



**SUMMER – 16 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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Q1. Solve any EIGHT of the following: (2 x 8 marks)

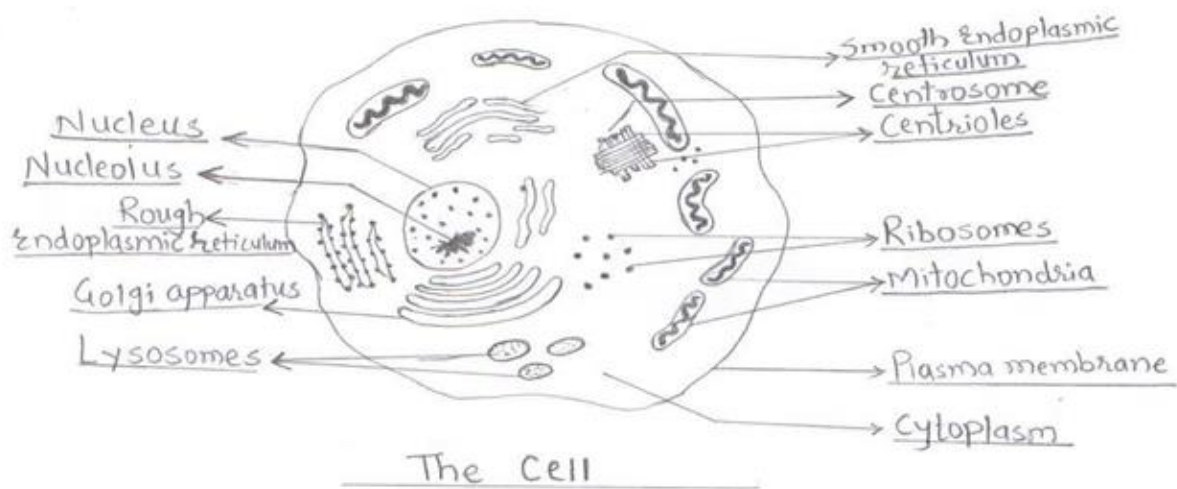
(a) Name the bones of upper limbs.(2 marks)

Humerus, radius, ulna, carpals, metacarpals and phalanges.

(b) Define the term physiology. (2 marks)

It is the study of the functions of various parts and how they are integrated to produce a coordinated action of the whole body.

(c) Draw a well labelled diagram of a simple living cell. (2 marks)



(d) Give examples of Ball and socket joint. (2 marks)

Ans. Shoulder Joint and Hip Joint

(e) Name the hormones secreted by Anterior Pituitary. (Any 4 hormones, 2 marks)

- Growth hormone (G.H.)
- Thyroid stimulating hormone (TSH)
- Adrenocorticotrophic hormone (ACTH)



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- d) Gonadotrophic hormones
- i) Follicle stimulating hormone (FSH)
- ii) Luteinising hormone (LH)/ ICSH in males
- e) Lactogenic hormone (Prolactin)

**(f) Give the composition of pancreatic juice. (2 marks)**

Composition of pancreatic juice-

Water

Mineral salts

Enzymes- amylase, lipase

Nucleases (to digest DNA & RNA)

Inactive enzymes- trypsinogen, chymotrypsinogen, procarboxypeptidase.

pH- 8. ( because it contains large quantities of bicarbonate ions).

**(g) What are auditory ossicles? ( 2 marks)**

There are three very small bones that extend across middle ear from tympanic membrane to oval window. They are named according to their shape, namely-i) Malleus (hammer), ii) Incus (anvil), iii) Stapes (stirrup). Sound waves vibrate tympanic membrane and these vibrations are amplified and transmitted by these ossicles to oval window of inner ear which are carried further to perceive the sound.

**(h) Name the cartilages of Larynx. (2 marks)**

1 Thyroid cartilage, 1 Cricoid cartilage, 2 Arytenoid cartilages, 2 Corniculate cartilages, 2 Cuneiform cartilages and 1 Epiglottis



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**(i) Give the location and functions of Biceps and triceps. (1 mark each)**

Biceps a two-headed muscle that lies on the upper arm between the shoulder and the elbow anteriorly.

Function: It stabilises & flexes the shoulder joint & at the elbow joint it assists with flexion & supination.

The triceps run along the humerus between the shoulder and the elbow located posteriorly.

Function: Along with the biceps, it enables extension and retraction of the forearm. It also stabilises the shoulder joint.

**(j) Mention functions of spleen. ( 2 marks)**

1. **Phagocytosis** - Destruction of old & abnormal RBCs, WBCs & platelets, microbes.
2. **Storage of blood**- It stores up to 350ml of blood.
3. **Immunity**- It contains T & B lymphocytes which are activated by presence of antigens i.e. infections.
4. **Erythropoiesis**- It is imp. Site of fetal blood cell production & can do this in adult in the time of need.

**(k) What are abnormal constituents of urine? (Any four, 2 marks)**

Protein, Albumin, Glucose, Ketone bodies, RBC, blood, Microbes, pus.

**(l) Give the names of six cranial nerves. (2 marks)**

- |                      |                         |
|----------------------|-------------------------|
| I- Olfactory         | II- Optic               |
| III - Oculomotor     | IV- Trochlear           |
| V- Trigeminal        | VI- Abducent            |
| VII - Facial         | VIII- Vestibulocochlear |
| IX- Glossopharyngeal | X Vagus                 |
| XI- Accessory        | XII- Hypoglossal        |

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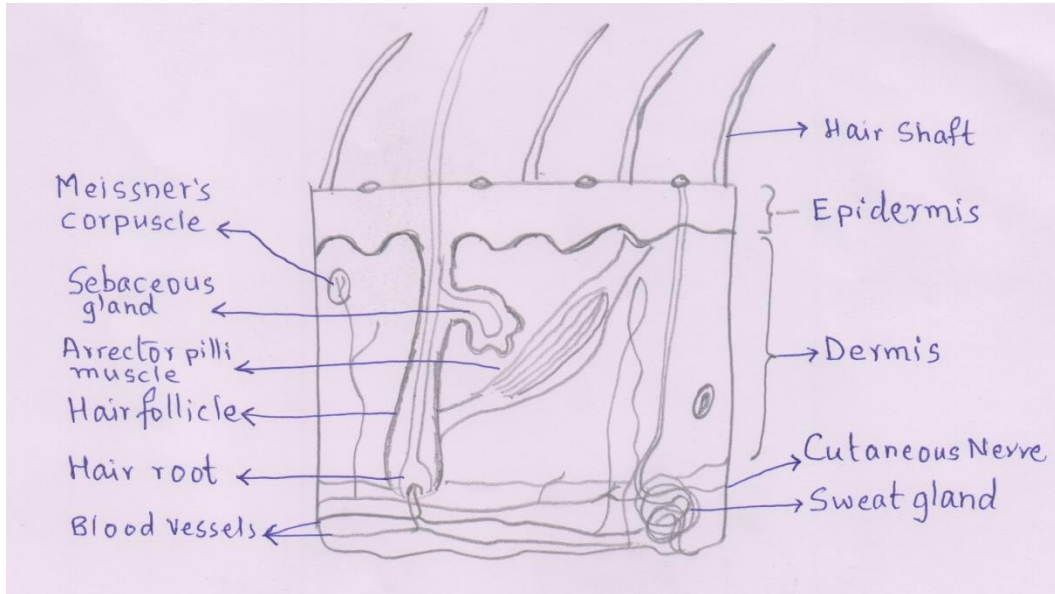
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Q2.Solve any FOUR of the following: (3 X 4 marks)

(a) Draw a well labelled diagram of V.S. of Skin. (3 marks)



(b) Give composition (1 mark) and functions (2 marks) of cerebrospinal fluid.

Ans. CSF: Cerebrospinal fluid is a clear, slightly alkaline fluid secreted into each ventricle of the brain by choroid plexuses. CSF is secreted continuously at a rate of about 0.5 ml per minute, i.e. 720 ml per day.

Composition: Water, mineral salts, glucose, plasma proteins: small amounts of albumin and globulin, creatinine & urea in small amounts, and few leukocytes.

Functions:

- It supports and protects the brain and spinal cord.
- It maintains a uniform pressure around these delicate structures.
- It acts as a cushion and shock absorber between the brain & the skull.
- It keeps the brain and spinal cord moist and there may be interchange of substances between CSF and nerve cells, such as nutrients and waste products.



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**(c) Give composition (1 mark) and functions (2 marks) of saliva.**

**Composition of saliva pH 5.8 -7.4**

Water

Mineral salts

Salivary amylase

Mucus

Lysosomes

Immunoglobulin

Blood clotting factor

**Functions of saliva-**

1. Chemical digestion of polysaccharides- the salivary amylase acts on the starch & reduces them to disaccharides.
2. Lubrication of food.
3. Cleaning & lubricating the mouth.
4. Nonspecific defense mech. Due to lysosomes & immunoglobulin.
5. Sense of Taste by lubrication of food.

**(d) Explain how kidneys help to maintain blood pressure. (3 marks)**

When arterial blood pressure drops, it leads to decrease renal blood flow. Due to this, there is a secretion of renin by the cells of afferent arteriole of the nephron of kidney. Renin circulates in the blood react with Angiotensinogen to form Angiotensin I. Angiotensinogen converting enzyme converts Angiotensin I to Angiotensin II, which is a powerful vasoconstrictor. It also stimulates adrenal cortex to release aldosterone which increases renal reabsorption of sodium & water. This leads to increase in blood volume. Thus cardiac output & blood pressure increases.

Decrease in blood volume & pressure  $\longrightarrow$  Secretion of Renin by Kidneys

Angiotensinogen  $\longrightarrow$  Angiotensin I  $\longrightarrow$  Angiotensin II  $\longrightarrow$



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Stimulation of Adrenal Cortex → release of aldosterone → Promotes urinary reabsorption of Na ions & water → Increases Blood Volume & Increases Blood Pressure.

**e) Describe systemic circulation of blood. (3 marks)**

**Ans.** Systemic circulation is the part of the cardiovascular system which carries oxygenated blood away from the heart to the body, and returns deoxygenated blood back to the heart.

From the left ventricle, blood is pumped through the aortic valve and into the aorta, the body's largest artery. The aorta arches and branches into major arteries to the upper body before passing through the diaphragm, where it branches further into arteries which supply the lower parts of the body. The arteries branch into smaller arteries, arterioles, and finally capillaries. It provides oxygen and nutrients to cells of all body tissues. Waste and carbon dioxide diffuse out of the cell into the blood. The deoxygenated blood is collected at the venous end of the capillaries which merge into venules, then veins, and finally the superior and inferior venae cavae, which drain into the right atrium of the heart. From the right atrium, the blood will travel through the pulmonary circulation to be oxygenated before returning again to the systemic circulation.

**(f) What do you mean by i) Muscle tone (1 ½ marks) ii) Muscle fatigue (1 ½ marks)**

**Muscle tone:** Muscle is never in a complete relaxed condition. It is always in a state of partial contraction which is described as muscle tone. Muscle tone in skeletal muscles is responsible for posture of the body. A degree of muscle tone is also maintained by smooth & cardiac muscle.

3) **Muscle fatigue** If the muscle is frequently stimulated to contract, its response to stimulus progressively decreases. Finally it may not contract by stimulation. Such a condition is called muscle fatigue.



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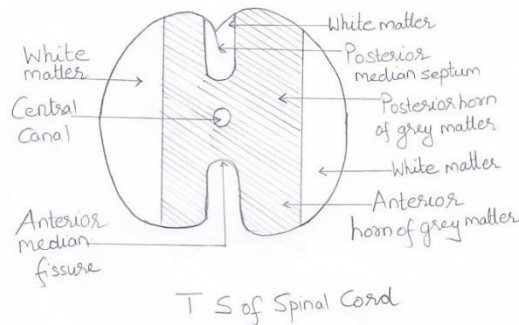
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Q.3 Solve any FOUR of the following:

12 Marks

a) Draw and label T.S of Spinal Cord.( 3 marks)



b) Explain digestion of proteins. (3 Marks)

b) 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.

c) Why pancreas is called exo-endocrine gland? (3 Marks)

Endocrine glands secrete their secretions (hormones) directly into the blood stream, and there is no duct involved. That is they are also called as ductless/glands secretion.

The pancreatic islets secrete insulin, glucagon and somatostatin all of which are secreted into the blood stream without ducts, and therefore pancreas is an endocrine gland.

Exocrine glands are the glands which secrete their secretion via a duct.

The pancreas also makes digestive enzymes, which are collectively known as pancreatic juice, and are secreted into the duodenum of the small intestine through the pancreatic duct.

Thus pancreas performs an exocrine function. Thus pancreas performs both the functions; they are called as exo-endocrine gland.





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d) Differentiate between male and female pelvic girdle. (Any 3 Points, 3 Marks)

	Male Pelvic Girdle	Female Pelvic Girdle
1	Bones are heavier and thicker	Bones are lighter and thinner
2	Cavity is deep and funnel shaped	Cavity is shallow and round
3	Sacrum less concave, making the true pelvis narrower at the outlet.	Sacrum more concave anteriorly, making the true pelvis broader at the outlet.
4	The angle made at the pubic arch is narrower. (less than 90degree angle)	The angle made at the symphysis pubic arch is wider. (more than 90degree angle)

e) What is Oedema? Give its causes. (Def. 1M, any four Causes-2M) (Examiner may judge & give the marks for explanation part)

**Ans: - Definition:-** Excess accumulation of tissue fluid is called oedema.

**Explanation: -** Tissue fluid serves as a medium of exchange between blood plasma and the cells. As the walls of blood capillaries are thin, some of the fluid passes into the space between the tissue cells. This process occurs by means of diffusion and by capillary hydrostatic pressure. Another force, called protein osmotic pressure is formed by the plasma protein which acts as a pulling force which holds the fluid in the vessels. This opposite force prevents the loss of fluid from the capillaries. As the blood moves through the capillary network, some fluid is lost in the tissue space which causes slight increase in plasma protein concentration and increase in pulling force. As a result, the water and crystalloids reenter in the capillaries, disturbing the normal balance between fluid leaving and re-entering the capillaries. This disturbance results in decrease in fluid return and causes excess accumulation of tissue fluid.

**Causes:-** Increased venous hydrostatic pressure.

Decrease in osmotic pressure due to insufficient plasma proteins.

Impaired Lymphatic drainage



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Damage to the capillary walls /increased small vessel permeability

Inability of kidneys to excrete sodium.

**f) What will be the effect of sympathetic nervous stimulation on: -**

**(i) G.I.T (1Mark)**

**(ii) Eye (0.5marks)**

**(iii) Blood Vessels (1.5marks)**

**G.I.T-** Relaxation of smooth muscles, reduces motility and sphincters are constricted

**Eye:** - Dilates the pupil causing mydriasis.

**Blood Vessels:** - Dilation of coronary artery

Dilation of skeletal blood vessels

Constriction of all other blood vessels

**Q.4 Solve any FOUR of the following:**

**12 Marks**

**a) Explain with a neat diagram, flow of blood through the heart. (Exp-2M, Diag-1M)**

The superior vena cava (for upper body) and inferior vena cava (for lower body) receive deoxygenated /impure blood from various part of the body through different veins. This deoxygenated/impure blood they pour into the right atrium of heart. The blood from right atrium enters the right ventricle through a tricuspid valve, which prevent back flow of blood from ventricle into atrium.

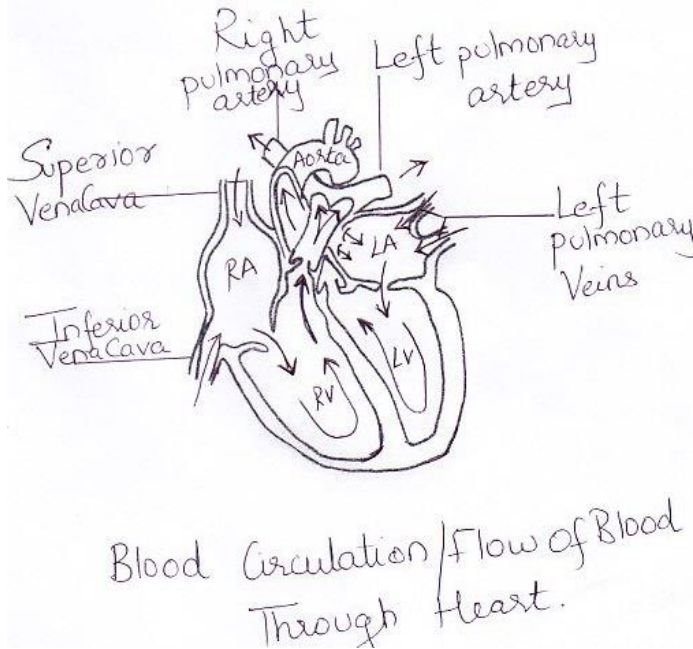
The deoxygenated/impure blood from right ventricle is forced into pulmonary artery through pulmonary valve. The pulmonary arteries divide into two branches, each enters the right and left lungs. In the lungs, the red blood cells (RBCs) release carbon dioxide and absorb oxygen. This oxygenated blood from the right and left lungs is collected by four pulmonary veins and poured into left atrium. From left atrium this blood enters into left ventricle through bicuspid valve which prevents back flow into left atrium. This oxygenated blood from left ventricle is forced into the aorta through aortic valve which prevent back flow of blood into left ventricle.

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**b) Describe the physiology of muscle contraction. (3 Marks)**

The motor pathway from the brain to the muscles involves two neurons. The upper motor neuron & the lower motor neuron. The axon of this neuron reaches the muscle. Near the termination in the muscle, the axon branches into tiny fibres that form the motor end plate near the muscle fibre.

When a nerve impulse reaches neuromuscular junction, the neurotransmitter released is Acetyl choline at this junction. This changes the permeability of the cell membrane to sodium & calcium ions. As a result the muscle becomes depolarized. This causes muscle contraction. The acetyl choline is hydrolysed by enzyme acetylcholine esterase. The calcium ion concentration is decreased in the muscle which causes repolarization which leads to relaxation of muscle.



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**c) Explain the terms universal donor and universal recipient. (1.5 Marks Each)**

Blood group “O” is called as **Universal donor** and Blood group “AB” is called as **Universal recipient**.

Individuals have different antigens on the surface of their RBCs. These antigens determine their blood groups.

Blood group ‘O’ has neither A nor B antigen on their cell membrane. There are Anti A & Anti B antibodies in the serum and thus blood can be safely transfused into A, B, AB and O, but can receive from only O. Therefore, blood group O is called Universal donor.

Whereas blood group AB has both A & B antigens on the cell membrane, but neither antiA nor antiB antibodies in the serum. Transfusion of any group into these individuals is safe since there are no antibodies to react with them. But can donate only to AB. Hence it is called as Universal recipient.

**d) Explain how the thoracic cage helps in process of breathing. (3 Marks)**

The thoracic cage consists of intercostal muscles attached to ribs. There are eleven pairs of intercostal muscles which occupy the space between the ribs. These are arranged in two layers, the external muscles extend downwards and forward and internal intercostal muscles which extend downwards and backwards. As the first pair of ribs is fixed, when the intercostal muscles contract the other pairs of ribs are pulled towards first rib. Because of the shape of the ribs, they move outwards when they are pulled upwards due to which thoracic cage is enlarged anterior-posteriorly.

The muscular flap called diaphragm which separates thoracic cavity from the abdominal cavity also helps in breathing. When the diaphragm contracts, its muscle fibers are shortened and the central tendon is pulled downwards, enlarging the thoracic capacity in length. The intercostal muscles and the diaphragm contract and relax simultaneously. During inspiration, the intercostal muscles & diaphragm contract, the thoracic cage is enlarged & the air is taken in the lungs. During expiration, the intercostal muscles and diaphragm relax; the ribs fall back into the place; the diaphragm ascends; the lung contracts and air is given out of the lungs.

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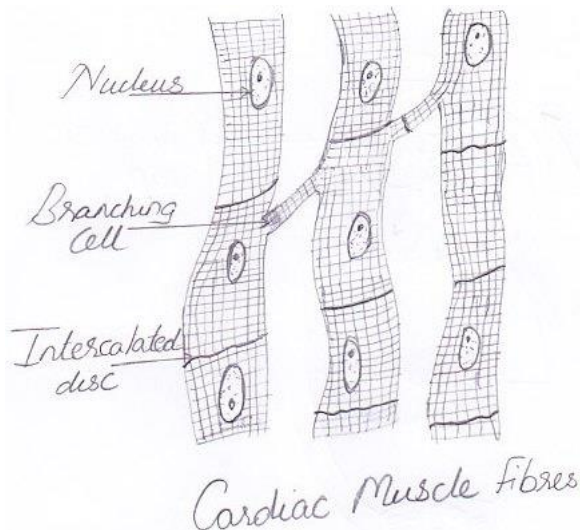
e) Give the classification of tissues and describe cardiac muscle.

(Classification-1M, Description 2M)

Ans:- **Classification:-** Tissues are classified into four major types:-

- 1) Epithelial tissue/Epithelium
- 2) Muscular tissue
- 3) Nervous tissue
- 4) Connective tissue

**Cardiac Muscle:-**



Exclusively found in the wall of the heart. The cardiac cell shows cross stripes. Each cell has a nucleus and one or more branches. The ends of the cells and their branches are in close contact with each other forming “intercalated disc” which look thick and dark lines. This arrangement gives cardiac muscle an appearance of a sheet of muscles rather than fibres.

f) Define the terms i) Myopia      ii) Mydriasis      (1.5 Marks Each)

i) **Myopia:** - Also termed as near-sightedness. Near vision is normal but far vision is blurred, because the far image is focused/formed in front of the retina as eye ball length is too long .

ii) **Mydriasis:** - Means dilation of pupil. Size of the pupil is controlled by two muscles of iris- radial muscle and circular muscle. Contraction of radial muscles increases aperture size i.e. pupil size causing Mydriasis.

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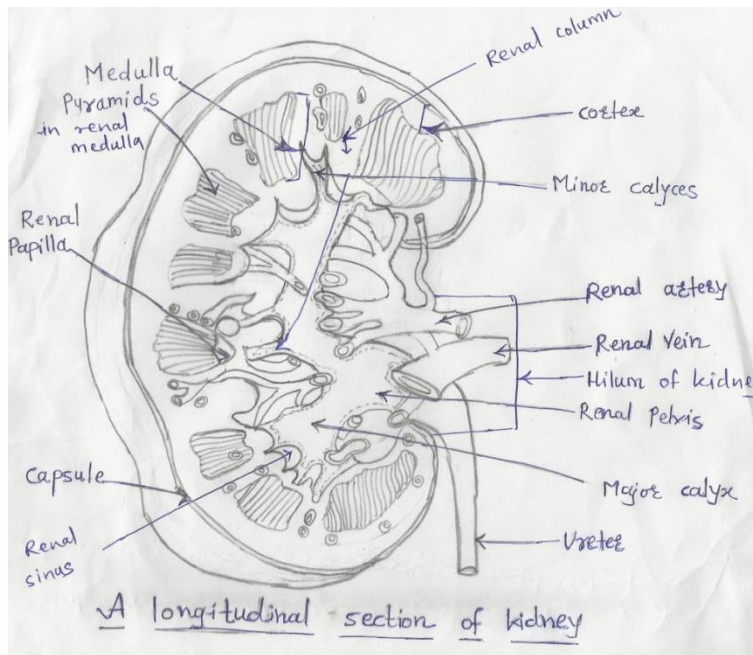
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Q.5 Solve any FOUR of the following: (12 marks, 03 marks each)

a) Draw and label diagram of L.S. of kidney. (3 marks)



b) Distinguish between sympathetic nervous system and parasympathetic nervous system. (6 points, 3 marks)

Sr. No.	Sympathetic nervous system	Parasympathetic nervous system
1	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.
2	It is also called thoracolumbar outflow.	It is also called craniosacral outflow.
3	Catabolic in nature.	Anabolic in nature.
4	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.



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5	The post ganglionic nerve fibre secretes neurotransmitter called adrenaline or noradrenaline	The post ganglionic nerve fibre secretes neurotransmitter called acetylcholine .
6	It is also known as called adrenergic nervous system	It is also known as called cholinergic nervous system
7	Effects of sympathetic stimulation on any of the organs (heart, eye, bronchi, etc)	Effects of parasympathetic stimulation on any of the organs (heart, eye, bronchi, etc)

**c) Differentiate between diabetes mellitus and diabetes insipidus.(Any 3 points, 3 marks)**

Sr. No	Diabetes mellitus	Diabetes insipidus
1	It is caused due to hypo secretion of insulin	It is caused due to hypo secretion of anti-diuretic hormone (ADH)
2	It is a disorder of pancreas	It is a disorder of posterior pituitary gland.
3	There is increase in blood glucose level	No increase in blood glucose level
4	Glucose excreted in urine (glucosuria)	No glucosuria
5	Ketone bodies occur in blood and urine.	Ketone bodies do not occur in blood and urine.
6	There is excessive hunger (polyphagia)	No polyphagia

**d) What do you mean by polycythaemia and agranulocytosis?(1.5 marks each)**

Polycythaemia means there are abnormally large number of RBCs in the blood which increases blood viscosity, slows the rate of flow of blood and increases risk of intravascular clotting. The physiological reasons include high altitudes; pathological reasons include cigarette smoking, pulmonary disease like asthma and bone marrow cancer.

Agranulocytosis is a disease associated with decrease or absence of granulocytes. It could be due to drugs, chemicals, radiation, diseases affecting bone marrow.



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**e) What physical and physiological changes occur in females during puberty? (3 marks)**

Following physical & physiological changes takes place during puberty in females:

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.

**f) Define and give normal values of (any two): (definition 1 mark, normal value 0.5 mark)**

**i) Tidal volume:** It is the volume of air moved in & out of lungs during normal breathing. Normal value is 500 ml.

**ii) 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 forceful inspiration and expiration (3 - 5 litres)

**(iii) Expiratory reserve volume:** This is the largest volume of air which can be expelled from the lungs during maximal expiration (800 - 1200 ml)



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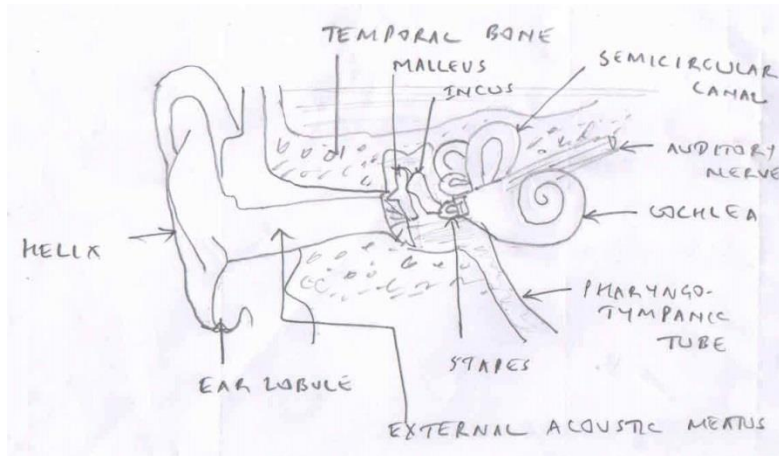
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Q.6 Solve any FOUR of the following: (16 marks, 04 marks each)

a) Draw a well labelled diagram of ear and explain mechanism of hearing.

Diagram of ear: (2 marks)



**Mechanism of hearing: (2 marks)** The pinna of ear directs the sound waves towards external acoustic meatus. This produces vibrations in the tympanic membrane. These vibrations are conveyed to the auditory ossicles which are then amplified and passed to the oval window. This causes the perilymph and endolymph in internal ear in motion. This stimulates the auditory receptors in the organ of Corti in cochlea which converts vibrations to nerve impulses. These impulses are carried to the brain by the auditory nerve where it is perceived as sound.

b) Describe the anatomy of male reproductive system.

(Listing 2 marks description 2 marks) (Examiner should consider if answer is given in diagram form)

The male reproductive system consists of the following organs:

Testes	2	}	Scrotum
Epididymides	2		
Deferent ducts	2		



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Spermatic cords	2	Seminal vesicles	2
Ejaculatory ducts	2		
Prostate gland	1		
Penis	1		

The **scrotum** is a pouch of deeply pigmented skin, fibrous and connective tissue and smooth muscles.

The **testes** are the reproductive glands of the male and these are suspended in the scrotum by spermatic cords (supporting structure of male reproductive system).

**Epididymis** is the site of sperm maturation.

**Deferent duct** helps in storage of sperms and also carries sperms from epididymis to the urethra.

**Seminal vesicles** are two small fibro muscular pouches lined with columnar epithelium on the posterior aspect of the bladder. Each seminal vesicle opens into a short duct which joins with the deferent duct to form an ejaculatory duct.

**Ejaculatory duct** is formed by the union of duct from seminal vesicle and deferent duct. These ducts pass through the prostate gland and join the prostatic urethra carrying seminal fluid and spermatozoa to the urethra.

**Prostate gland** lies in the pelvic cavity in front of the rectum. It secretes a thin milky fluid that makes up about 30% of the semen.

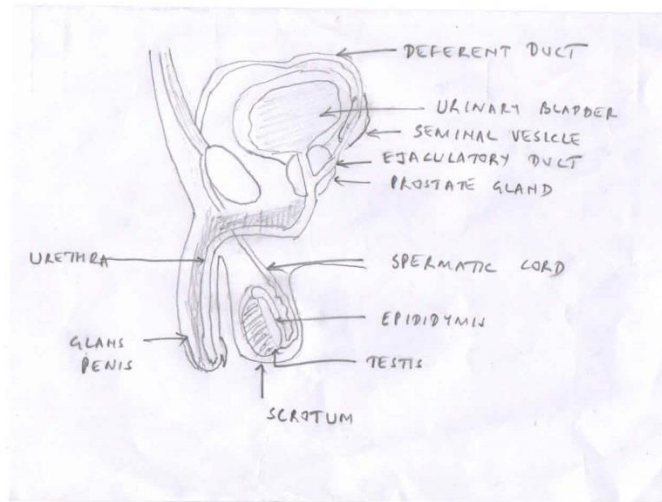
**Penis** is used to introduce sperms into the vagina.

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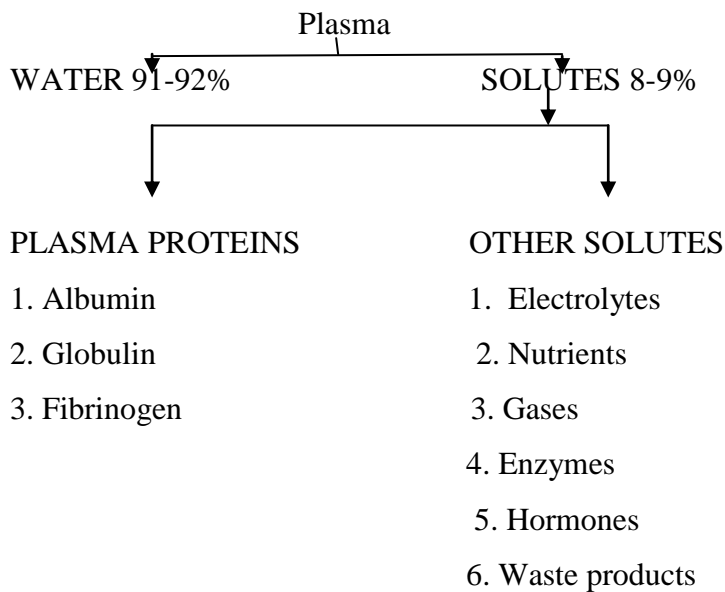
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c) Give the composition of blood and explain the functions of haemoglobin and neutrophils.(composition 2 marks, functions 1 mark each)

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

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



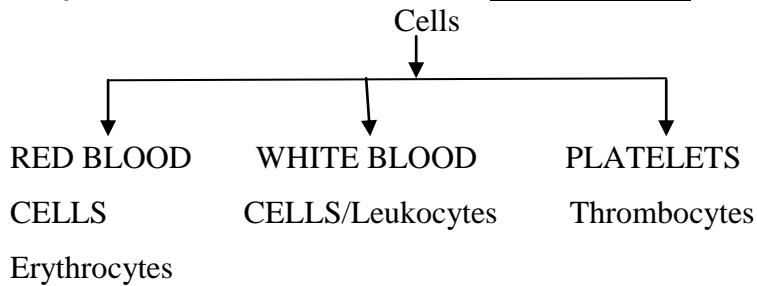


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**Functions of haemoglobin:** (i) Hb helps in the transport of oxygen and carbon dioxide.

(ii) It acts as a buffer.

**Functions of neutrophils:** The main function of neutrophils to protect against any foreign material that gains entry to the body, mainly microbes, and to remove waste materials, e.g. cell debris. They engulf and kill the microbes by phagocytosis.

**d) Define cardiac cycle. Describe its events. (def. 1 mark, explanation 3 marks)**

Cardiac cycle: The events which occur in the heart during the circulation of blood during each heart beat is called cardiac cycle OR The series of events during one heart beat is known as cardiac cycle.

Events in cardiac cycle:

(i) Atrial systole (0.1 sec)

(ii) Ventricular systole (0.3 sec)

(iii) Complete cardiac diastole (0.4 sec)                      Total 0.8 sec

**Description of cardiac cycle (2 marks)**

The superior & inferior vena cava transports the deoxygenated blood into right atrium. At the same time four pulmonary veins transport oxygenated blood into the left atrium. The heart action starts in the special cells of myocardium called SA node or sinoatrial node. It is situated near the opening of superior vena cava in the right atrium. These impulses from the SA node spreads over the atria, atria contracts, the AV valves open and & blood flows to ventricles. (Atrial systole- 0.1 sec)



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When the wave of contraction reaches AV node, it is stimulated & emits impulses which spreads over AV bundle, bundle branches & Purkinje fibres resulting in contraction of ventricles pumping the blood into pulmonary artery & the aorta. (ventricular systole 0.3 sec). After the contraction of the ventricles there is complete cardiac diastole (0.4 sec) when both atria & ventricles relax. After this the next cycle begins.

**e) What is portal circulation? Give its significance.**

**Portal circulation (3 marks)**

In all parts of the body, the venous blood passes from the tissues to the heart by the direct route. But, in the portal circulation, venous blood from the capillary bed of the abdominal parts, the spleen & the pancreas passes to the liver via the portal vein. The portal vein is formed by union of gastric vein from stomach, superior & inferior mesenteric veins from small and large intestine, splenic vein from spleen & cystic vein from gall bladder. The blood passes through the second capillary bed, the hepatic sinusoid in the liver before entering the general circulation via the inferior vena cava.

**Importance of portal circulation (1 mark)**

Blood with the high concentration of nutrients absorbed from the stomach & intestine goes to liver first. Here the nutrients are modified and it also helps in the regulation of materials to various parts of the body. The venous blood then leaves liver via hepatic vein & joins the inferior vena cava.

**f) Describe functions of liver.**

**Functions of liver (any 8 points, 0.5 mark for each point)**

1. Secretion of bile: Bile salts are helpful in digestion and absorption of fats by its emulsification.
2. Glycogenic function: The hepatic cells by the action of enzymes convert glucose into glycogen and it is then stored in the liver.
3. Formation of urea: Hepatic cells by the action of the enzyme cause deamination of amino acid, i.e. amine group is set free which forms urea.



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**Model Answer**

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4. Metabolism of fat: Whenever energy is needed, the saturated stored fat is converted to a form in which it can be used to provide energy.
5. Formation of RBCs in foetal life.
6. Destruction of RBCs forming bile pigments and iron.
7. Formation of plasma protein.
8. Formation of heparin, a natural anticoagulant in the blood.
9. Storage of iron and vitamin B<sub>12</sub>.
10. Maintenance of body temperature: As a number of chemical reactions occur in the liver, heat is generated which is helpful in maintaining body temp.
11. Excretion of toxic substances: The toxic substances entering the body through alimentary canal are destroyed in liver.

**OR**

- I. Carbohydrate metabolism: It helps in maintaining plasma glucose level with the help of insulin & glucagon.
- II. Fat metabolism: Stored fat can be converted to a form in which it can be used by the tissue to provide energy.
- III. Protein metabolism: Deamination of amino acids.-removes nitrogenous portion from amino acid not required for formation of new protein. Urea is formed from the nitrogenous portion which is excreted in urine. Break down of nucleic acids to form uric acid which is excreted in urine. Transamination: Removes the nitrogenous portion of amino acid & attaches it to carbohydrate molecule forming new non-essential amino acid.
- IV. Synthesis of plasma protein & most blood clotting factors from amino acid.
- V. Breakdown of RBCs & defence against microbes. This is carried out by Kupffer cells.
- VI. Detoxification of drugs & noxious sub.
- VII. Inactivation of hormones
- VIII. Production of heat
- IX. Secretion of bile
- X. Storage of glycogen, iron, copper, & fat soluble vit-A, D,E, K, water soluble vit. like vit. B<sub>12</sub>