



SUMMER – 13 EXAMINATION

Subject Code: 0809

Model Answer

Page No: _1___/ N

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.



SUMMER – 13 EXAMINATION

Subject Code: 0809

Model Answer

Page No: __2__ / N

Q 1 Attempt any FIVE of following(5*2 marks)

(a) Explain why mitochondria is called as the store -house of energy ? (2 marks)

When oxidative enzymes present in mitochondria combine with oxygen and nutrients, energy in the form of ATP, carbon dioxide and water are formed. This released energy (ATP) then diffuses throughout the cell which is stored and utilized for cellular respiration. Hence mitochondrion is known as store -house of energy

(b) Name the endocrine glands of body (0.5 marks for 2 glands)

- | | |
|-----------------------|----------------------|
| 1) Pituitary gland | 2) Thyroid gland |
| 3) Parathyroid gland | 4) Adrenal gland |
| 5) Endocrine Pancreas | 6) Ovaries in female |
| 7) Testis in male | 8) Pineal gland. |

(c) Name various valves in heart. (0.5 mark each)

- | | |
|--------------------|--------------------------|
| 1) Tricuspid valve | 2) Bicuspid valve/mitral |
| 3) Pulmonary valve | 4) Aortic valve |

(d) Define tissue. Name the fundamental tissues of the body. (1+1mark)

Tissue - it is a group of cells that usually have a common embryonic origin and function together to carry out specialized functions. OR

It is a group of cells with similar structures performing similar functions.

Types of Tissues : Epithelial, Connective , Muscular and Nervous tissue.

(e)What do you mean by the following (0.5 mark each)

a **Anatomical position** – This is the upright position of the human body with the head facing forward, the arms at the sides with palms of the hands facing forward and the feet together.

b **Fossa**- A hollow or depression in a bone

c **Meatus**- A tube shaped cavity within a bone.

d **Physiology**- It deals with function of body part and their working to co-ordinate action of whole body. OR
It is concerned with the way in which the various parts work and how they are integrated to produce a co-ordinated action of the whole body.



SUMMER – 13 EXAMINATION

Subject Code: 0809

Model Answer

Page No: _3_/ N

(f) Name any two synovial joints with one example of each. (0.5+0.5 mark each)

Ball and Socket Joint : e.g. shoulder and hip joint

Hinge Joint :e.g. elbow, knee and ankle joint.

Double Hinge Joint (Condyloid) : e.g base of the thumb (between the trapezium and the 1st metacarpal bone).

Gliding joint : e.g between various carpals and tarsals bone.

Pivot joint : e.g the radius and the ulna at the proximal and the distal end and between atlas and axis bone.

Q 2 Attempt any FOUR of following (4*3.5 marks)

(a) Define skeleton. Write the functions of bone. (1 +2.5 marks for any five points)

Definition: Skeleton is the bony framework of the body.

Functions:

- 1) They form supporting framework of the body.
- 2) They form boundaries for the cranial, thoracic and pelvic cavities.
- 3) They give protection to delicate organs.
- 4) They form joints which are essential for the movement of the body.
- 5) They provide attachment for the voluntary muscle. This helps in the movement of joints.
- 6) They form blood cells in the red bone marrow in cancellous bone.
- 7) They act as a storehouse of calcium and phosphate salts.



SUMMER – 13 EXAMINATION

Subject Code: 0809

Model Answer

Page No: _4_/ N

b) Differentiate between male and female pelvis. (3.5 marks)

	Female	Male
Bones	Lighter and thin	Heavier and thick
cavity	Shallow and oval	Deep and funnel shape
sacrum	More concave anteriorly, making true pelvis border	Less concave, making the true pelvis narrower at the out let
Pubic-Arch	The angle made at the symphysis pubis is wider.	The angle of the pubic arch is narrower

(c) Draw a well labeled diagram of Neuron and describe its structure.

Structure: (2 marks)

The different parts of neuron are as follows:

Neurons have three parts - cell body, axon and dendrites.

Nerve cell body : contains nucleus and some organelles. It forms the gray mater.

Axon: Each nerve cell has only one axon which carries impulses away from the nerve cell. The plasma membrane of axon is known as axolemma. The axon of peripheral nerves are surrounded by myelin sheath. This consists of series of Schwann cells arranged along the length of axon. The outermost layer of Schwann cell plasma membrane is known as neurilemma. There are tiny areas of exposed axolemma between adjacent Schwann cells known as nodes of Ranvier. The axon ends by dividing into many fine processes called axon terminals.

Dendrites: These are the processes on the nerve cells which carry impulses towards nerve cells. Each neuron has many dendrites.

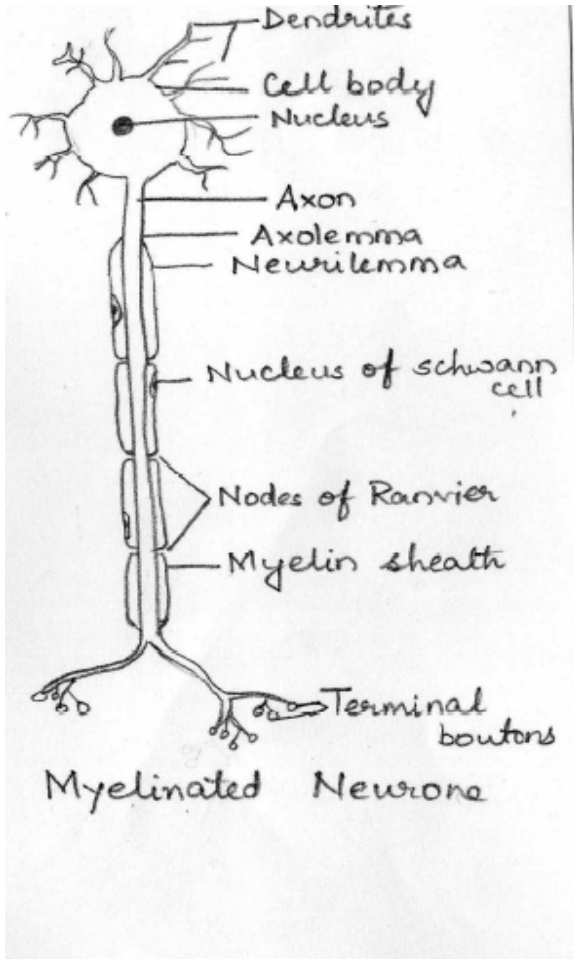
SUMMER – 13 EXAMINATION

Subject Code: 0809

Model Answer

Page No: __5__ / N

Diagram: (1.5 marks)



(d) Name the different types of blood cells. Give its normal count.(1.5+1+1 marks)

Blood cell	Normal count
Erythrocytes/ RBC	Males : 4.5 - 6.5 million/cu mm Females : 4 - 5.5 million/cu mm
Leucocytes/ WBC	4000 - 10000 /cu mm
Thrombocytes/ platelets	2 – 3.5 lakhs/ cu mm

SUMMER – 13 EXAMINATION

Subject Code: 0809

Model Answer

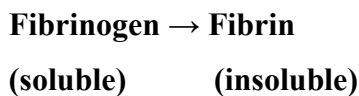
Page No: __6__ / N

(e) Describe the mechanism of blood coagulation. (3.5 marks)

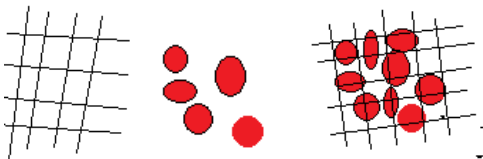
Whenever there is damage to the blood vessel, there is formation of rough surface. When blood platelets come in contact with this surface, they get injured and release the substance called thromboplastin. In the presence of thromboplastin & calcium the inactive plasma protein prothrombin is converted into thrombin. This thrombin helps conversion of plasma protein fibrinogen to fibrin. The fibrin is insoluble & it forms threads. The threads of fibrin form the net, in this net blood cells are entangled. This mass forms a blood clot. This mechanism involves many blood clotting factors.



Thrombin acts on



Fibrin + Blood Cells → Clot



(f) Which blood group is called as “Universal donor” and “universal recipient” and why? (1+2.5 marks)

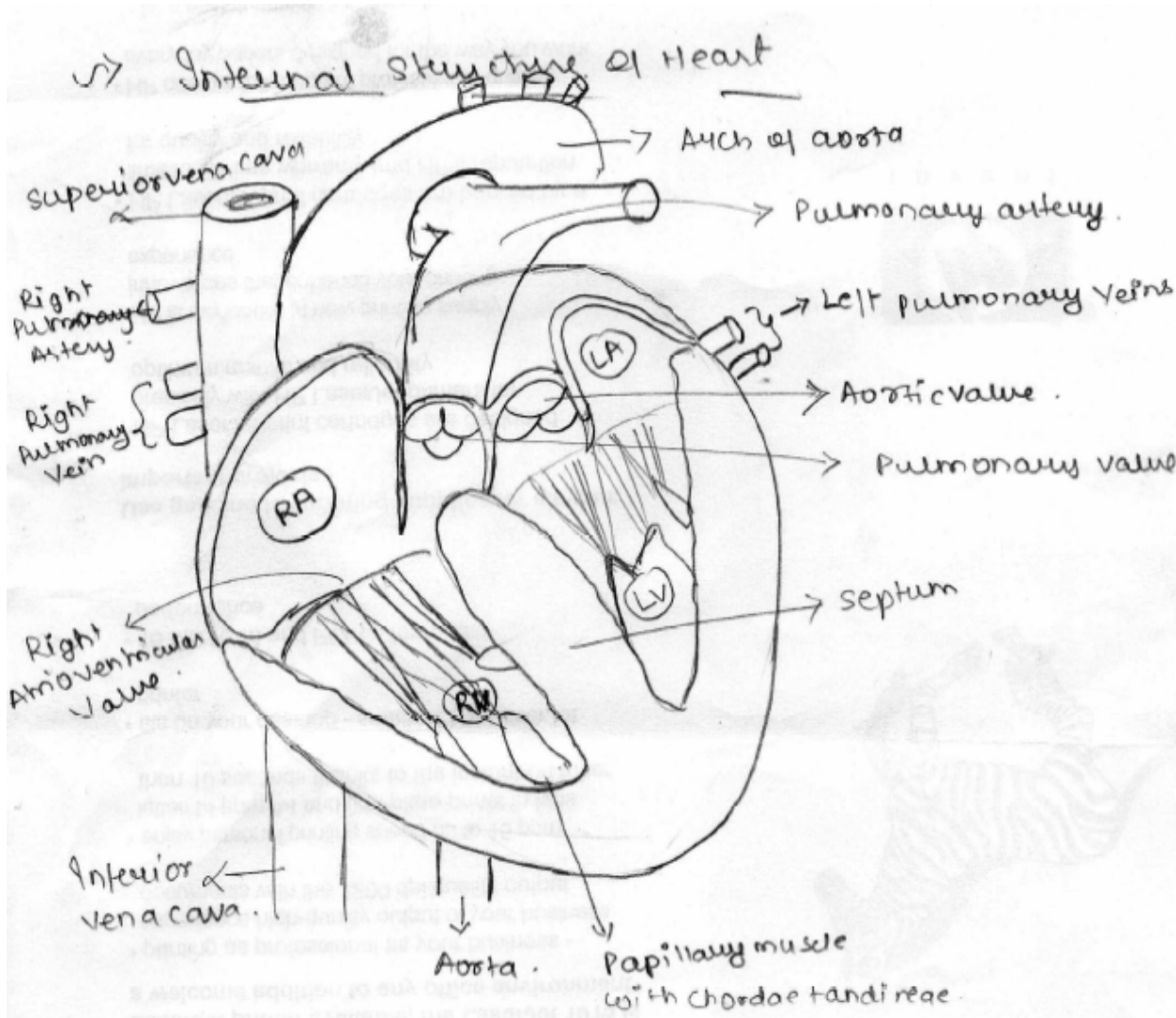
Blood group “O” is called as **Universal donor** and Blood group “AB” is called as **Universal recipient**. Individuals have different antigens on the surface of their RBC. These antigens determine their blood groups. If individuals are transfused with blood of the same group, i.e. possessing same antigen, their immune system will not recognize them as foreign and will not reject them. However, if they are given blood from an individual of a different blood type i.e. with different antigen on RBC, their immune system will mount an attack upon them and destroy the transfused cells. This is termed as *transfusion reaction*.

Blood group ‘O’ have neither A or B antigens on their red cell membrane. There will be no agglutination and thus blood can be safely transfused into A, B, AB and O. therefore blood group O as universal donor.

Whereas blood group 'AB' make neither anti A nor anti B antibodies. Transfusion of any group into these individuals is safe since there are no antibodies to react with them. Hence it is called as universal recipient.

Q3 Attempt any four of the following:(4*3.5marks)

(a) Draw a well labeled diagram showing internal structure of heart. (3.5 marks)



(b) Name & describe the various events of cardiac cycle
various events of cardiac cycle (1 ½ mark)

- (i) atrial systole (0.1 sec)
- (ii) ventricular systole (0.3 sec)
- (iii) complete cardiac diastole(0.4 sec)



Description of cardiac cycle (2 marks)

The superior & inferior vena cava transport the deoxygenated blood into right atrium. At the same time four pulmonary veins transport oxygenated blood into the left atrium.

The 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)

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.

(c) Describe the portal circulation and its importance.

The portal circulation(2 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, superior & inferior mesenteric veins, splenic vein & cystic vein. 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 ½ marks)

Blood with the high concentration of nutrients absorbed from the stomach & intestine goes to liver first. In the liver certain modifications takes place including the blood nutrient level. The venous blood then leaves liver via hepatic vein & joins the inferior vena cava.

(d) Give the Composition & functions of intestinal juice .

The Composition of intestinal juice (1 ½ marks)

(1500 ml/day.)

Water, mucus, mineral salts. Enzyme enterokinase (enteropeptidase).

Functions of intestinal juice

- 1) Mucus protects the intestinal lining.
- 2) Enzyme enterokinase converts inactive pancreatic trypsinogen & chymotrypsinogen to active trypsin & chymotrypsin which converts peptones into peptides & polypeptides.



SUMMER – 13 EXAMINATION

Subject Code: 0809

Model Answer

PageNo: __9__ /N

(e) Describe the exocrine & endocrine functions of pancreas

Exocrine functions of pancreas (2 marks) secretion of pancreatic juice

Composition of pancreatic juice- (PH- 8)

water, mineral salts, enzymes- amylase, lipase, inactive enzymes- trypsinogen, chymotrypsinogen, procarboxypeptidase.

Enterokinase activates trypsinogen & chymotrypsinogen. These converts polypeptides to dipeptides , tripeptides & amino acids.

Amylase converts starch to disaccharides.

Lipase converts fats to fatty acid & glycerol.

Endocrine functions of pancreas (1 ½ marks)

Pancreatic islets- (islets of Langerhans) –

There are three types of cells. α cells -secrete glucagon, β cells - secrete insulin & delta cells- secrete somatostatin. Glucagon increases the blood glucose level. Insulin decreases the blood glucose levels & somatostatin (GHRH) inhibits the secretion of both insulin & glucagon.

(f) Enlist the functions of liver(0.5 marks for any seven points)

- 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. Breaks down nucleic acids to form uric acid which is excreted in urine.
Trans amination: 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, & water fat soluble vit-A,D,E, K, soluble vit. Like vit. B12.

SUMMER – 13 EXAMINATION

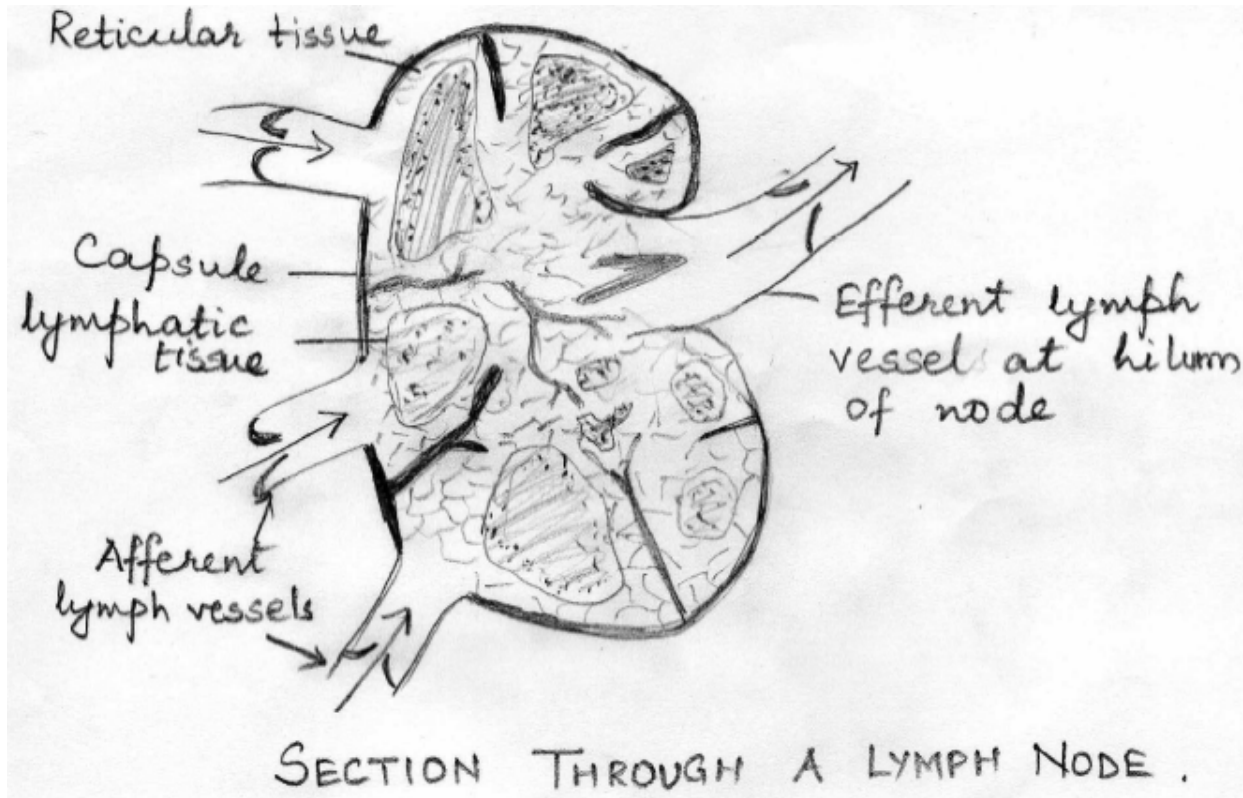
Subject Code: 0809

Model Answer

PageNo: __10__ /N

Q 4 Attempt any four of the following (4*3.5 marks)

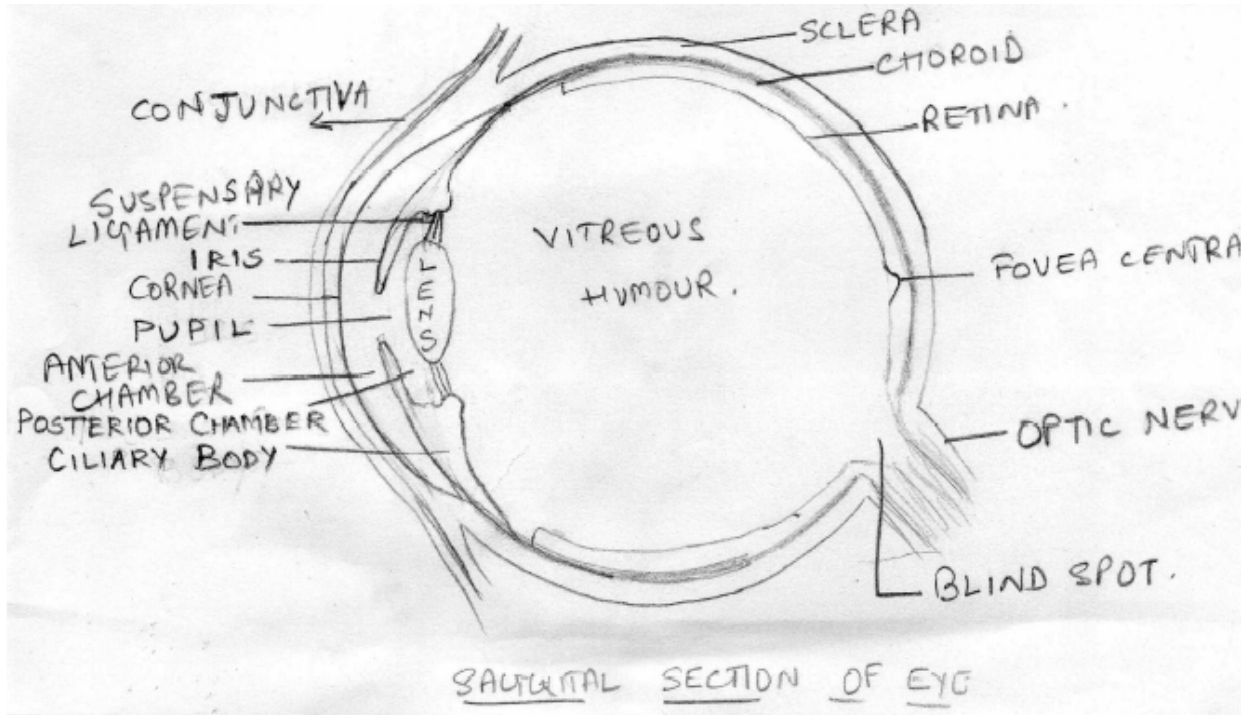
(a) Draw & explain T.S, of Lymph node(2+1.5 marks)



Lymph node is a bean shaped structure .

They have surrounding capsule of fibrous tissue, which dips down into the nodes forming trabeculae. Each node has hilum where artery enters and vein & efferent vessel come out. It contains reticular & lymphatic tissue containing lymphocytes & macrophages. Four to five afferent lymph vessels enter each node & only one efferent vessel comes out.

(b) Draw & label Saggital section of eye (3 ½ marks)



(C) Name the auditory ossicles Describe its functions.

Auditory ossicles are malleus, incus & stapes (1.5 marks)

Functions-(2 marks)

- 1) when the sound waves fall on tympanic membrane it vibrates & passes the vibrations to the auditory ossicles. When auditory ossicles vibrate it passes the sound waves to the inner ear.
- 2) amplification of sound.

(d) Enlist the functions of skin (0.5 marks each point)

i) protection

It forms the water proof layer & protects the inner delicate structures. it acts as the barrier against the invasion of the microbes chemicals & dehydration. The melanin pigment protects against the harmful uv rays.

ii) Regulation of body temp.-

the temp. is constant at 36.8° C when the metabolic rate of the body increases the body temp. increases & vice a versa. To ensure constant body temp. a balance between heat production & heat loss is maintained by the skin.

SUMMER – 13 EXAMINATION

Subject Code: 0809

Model Answer

PageNo: _12___/N

iii) formation of vit. D.-

7-dehydroxycholesterol is present in the skin. the uv light from the sun converts it to vit. D.

iv) sensation.

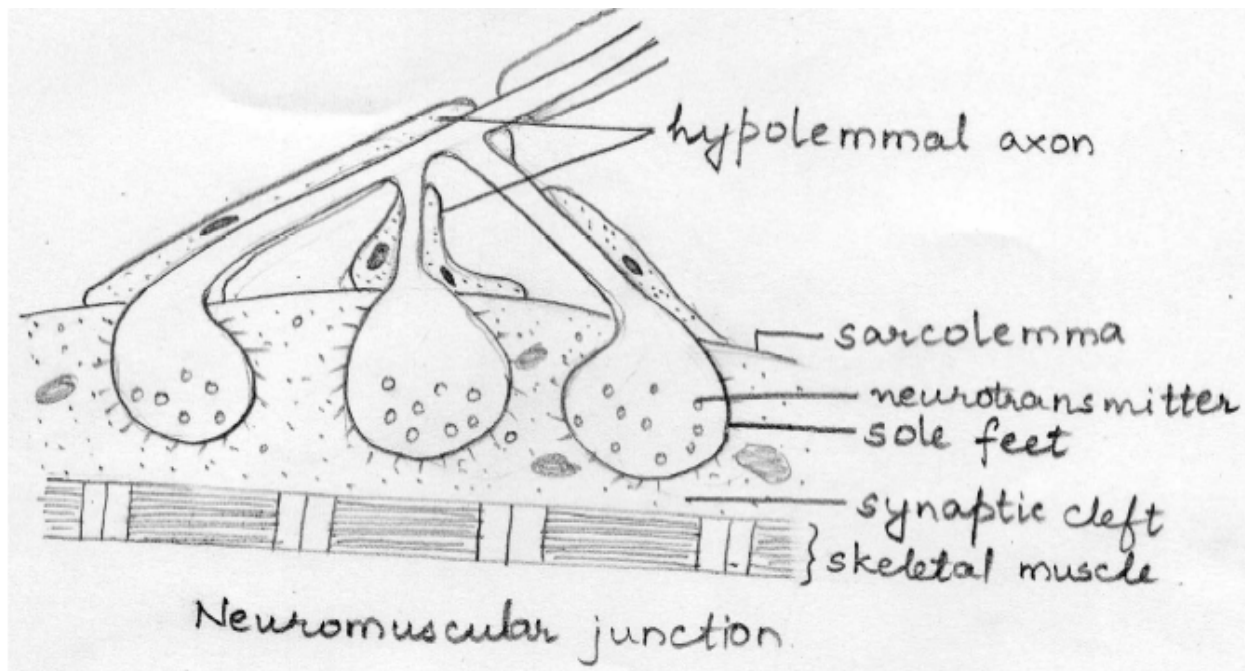
v) Absorption- Some drugs & chemicals are absorbed through the skin.

vi) excretion- skin is a minor excretory organ & excretes NaCl, urea & sub.like garlic.

e) Name the muscles of upper limbs (3 ½ marks)

deltoid, pectoris major, coraco brachialis, biceps, triceps, brachioradialis, pronator quadrates, pronator teressupinator, flexer carpi radialis, flexer carpi ulnaris, extensor carpi radialis longus & brevis, extenser carpi ulnaris, palmarus digitorum & muscles that control finger movements.

(f) Write a note on Neuro muscular junction(3.5 marks)



The motor pathway from the brain to the muscles involves two neurons. The upper motor neuron & the lower motor neuron. The lower motor neuron has the cell body in the anterior horn of the grey mater in the spinal cord. The axon of this neuron reaches the muscle.

The Neuromuscular junction is the connection between a large myelinated nerve and skeletal muscle fibre.. The muscle membrane through which a nerve fibre passes is called sarcolemma. Near the termination in the muscle, the axon branches into tiny fibres that form the motor end plate near the muscle fibre.



SUMMER – 13 EXAMINATION

Subject Code: 0809

Model Answer

Page No: _13___/N

The nerve fibre spreads to form branches called Hypolemmal axons which end in club like feet called sole feet. The entire nerve ending is called end plate. Below the sole feet, a small space called synaptic cleft is present. Below this, there are large folds of muscle membrane. The neuro transmitter released is Ach. at this junction which is responsible for stimulating the muscle fibre & causing voluntary muscle movement.

Q5. Attempt any FOUR of the following (3.5 marks each)

a) Define and give normal value of

i) Vital capacity(1+1 mark)

It is the volume of air that passes into and out of the lungs by the most forcible inspiration and expiration. The normal value is 3 - 5 lit.

ii) Tidal volume(1+.5 mark)

It is the amount of air which is moved in & out of lung during each cycle of quiet breathing. Normal value is 500 ml.

b) Name the cartilages of larynx.(1.5 marks) Describe functions of larynx.(2marks)

Larynx is composed of pieces of cartilages connected by ligaments and membrane. The cartilages are

- One thyroid cartilage
- One cricoid cartilage
- Two arytenoid cartilages
- Two cuneiform cartilages
- Two corniculate cartilages
- One epiglottis

Functions of larynx-

It provides a passage of air between pharynx and trachea.

During the passage of air through the larynx, it gets moistened, filtered and warmed.

The vocal cords lie inside the larynx. When air passes through the laryngeal cavity, vibrations are caused in the vocal cords which produce voice.



SUMMER – 13 EXAMINATION

Subject Code: 0809

Model Answer

Page No: ___14_/N

The epiglottis present on top of the thyroid cartilage helps to close the larynx during swallowing and protects the lower respiratory tract.

c) Describe the process of urine formation. (3.5 marks)

There are 3 stages in urine formation-

- i) Ultra filtration
- ii) Selective reabsorption
- iii) Tubular secretion

Ultrafiltration/ glomerular filtration – Filtration takes place through the semi permeable walls of the glomerulus & glomerular capsule or Bowman’s capsule. Water and small molecules pass through it. The afferent renal artery brings blood to the glomerulus and the efferent artery carries the blood away from it. As the diameter of afferent artery is more than the efferent artery, a hydrostatic pressure is generated in the glomerulus (55mm Hg). This pressure is opposed by osmotic (30 mmHg) and filtrate hydrostatic pressure in capsule (15mm Hg). The net filtration pressure is $55 - (30 + 15) = 10$ mm of Hg.

All constituents of blood are filtered except blood cells and plasma proteins.

Selective reabsorption- This 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, vitamins, amino acids get completely re- absorbed into the blood. These are called high threshold substances. Low threshold substances like urea, uric acid are absorbed slightly. Some substances like creatinine is not reabsorbed at all.

Tubular secretion- substances not required & foreign materials (non threshold substances) eg- drugs like penicillin may not be cleared in filtration. Such substances are cleared by secretion into convoluted tubules and excreted from body in urine.

d) Explain how kidney helps to maintain B.P. (3.5 marks)

Due to Low blood volume, decreased B.P. or sympathetic stimulation, enzyme Renin is released by the kidneys. Renin converts plasma protein angiotensinogen to angiotensin I. Angiotensin converting enzyme (ACE) formed in lungs, proximal convoluted tubules and other tissues convert angiotensin I to angiotensin II which is a powerful vasoconstrictor and increases BP.

Renin also stimulates adrenal cortex to produce aldosterone which causes increased absorption of Na^+ . This is followed by reabsorption of water. Blood volume increases thereby increasing BP. This inhibits the enzyme rennin by negative feedback mechanism.

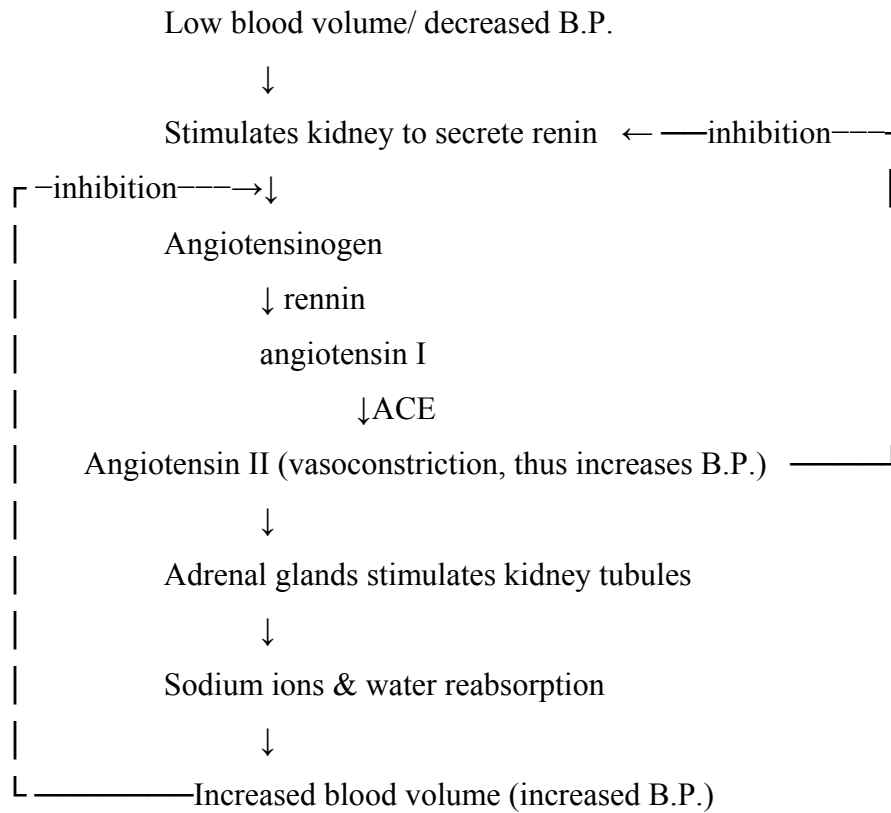


SUMMER – 13 EXAMINATION

Subject Code: 0809

Model Answer

Page No: __15__ /N



e) What is oedema? Give its causes.(1.5 mark+2 marks)

All the cells in the body are bathed in the tissue fluid. Oedema is excessive accumulation of tissue fluid causing swelling.

Causes of Oedema –

- Increased venous B.P.
- Decreased plasma osmotic pressure
- Impaired lymphatic drainage
- Increased small vessel permeability

f) Describe the phases of “menstrual cycle”(3.5 marks)

Menstrual cycle is defined as a series of changes in endometrium of a female every 26 to 30 days throughout the child bearing period.



SUMMER – 13 EXAMINATION

Subject Code: 0809

Model Answer

Page No: __16__ /N

Phases of menstrual cycle are divided into

Menstrual phase : 4 days

Proliferative phase : 10 days

Secretory phase : 14 days

Menstrual phase: It is characterized by periodic discharge of 25-65ml of blood, tissue fluid, mucus and epithelial cells. It is caused by sudden reduction in oestrogen and progesterone and lasts for approximately 4-5 days. During menstrual phase, ovarian cycle is also in operation and primary follicle begins its development. At birth, each ovary contains 200,000 follicles each consisting of primary ovum surrounded by single epithelium. Towards the end of menstrual phase, many primary follicles developed into secondary follicle which consists of secondary ova.

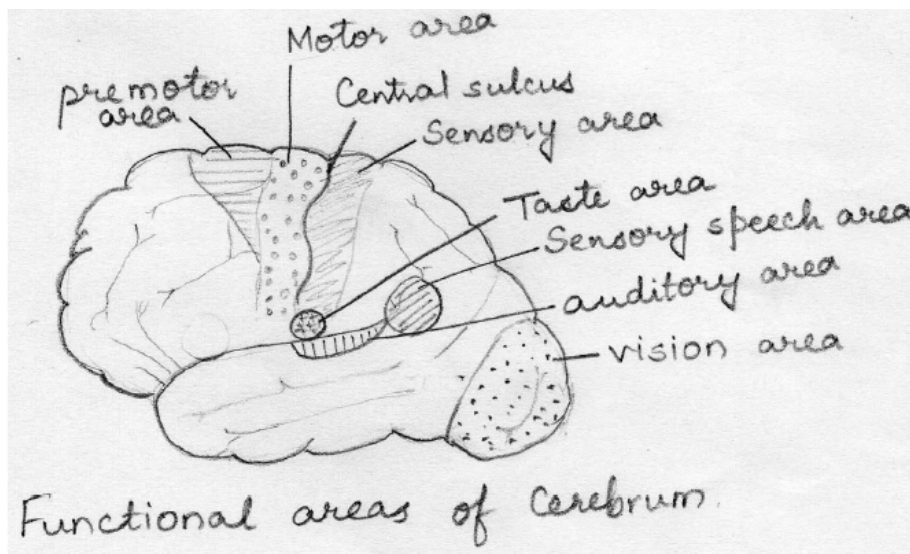
Proliferative phase: It is characterized by release of oestrogen. During this, endometrium gets proliferated and it gets renewed in this period. Also, graafian follicle is maturing and this phase is terminated when ovulation occurs and oestrogen production is inhibited.

Secretory phase: Immediately after ovulation, the cells lining ovarian follicle are stimulated by LH to develop corpus luteum which further produces progesterone. Under the influence of progesterone, the endometrium becomes oedematous and secretory glands produce an increased amount of watery mucus which is also called luteal phase. If the implantation of fertilized ovum occurs, then endometrium grows further. Then the menstrual cycle is interrupted during the period of lactation .If ovum is not fertilized, the cycle enters in the next phase.



Q6. Attempt any FOUR of the following

a) Draw and label diagram indicating different functional areas of cerebrum. (3.5 marks)



b) Describe the functions of medulla oblongata.(3.5 marks)

The vital centres consisting of group of cells associated with autonomic reflex activity lie in Medulla oblongata. These are

- Cardiac centre- The cardiac centre controls the rate and force of cardiac contraction and blood pressure.
- Respiratory centre – The respiratory centre controls the rate and depth of respiration. Nerve impulses pass to the phrenic and intercostals muscles which stimulate the contraction of diaphragm and intercostals muscles, thus initiating inspiration.
- Vasomotor centre – This controls the diameter of blood vessels especially small arteries and arterioles. Stimulation causes constriction or dilation depending on site.
- Reflex centre – When irritating substance are present in stomach or respiratory tract, nerve impulse pass on to the medulla oblongata stimulating the reflex centre which initiate reflex actions like vomiting, sneezing and coughing.



SUMMER – 13 EXAMINATION

Subject Code: 0809

Model Answer

Page No: __18__ /N

c) Explain the following terms:

i) Spermatogenesis (2 marks)

The process by which male primordial germ cells undergo meiosis and produce a number of cells called spermatozoa is termed as spermatogenesis.

primordial germ cell → Spermatogonia (stem cell) → primary spermatocyte → secondary spermatocytes → spermatids → sperms

ii) Oogenesis (1.5 marks) The formation of ovum or egg cell in the ovaries is called oogenesis.

Primordial follicles → primary follicle → secondary follicle → mature follicle → ovulation

d) Differentiate between two divisions of A.N.S. (0.5 mark for each point)

Sympathetic division	Parasympathetic division
Called as thoraco lumbar outflow	Called as cranio sacral out flow
Ganglia near the spinal cord	Ganglia near the effector organ
Short pre ganglionic fibre	Long preganglionic fibre
Long post ganlionic fibre	Short post ganglionic fibre
Also known as Adrenergic system	Also known as Cholinergic system
It prepares body for fight and flight response	It is a peace maker which allow restoration processes to occur quietly.
Neurotransmitter is noradrenaline	Neurotransmitter is acetylcholine

e) Name the cranial nerves. (0.5 for each)

Olfactory

Optic

Oculomotor

Trochlear

Trigeminal

Abducent



SUMMER – 13 EXAMINATION

Subject Code: 0809

Model Answer

Page No: _19___/N

Facial

Auditory (vestibulocochlear)

Glossopharyngeal

Vagus

Accessory

Hypoglossal

f) Name the hormones secreted by anterior lobe of pituitary gland with their functions.

Hormone	Functions
Growth hormone (GH)/somatotrophic hormone	It stimulates growth directly and in conjunction with other hormones.
Thyroid stimulating hormone (TSH)/ thyrotrophic hormone	It controls the growth and activity of thyroid gland
Adrenocorticotrophic hormone (ACTH)	It stimulates the cortex of adrenal glands to produce their hormones.
Gonadotrophic hormones i) Follicle stimulating hormone (FSH)	In females, it stimulate the ovarian follicle to produce mature ovum and secretion of estrogen by ovaries. In males, it stimulate the formation of spermatozoa in testis.
ii) Leutinizing hormone(LH)/ICSH in males	In females, it stimulates the corpus luteum to produce progesterone. In males, it stimulates interstitial cells to produce testosterone
Lactogenic hormone/ prolactin	It has direct effect on mammary glands & with help of other hormones it stimulates mammary glands to secrete milk.



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