplasmic Reticulum, Golgi apparatus, Lysosomes, Centrosomes, Microsomes and Ribosomes.

Q 2 Solve any FOUR of the following: (4 X 3)

(12 marks)

(a) Describe structure and functions of mitochondria. (Structure 2 marks, Function 1 mark)

Ans:



Structure: - It is present in cytoplasm. Number varies from few hundreds to few thousands. It is made of outer mitochondrial membrane which is smooth. Inner mitochondrial membrane folded into sheets of tubules called cristae. Central cavity called Matrix is present. Matrix contains important enzyme systems.

Function – It contains various oxidative enzymes responsible for generating energy for cellular respiration. When oxidative enzymes combine with oxygen and nutrient to form carbon dioxide and water and liberates energy. This energy is used to produce ATP which diffuses throughout the cell and releases its stored energy for cellular respiration. Therefore, mitochondria are also called the power house of the cell.



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(b) Define blood pressure. (1Mark) Write it's types (2 Marks).

Ans: Blood pressure – It is defined as the lateral pressure exerted by blood on blood vessels.

Types of Blood pressures are:

- 1) Systolic blood pressure - The maximum pressure produced in the arteries during systole is called systolic blood pressure. Normal value in adults is 100 – 120 mm Hg.
- 2) Diastolic Blood pressure – The minimum pressure produced in the arteries during diastole is called diastolic blood pressure. Normal value in adults is 60-80mm Hg.

(c) Name hormones of posterior lobe of pituitary gland with their functions. (Name 1 mark & Functions. 2 marks)

Ans:

Name	Function
1) Oxytocin	1) Contraction of uterus during labor and to bring about parturition (birth of a baby) and 2) Ejection of milk from breast
2) Vasopressin (Anti diuretic hormone)	1) Decrease the urine output 2) Increasing the blood pressure.

(d) Write functions of hypothalamus. (1/2 mark each)

Ans: The functions of hypothalamus are:

- 1) Controls Autonomic nervous system
- 2) Regulation of eating and drinking habits as feeding centre is located in hypothalamus.
- 3) Regulation of thirst
- 4) Maintenance of emotional behavior, personality and social behavior.
- 5) Regulation of body temperature
- 6) It regulates and controls release of hormones from pituitary gland.
- 7) Control of appetite and satiety.

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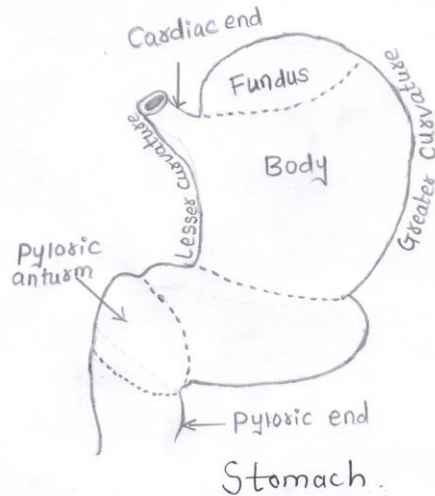
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(e) Describe structure (1½ mark) and functions (1½ mark) of stomach.

Ans:



Structure: - J shaped dilated portion present in the left hypochondriac region of abdominal cavity. It has two surfaces anterior and posterior. It has two borders greater and lesser curvature. It has two ends cardiac end and pyloric end guarded by cardiac sphincter and pyloric sphincter. It is divided into three parts fundus, body and pyloric antrum. Four coats are present outer peritoneal coat, Muscular coat (Made of outer longitudinal, middle circular, inner oblique muscle layer), sub mucosa made of areolar tissue and mucous membrane.

Function: - 1) Digestive function: digestion of food

2) Storage function: temporary storage of food

3) Mechanical function: semisolid bolus converted into liquid chyme

4) Haematinic function: Secretes intrinsic factor for absorption of Vitamin B12

5) Absorptive functions: absorbs alcohol, certain drugs and small quantity of water.

6) HCl in gastric juice acts against microbes, it has antiseptic action.

(f) Mention functions of blood.(1/2 mark each)

Ans: (i) **Respiratory function:** Transportation of oxygen to various tissues and carbon dioxide from tissues to lungs.

(ii) **Excretory function** - Carries waste products from tissues to excretory organ.

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- (iii) **Nutritional function:-** Carries nutritional substances to various tissues of the body
- (iv) **Immunological function:-** Protection against infections as it contains antibodies and W.B.Cs.
- (v) Redistributes water from one part to other.
- (vi) Regulates body temperature.
- (vii) Carrier of hormones from endocrine glands to various tissues.
- (viii) Clotting of blood.

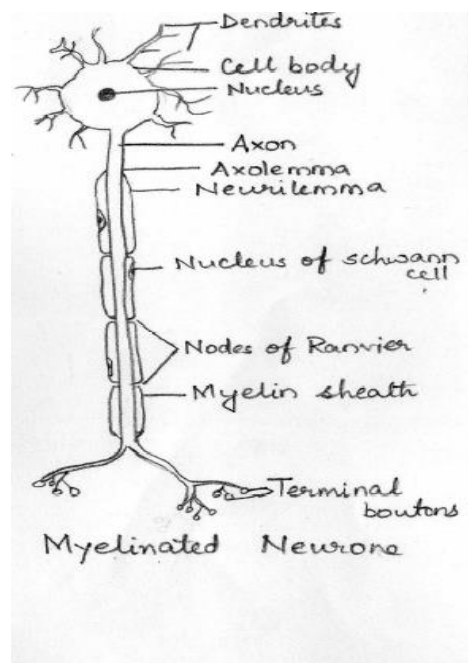
3. Solve any **FOUR** of the following:

4 x 3 = 12

a) **Define neuron. Draw and label its structure.**

Neuron: Neuron is the structural and functional unit of nervous system.(1 mark)

Diagram: (2 marks)



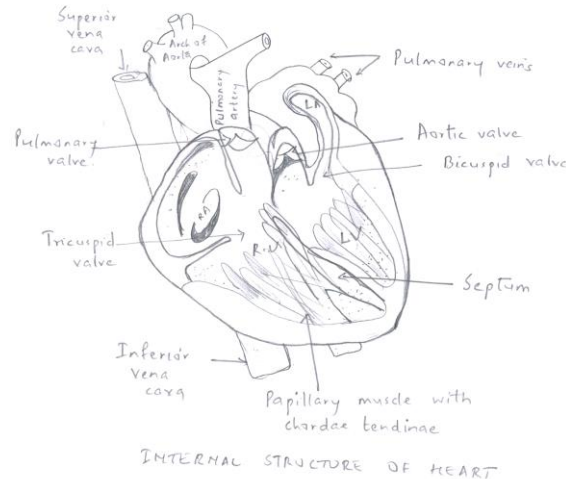
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b) Describe internal structure of heart.(3marks)



The heart is a four-chambered organ consisting of two upper chambers called right atrium and left atrium and two lower chambers consisting of right ventricle and left ventricle. The two thin-walled atria are separated by inter-atrial septum and ventricles are separated by inter-ventricular septum.

The ventricles are thick walled because they have to pump the blood with force. The atria are relatively thin walled. The left ventricle is the largest chamber of the heart with the thickest wall.

The valves between atria and ventricles ensure that the flow of blood is in one direction only.

The valve separating the right atrium from right ventricle is called right atrioventricular valve or tricuspid valve and consists of three cusps or flaps. The left atrioventricular valve is called bicuspid or mitral valve and consists of two cusps or flaps.



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Thick thread-like cords of fibrous tissue which connects the valve flaps to the walls of ventricles with papillary muscles are called chordae tendinae. These prevent collapsing of valves during blood flow.

The pulmonary artery arises from the right ventricle and the aorta arises from the left ventricle. The place where pulmonary artery and aorta leave the ventricles is guarded by crescent-shaped valves called semi-lunar valves (pulmonary valve and aortic valve). These valves prevent the backflow of blood.

c) Explain how skin helps for regulation of body temperature.(each point 1.5 marks)

The centre controlling temperature is situated in hypothalamus which is called heat regulating centre. The vasomotor centre in medulla oblongata also helps in regulating the body temperature.

1. The amount of heat loss from the skin depends on the blood in the vessels which lie in the dermis. As the amount of heat in body increases, the vasomotor centre is stimulated which causes vasodilation of blood vessels in skin. Due to this, more amount of blood is passed through the skin which increases temperature of skin. As a result, sweat glands are stimulated by nerve impulses from the heat regulating centre. Due to this more sweating occurs which gets evaporated to atmosphere, thus cooling the body.

2. If the external temperature is low, or heat production is less, the vasomotor centre causes vasoconstriction. Due to vasoconstriction, amount of blood flowing to the skin decreases which decreases the temperature of the skin and finally prevents heat loss from the body.

d) Give functions of spleen. (6 points, 3 marks)

Functions –

1. Spleen is a reservoir of RBCs - Blood is poured out from spleen in circulation at the time of stress, anxiety, anoxia, haemorrhage and carbon monoxide poisoning.
2. Spleen produces erythrocytes during embryonic life.



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3. In adults, spleen breakdown the RBCs, so it is called as graveyard of RBCs.
4. It produces lymphocytes, macrophages, and monocytes which engulf foreign particles and micro-organisms and destroy them and protects body against infection.
5. It produces some specific antibodies and anti-toxins.
6. In various diseases conditions or malfunctioning of spleen it can be removed from the body without any adverse effects.

e) Explain structure and functions of uterus. (structure 1.5 marks, functions 1.5 marks)

Structure: It is a hollow muscular, pear-shaped organ situated in pelvis. It consists of three parts viz. body, fundus and cervix. The walls of uterus consist of three layers viz., perimetrium, myometrium and endometrium.

Perimetrium covers most of the surface of uterus. Anteriorly, it extends over fundus and body; posteriorly is extends over fundus, body and cervix, and laterally only fundus is covered. There is a double fold of ligament (broad ligament) which laterally attaches uterus to the sides of the pelvis.

Myometrium is the thickest layer of tissue in the uterine wall. It is amass of smooth muscle fibres interlaced with areolar tissue, blood vessels and nerves.

Endometrium consists of columnar epithelium and contains a large number of mucus secreting tubular glands.

Functions: 1. Menstrual cycle every month. The endometrium is prepared for the reception of fertilized ovum during each menstrual cycle.

2.If the ovum is fertilized, the uterus grows to accommodate the developing baby until the time of delivery.

3. It serves as pathway for sperm deposited in the vagina to reach uterine tubes.



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f) Name cartilages of larynx.(6 points, 3 marks)

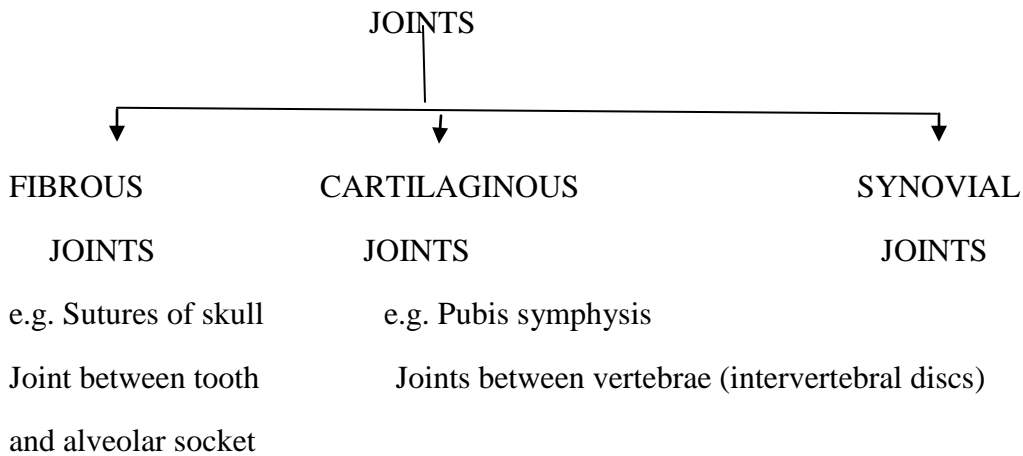
Larynx consists of - 1 thyroid cartilage 1 cricoid cartilage 2 arytenoid cartilages
2 cuneiform cartilages 2 corniculate cartilages 1 epiglottis

4. Solve any FOUR of the following:

4 x 3 = 12

a) Define joint. Classify it .(definition 1/2 mark, classification 2 ½ marks)

A joint is the site at any two or more bones articulates or come together.



SYNOVIAL JOINT: Classified into 6 types-

1. Ball and Socket joint e.g. Shoulder joint, Hip joint
2. Hinge joint e.g. Elbow joint, Knee joint, Ankle joint
3. Gliding joint e.g. Joint between carpals, joint between tarsals, sternoclavicular joint
4. Pivot joint e.g. Joint between atlas and axis, Radioulnar joints
5. Condyloid joint e.g Wrist joint, temporomandibular, metacarpophalangeal and metatarsophalangeal joints.
6. Saddle joint e.g. Joint between trapezium & first metacarpal bone.

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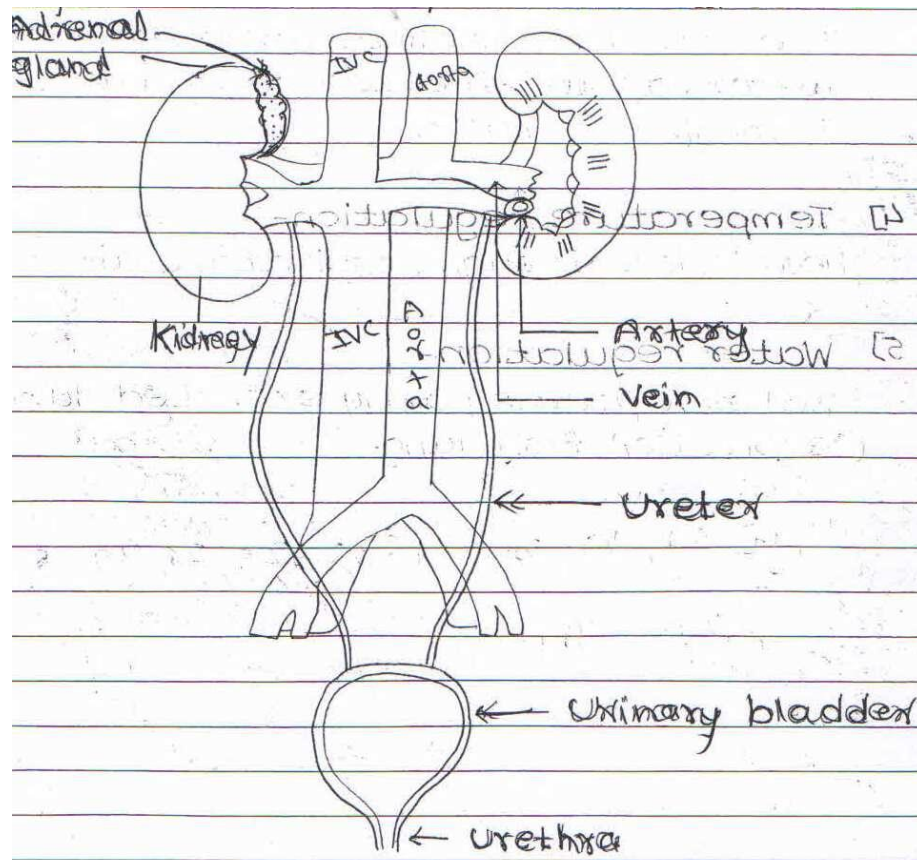
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b) Define respiration. Name organs of respiratory system.

Respiration can be defined as exchange of gases i.e. oxygen and carbon dioxide between the atmosphere and tissues. (1 mark)

Organs of respiratory system: Nose, pharynx, larynx, trachea, bronchi and bronchioles, lungs and muscles of respiration viz. intercostal muscles and diaphragm. (2 marks)

c) Draw and label urinary system.





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d) Write effect of hyposecretion and hypersecretion of growth hormone.(hyposecretion 1.5 marks, hypersecretion 1.5 marks)

Hyposecretion of GH: Before puberty, it leads to dwarfism in which the individual is of small stature but is well proportioned and mental health is not affected.

After puberty, hyposecretion of GH causes trophic changes in the thyroid and adrenal glands and in gonads.

Hypersecretion of GH: Before puberty, it cause gigantism in which the affected individuals may grow to heights of 2.1 to 2.4 m although body proportions remain normal.

After puberty, hypersecretion causes acromegaly in which the bones and soft tissues of some organs thicken and coarsen, particularly it affects the hands, feet and tongue.

e) Enlist cranial nerves. (3 marks)

- I. Olfactory
- II. Optic
- III. Oculomotor
- IV. Trochlear
- V. Trigeminal
- VI. Abducent
- VII. Facial
- VIII. Auditory (vestibulocochlear)
- IX. Glossopharyngeal
- X. Vagus
- XI. Accessory
- XII. Hypoglossal



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f) Write composition and functions of pancreatic juice. (composition 1 mark, functions 2 marks)

Composition: It consists of water, mineral salts, enzymes - amylase and lipase and inactive enzyme precursors trypsinogen and chymotripsinogen and procarboxypeptidase.

Functions:

1. Digestion of proteins: Enterokinase or enteropeptidase activates such as trypsinogen and chymotripsinogen and converts them into active proteolytic enzymes trypsin and chymotripsin. These enzymes convert polypeptides to tripeptides, dipeptides and amino acids.
2. Digestion of carbohydrates. Pancreatic amylase converts all polysaccharides not acted upon by salivary amylase to disaccharides.
3. Digestion of fats: Lipase converts fats into fatty acids and glycerol.

Q5. Solve any FOUR of the following:

(4X3)=12 marks

(a) Define meninges. Enlist it. (Definition 1.5 marks, Names 1.5 marks)

Ans. The brain and spinal cord are completely surrounded by three membranes called the meninges. They are lying between the skull and the brain and between the vertebrae and the spinal cord.

Named from outside inwards they are:

- Dura mater
- Arachnoid mater
- Pia mater

(b) Define term (any TWO): (Each definition 1.5 marks)

- (i) Systole: Systole is period of contraction of heart muscle. e.g. Atrial systole, lasts for 0.1second; Ventricular systole, lasts for 0.3 second.



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(ii) Hypotension: Hypotension is medical term for Low Blood Pressure. It is condition in which systolic blood pressure is consistently less than 100mm of Hg.

(iii) Angina pectoris: It is condition in which there is chest pain, pressure, or squeezing, often due to ischemia of the heart muscle from obstruction or spasm of the coronary arteries.

(c) What is puberty? State physical and physiological changes that occurs at puberty in female. (Definition 1 mark, changes 2 marks)

Ans. Puberty is period during which secretion of sex hormones start and reproductive system reaches to maturity.

- Following physical & physiological changes takes place during puberty in female:
 1. The uterus, uterine tubes & ovaries reach maturity
 2. The menstrual cycle & ovulation begins
 3. The breasts develop & enlarge
 4. Pubic & axillary hair begins to grow
 5. Increase in rate of growth of height & widening of pelvis
 6. Increase in amount of fat deposited in subcutaneous tissue

(d) What is auditory ossicle? Write its functions. (Description of auditory ossicles 1 ½ marks, Function 1½ mark)

Ans. Auditory ossicles are very small bones present in tympanic cavity of the ear. There are 3 auditory ossicles: Malleus (hammer-shaped), Incus (anvil-shaped) and Stapes (stirrup-shaped). They are attached to cavity by ligaments and connected to each other by synovial joints. Malleus is in contact with eardrum and stapes is fitted into oval window of internal ear.



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Function: The sound waves vibrate the ear drum and these vibrations are transmitted to the three ossicles which causes amplification of sound waves, and further it is transmitted to internal ear and then to the vestibulocochlear nerve resulting in perception of sound.

(e) Explain how digestion of protein takes place? (3 marks)

Ans. Digestion of protein is process of conversion of protein into amino acids by action of enzymes. Digestion of protein initiates in stomach and ends in small intestines.

In Stomach: Acid from gastric juice converts enzyme pepsinogen into pepsin. This pepsin acts on protein and breakdown into polypeptides.

In Small Intestines: By the action of enzyme enterokinase present in intestinal mucosa, chymotrypsinogen and trypsinogen from pancreatic juice get converted into chymotrypsin and trypsin. These enzymes convert polypeptides into bi-peptides and tri-peptides. Enzyme peptidase secreted by enterocytes of small intestine converts bi-peptides and tri-peptides into amino acids. These amino acids further absorbed into blood circulation. In this way digestion of protein takes place.

(f) Define any two of following: (Each definition 1.5 marks along with value)

(i) Vital Capacity: This is the maximum volume of air which can be moved into and out of the lungs. **OR** It is the volume of air that passes into and out of the lungs by the most forcible inspiration and expiration (3 - 5 litres)

(ii) Inspiratory reserve volume: This is the extra volume of air that can be inhaled into the lungs during maximal inspiration. **OR** It is the amount of air that can be breathed in and above the tidal volume by the deepest possible inspiration. (1800 - 3000 ml)

(iii) Expiratory reserve volume: This is the largest volume of air which can be expelled from the lungs during maximal expiration. **OR** It is the amount of air that can be breathed out after a quiet expiration by the most forcible expiration. (800 - 1400 ml)

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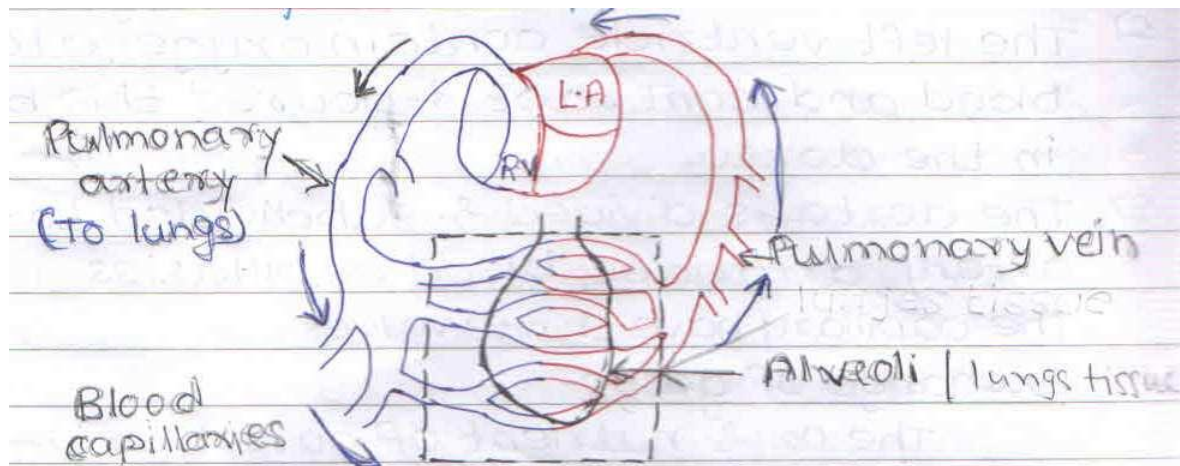
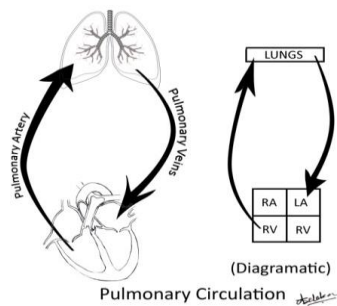
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Q.6 Solve any FOUR of the following:

(4X4)=16 marks

(a) Write in detail about pulmonary circulation. (4 marks)

Ans. Blood circulation from heart to lungs and back from lungs to heart is called as pulmonary circulation. Impure / de-oxygenated blood from right ventricles is carried to the lungs through right and left pulmonary arteries after each ventricular systole. Pulmonary arteries enter the



lungs, divides and subdivided into different branches and finally into small capillaries. Each capillary comes in contact with alveoli of lungs. Here exchange of oxygen from alveoli to blood and exchange of carbon-dioxide from blood to the alveoli take place. Thus here blood becomes oxygenated and pure. Then capillaries join to form the venules and finally form left and right pulmonary veins. Then pure / oxygenated blood from lungs carried to the left atria of heart through left and right pulmonary veins.

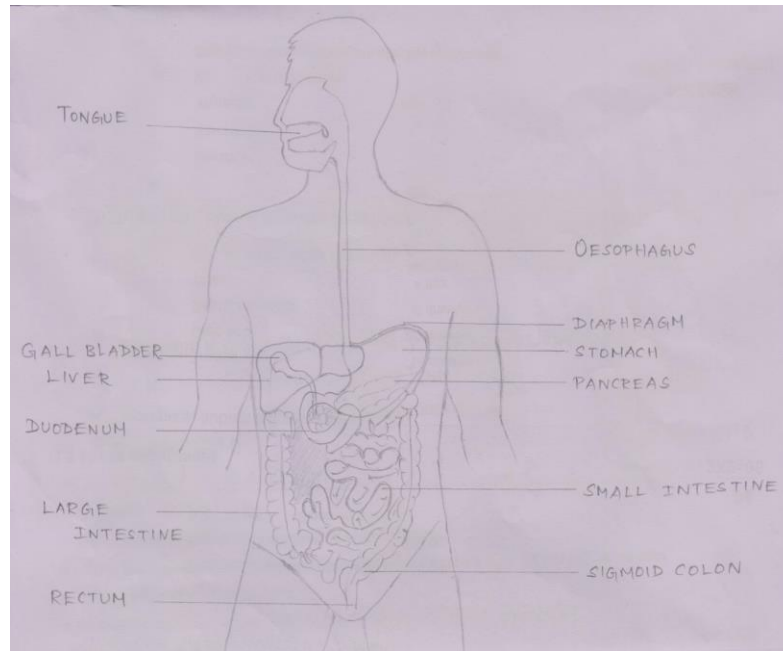
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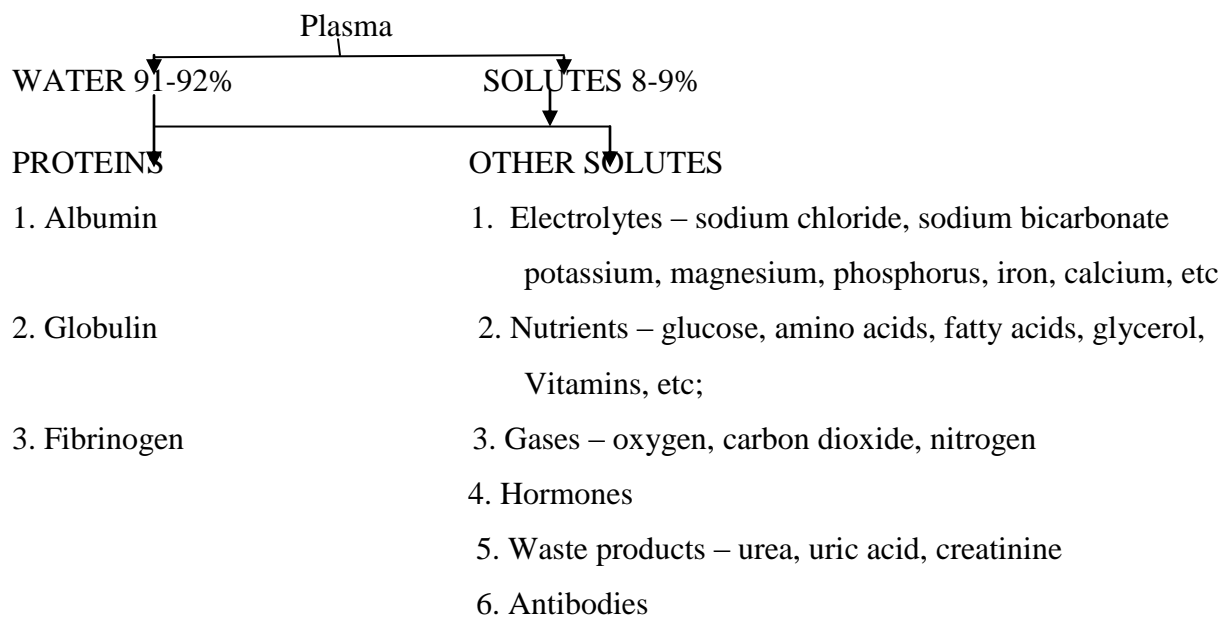
(b) Draw sketch of digestive system. Label it. (4 marks)



(c) Write composition of blood in detail. (4 marks)

Ans .Blood is liquid connective tissue. Its composition is as follows:

Blood: composed of 2 components: Suspended cell (45%) and Plasma (55%)



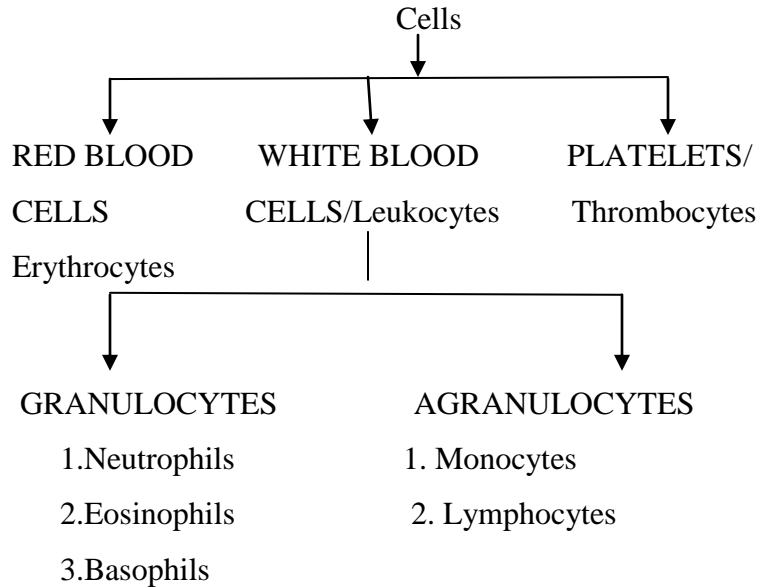


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(d) Give functions of cerebrum. (4marks)

Ans. There are three main functions of cerebrum:

1. Mental activities: memory, intelligence, sense of responsibility, thinking, reasoning, moral sense and learning.
2. Sensory perception: perception of pain, temperature, touch, sight, hearing, taste and smell
3. Motor activities: initiation and control of skeletal muscle contraction.

e) Name hormones of adrenal cortex along with functions. (names 1 mark, functions 3 marks)

Ans. Adrenal cortex secretes 3 hormones: Mineralocorticoids, Glucocorticoids and Sex hormones.



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Functions:

Mineralocorticoids: Act on metabolism of electrolytes or minerals of extra-cellular fluid especially sodium & potassium. Main mineralocorticoid is aldosterone.

- It stimulates the reabsorption of sodium (Na⁺) by the renal tubules and excretion of potassium (K⁺) in the urine.
- Sodium reabsorption is also accompanied by retention of water and therefore aldosterone is involved in the regulation of blood volume and blood pressure too.
- When the blood potassium level rises, more aldosterone is secreted. Low blood potassium has the opposite effect

Glucocorticoids: Main glucocorticoid-Cortisol (Hydrocortisone) *Small amount: corticosterone & cortisone*

- They are essential for life, regulating metabolism and responses to stress.
- *Gluconeogenesis* (formation of new sugar from, for example, protein) and hyperglycaemia (raised blood glucose level)
- *Lipolysis* (breakdown of triglycerides into fatty acids and glycerol for energy production)
- Stimulating breakdown of protein, releasing amino acids, which can be used for synthesis of other proteins, e.g. enzymes, or for energy (ATP) production
- Promoting absorption of sodium and water from renal tubules (a weak mineralocorticoid effect).

Sex hormones secreted by the adrenal cortex are mainly *androgens* (male sex hormones) and the amounts produced are insignificant compared with those secreted by the testes and ovaries.



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(f) Explain how kidney helps for maintenance of water balance. (4 marks)

Ans. Kidney controls urine output & maintain water balance by 3 ways.

1. ANTI-DIURETIC HORMONE

Increased blood osmotic pressure → Osmoreceptors in hypothalamus
→ Stimulation of post.Pituitary → Release of ADH →
promotes Reabsorption of water → Reduces loss of water in urine
(reduced blood osmotic pressure)

2. ALDOSTERONE

Decrease in blood volume & pressure → Secretion of Renin by Kidneys →
Angiotensinogen → Angiotensin I → Angiotensin II →
Stimulation of Adrenal Cortex → release of aldosterone → Promotes urinary
reabsorption of Na⁺ & Cl⁻ → simultaneously increases water reabsorption via
osmosis → Reduces loss of water in urine.

3. ATRIAL NATRIURETIC PEPTIDE

Increased blood volume → Secretion of ANP by atria of heart →
Reduces Reabsorption of Na⁺, Cl⁻ by Kidneys → Promotes natriuresis, →
increased urinary excretion of Na⁺, Cl⁻ → Increases loss of water in urine via
osmosis



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