



MODEL ANSWER

SUMMER- 17 EXAMINATION

Subject Title: Human anatomy physiology

Subject Code:

0809

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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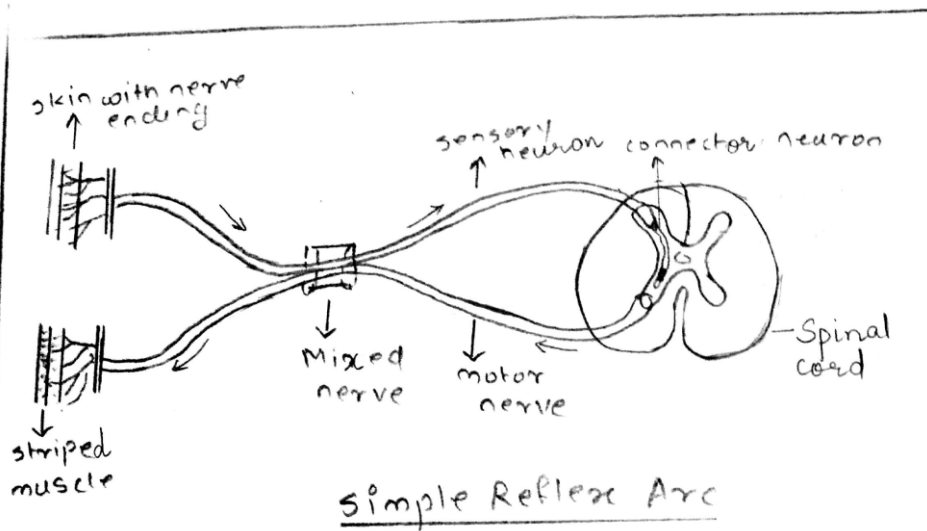
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Compound epithelium is of two types -

Stratified epithelium Transition epithelium

(c)

Draw a well labeled diagram showing a simple reflex arc. (2M)



(d)

Enlist the muscles of neck & give their functions.(2M)

Neck muscle	Function
Sternocleidomastoid	Turns the head to opposite side when used separately. When used together, flexes the neck
Trapezius	It pulls the head backwards, draws the scapula back, raises the shoulder

(e)

Name different vertebrae of vertebral column.(0.5 Each)

Vertebral column consists of twenty four separate, movable, irregular bones called vertebrae which are divided into three groups -



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Cervical vertebrae - seven

Thoracic vertebrae - twelve

Lumbar vertebrae – five

The following are formed by fusion of vertebrae.

Sacrum –fusion of five vertebrae

Coccyx-fusion of four vertebrae

(f)

Why pituitary gland is called as master gland? (2M)

The pituitary gland secretes important hormones like growth hormone, prolactin, anti-diuretic hormone and oxytocin which directly act on the body and control important functions. It also secretes trophic hormones like TSH, gonadotrophic hormone, ACTH, which control secretion of other endocrine glands. Hence, it is called as master gland.

(g)

Define lymph.(1M) Mention different components of lymphatic system.(1M)

Lymph is a fluid connective tissue. All the body tissues are bathed in tissue fluid, some tissue fluid diffuses through the lymph capillaries forming lymph.

The different components of lymphatic system are

Lymph, lymph capillaries, lymph vessels, lymph nodes, lymph organs spleen & thymus gland, lymphoid tissue (MALT) e.g. tonsils, bone marrow (lymphocytes production)

(h)

What is Puberty? (2M)

Puberty is defined as age at which the internal reproductive organs reach maturity.

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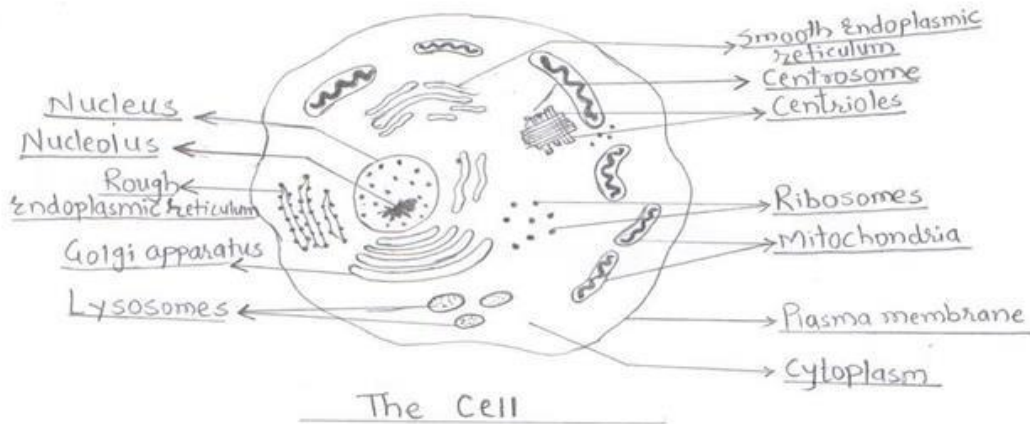
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(i) **Draw and label structure of cell.**



(j) **Give the normal values of the following (0.5 Each)**

- i) **Pulse** - 72 / min (60-80/min)
- ii) **Cardiac output** - 5040ml / min
- iii) **Stroke volume** - 70 ml
- iv) **Heart rate** - 72 beats / min (60-80/min)

Answer any FOUR of the following

(a) **Define Respiration.(1M) Explain the mechanism of respiration.(2M)**

Respiration is defined as exchange of oxygen and carbon dioxide bet. atmosphere & body cells.

Mechanism of respiration - The normal human has 12-15 breath per min.

Each breath consists of inspiration, expiration & pause.

Inspiration- The simultaneous contraction of intercostal muscles & diaphragm increases the capacity of thoracic cavity. This reduces the pressure in the lungs. To equalise the pressure the air from atmosphere enters the lungs. The process of inspiration is active as it needs energy for

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4×3=12

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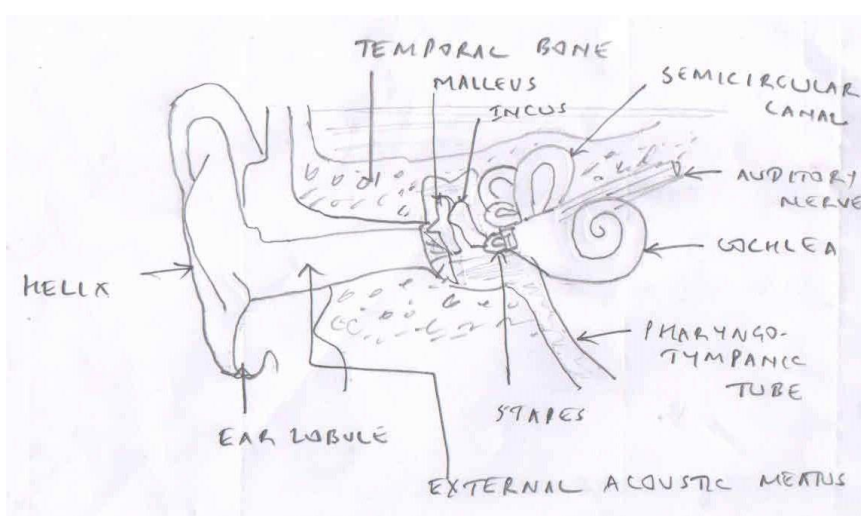
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muscle contraction. It lasts for 2 sec.

Expiration-Relaxation of intercostal muscles & diaphragm results in decrease in the space in the lungs. As a result, the pressure inside the lungs increases as compared to atmospheric pressure. The air from the lungs is expelled from the lungs. This process is passive as it does not require energy. The expiration lasts for 3 sec. After expiration there is **pause** & then the next cycle begins.

(b) **Draw a well labelled diagram showing internal structure of human ear. (3M)**



(c) **Classify Muscular Tissue. (1M) Explain anatomy and physiology of different types of muscular tissue. (2M)**

Muscular tissue is classified into -

- Striated /skeletal/voluntary muscles
- Non striated /smooth/involuntary muscles
- Cardiac muscles

Striated muscle fibre - These muscles appear striated because their fibres have regions of different densities which occur at regular intervals. Each muscle cell is covered with



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membrane called sarcolemma. There are many nuclei at regular intervals.. Each muscle fibre is about 10 - 40 mm in length and large number of them lie parallel to one another to form bundles. The cytoplasm of each muscle fibre has large number of myofibrils which are tightly packed. The striated muscle fibres are present in those movable parts of body which are under the will of the person such as tongue, muscles of arms, legs etc

Non striated muscle fibre - These are long spindle shaped with a nucleus present in the centre. Each nucleus is surrounded by sarcoplasm. The myofibrils in sarcoplasm are present longitudinally and sarcolemma is absent. It is covered by plasma membrane. These muscles are responsible for the movement of those parts of the body which are not under the control of the person, ie, lower part of oesophagus, stomach, intestine, lungs, blood vessels, urinary bladder. They are under the control of autonomic nervous system.

Cardiac muscles - This is found exclusively in the heart wall. It is not under control of our will but has cross stripe characteristics of voluntary muscle. Each fibre has one nucleus and one or more branches. The ends of the cells and there branches are in close contact with the ends & the branches of adjacent cells. These joints form intercalated discs. This gives the muscle the appearance of a sheet of muscle. A wave of contraction spreads from cell to cell across this disc & the cells do not require individual stimulation.

(d)

Differentiate between male and female pelvis.(3M)

	Male Pelvis	Female Pelvis
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)



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(e) **Give composition (1.5M) and functions of blood plasma.(1.5M for any three)**

Plasma-composition-

water-90-92%,

plasma proteins

inorganic salts

nutrients

waste material

hormones

gases.

Functions-

Plasma proteins:

albumin maintains the osmotic pressure of blood & also acts as carrier molecule for lipids & steroid hormones.

globulin immunoglobulin are produced by lymphocytes act as antibodies and is a part of immunity.& transports some hormones and mineral salts.

Fibrinogen is essential for blood clotting.

Inorganic salts They are involved in activities like muscle contraction, transmission of nerve impulses, formation of secretions & maintenance of acid base balance.

Nutrients monosaccharides, amino acids, fatty acid & glycerol used by the body cells for energy.

waste products urea, uric acid & creatinine are the waste products of protein metabolism. They are formed in the liver & sent to kidneys for excretion.



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metatarsophalangeal joints.

6.Saddle joint e.g. Joint between trapezium & first metacarpal bone.

(b)

What is NMJ?(1M) Explain physiology of neuromuscular transmission.(2M)

Neuromuscular junction: The Neuromuscular junction is the connection between a large myelinated nerve and skeletal muscle fibre. **OR** It is the physiological contact between somatic nerve ending & skeletal muscle fibre.

Physiology of neuromuscular junction: 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 neuro transmitter 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.

(c)

Differentiate between CNS & ANS.(1M) What is effect of parasympathetic stimulation on (i)Lachrymal glands (ii) Heart (2M)

CNS	ANS
It includes the brain and spinal cord.	It consists of motor nerves of cranial, thoracic, lumbar and sacral nerves.
receives information from all organs of the body and sends instructions to control their activities.	It controls involuntary functions like respiration, beating of heart, peristaltic movements of alimentary canal.



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Effect of parasympathetic stimulation on

(i) **Lachrymal glands:** Secretion of lachrymal fluid (tears) increases.

(ii) **Heart:** Rate and force of contraction of heart decreases. The coronary arteries constrict.

(d)

What is shock?(1M) Explain various types of shocks.(2M)

Shock occurs when the metabolic needs of the cell are not met with. There is reduction in the circulating blood volume, in the blood pressure & cardiac output.

Different types of shock are :

•**Hypovolemic shock:** When the blood volume reduces due to severe haemorrhage, vomiting diarrhea, or burns.

•**Cardiogenic shock:** Cardiac output is reduced due to damaged heart muscle e.g. myocardial infarction.

•**Septic shock:** Due to severe infection, the toxin is released into the circulation which causes severe vasodilatation or depression of myocardial muscle.

•**Neurogenic shock:** Due to sudden pain, emotional experience or spinal anesthesia. The reduced sympathetic activity or increased parasympathetic activity reduces the heart rate & cardiac output. Vasodilatation reduces the blood supply to the brain causing fainting.

•**Anaphylactic shock:** It is a severe allergic reaction to substances like penicillin, peanuts etc. release of histamine & bradykinin causes vasodilatation, & severe bronchoconstriction.

(e)

Classify,(1M) give normal count (1M)and functions of blood corpuscles (1M).

Blood corpuscles are classified into 3 types:

Red Blood Cells (Erythrocytes), White Blood Cells (Leukocytes). Platelets (Thrombocytes)

Normal RBC count: Male-4.5-6.5million/mm³ female-4.5-5million/mm³.

Normal WBC count: 4000-10,000/mm³



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Normal Platelet count : 2 – 3.5 lacs/mm³

Functions of blood corpuscles: (any One function of each type)

RBC:

1. Transport O₂ from lungs to tissues. & transport CO₂ from tissues to lungs.
2. Act as buffer by action of hemoglobin.
3. Help in determination of blood groups.

WBC:

Phagocytosis, destruction of bacteria, allergic reactions, development of antibodies.

Platelets: vascular spasm and blood clotting.

(f)

What do you mean by (1.5M each)

(i) **Renal calculi:** It means kidney stones. Developed when normal dissolved urinary constituents like calcium, oxalate, urate and phosphate are precipitated. (It is due to dehydration, pH of the urine, infection or metabolic conditions).

(ii) **Atherosclerosis:** It refers to the deposition of fats, cholesterol and other substances (plaques), in the tunica intima of mid-size and large artery, which can restrict blood flow due to narrowing or complete blocking of artery.

Attempt any FOUR of the following:

(a)

Define (1M each)

(i) **Hypertension:** Increase in the arterial blood pressure –systolic pressure above 140 mm of Hg &/or diastolic pressure above 90 mm of Hg is called as hypertension.

(ii) **Oedema:** Oedema is excess accumulation of tissue fluid causing swelling.

(iii) **Meningitis:** It is inflammation of the meninges, protective coverings of brain and spinal

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4×3=12

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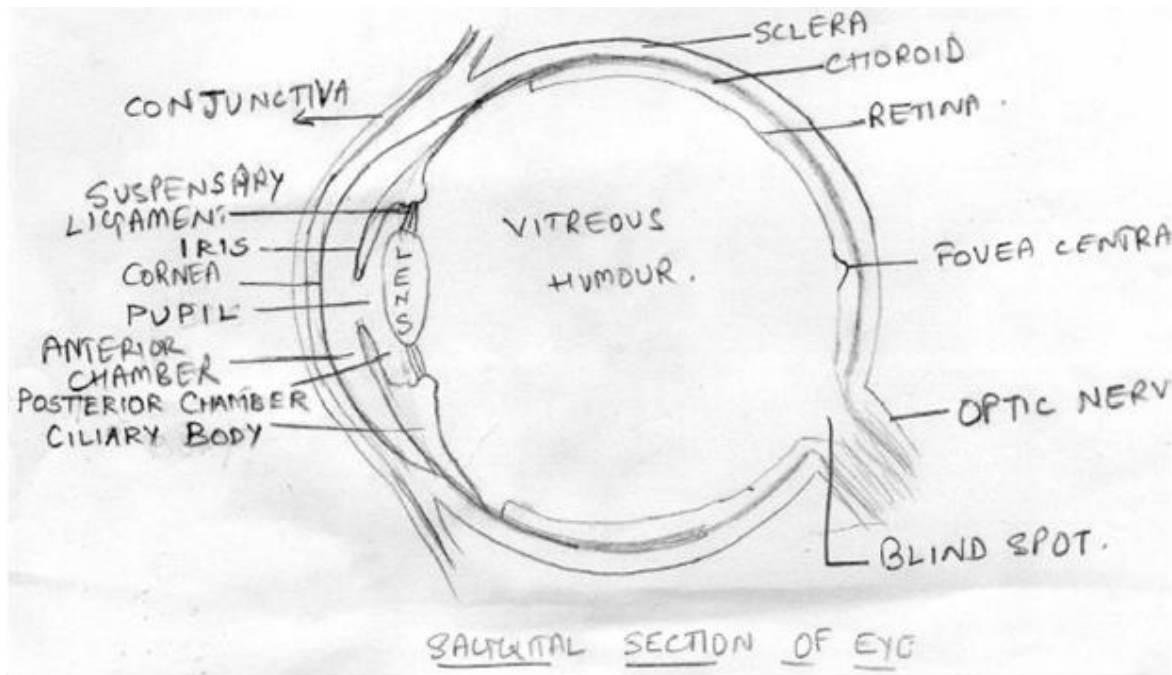
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cord.

(b)

Draw well labeled diagram showing saggital section of eye. (3M)



(c)

Classify bones based on their microscopic structure.(1M) List important functions of bones.(2M for any 4 functions)

On the basis of microscopic structure bones are classified into 2 types:

1. Compact bone
2. Spongy or cancellous bone

Functions –1. They form supporting framework for the body.

2. They give protection to delicate organs.

3. They form joints which are essential for the movement of the body.

4. They provide attachment for the voluntary muscles. This helps in the movement of joints.

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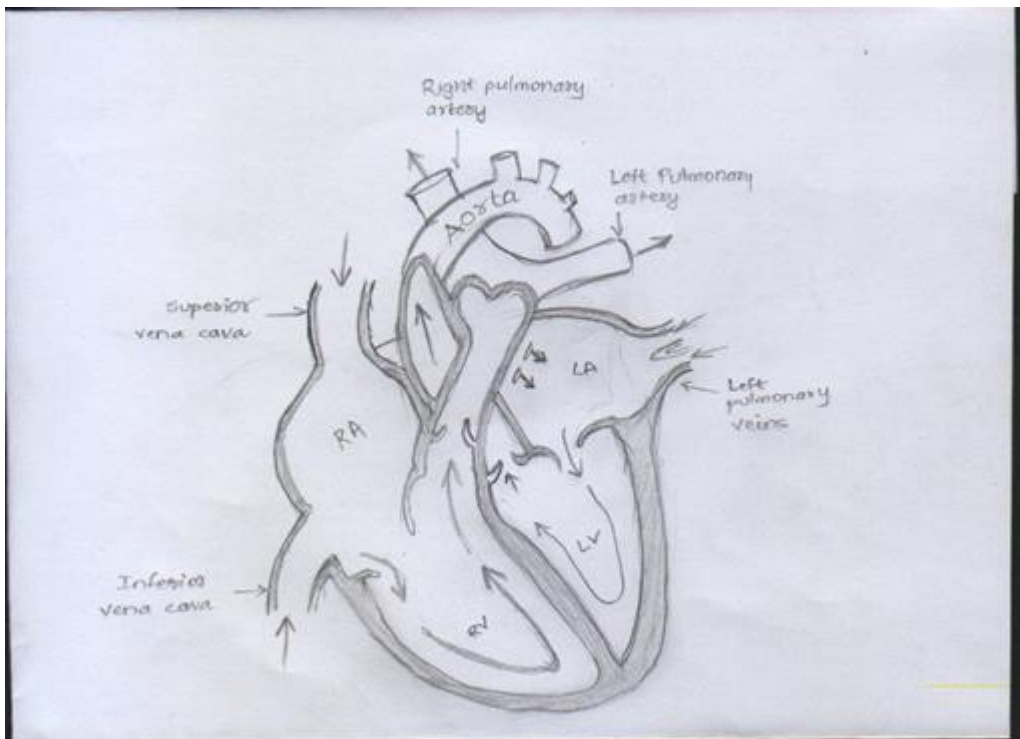
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(d)

5. They form blood cells in red bone marrow in cancellous bone.
6. They act as a storehouse of calcium salts.
7. They form boundaries for the cranial, thoracic and pelvic cavities.

With the help of suitable diagram(2M) explain circulation of blood through heart.(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.



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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.

(e) **Give functions of uterus,(1M for any two) fallopian tubes (1M for any two))and ovaries.(1M any two)**

Functions of uterus:

- 1.Uterus serve as part of pathway for sperm deposited in the vagina to reach uterine tubes
2. It is site of implantation of fertilized ovum.
3. It is site of development of the fetus, during 40 weeks of gestation.
4. It causes labour by contracting muscles of fundus & body cervix relaxes & dilates.
5. During reproductive cycles, when implantation does not occur, it is source of menstrual flow.

Functions of fallopian tubes:

1. Tube provide route for sperm to reach ovum, transport secondary oocyte and fertilized ova from ovaries to uterus.
2. Mucus secreted in tube provides nutrition for ovum.
3. Usually it is site for fertilization.

Functions of ovaries:

1. Maturation of the follicle is stimulated by FSH from anterior pituitary and estrogen is secreted by the follicle lining cells.



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5	<p>(f) 2. Ovulation is triggered by LH by anterior pituitary.</p> <p>3. After ovulation the follicle lining cells develop into corpus luteum (yellow body) under the influence of LH.</p> <p>4. The corpus luteum produces progesterone & some estrogen.</p> <p>What do you mean by motor,(0.5M) sensory (0.5M)and mixed nerves(0.5M)? Give one example of each.(0.5 for each)</p> <p>Motor nerve: It carries nerve impulse away from brain/spinal cord to the effector organ. E.g. Occulomotor nerve, Trochlear nerve, Abducent nerve, Accessory nerve and Hypoglossal nerve.</p> <p>Sensory nerve: It carries sensory input from the organs towards the brain or spinal cord. E.g. Olfactory nerve, Optic nerve, Vestibulocochlear nerve.</p> <p>Mixed nerve: It carries sensory input and motor output. E.g. Trigeminal nerve, Facial nerve , Glassopharyngeal nerve, Vagus nerve and all spinal nerves.</p> <p>Attempt any FOUR of the following:</p> <p>(a) Define blood pressure.(1M) Explain factors maintaining blood pressure.(2M)</p> <p>Blood pressure: It is the force or lateral pressure which the blood exerts on the wall of blood vessels.</p> <p>Factors maintaining blood pressure are as follows:</p> <p>The blood pressure is maintained by cardiovascular centre in medulla oblongata & Renin-angiotensin system in following way:</p> <p>1) cardiovascular centre in medulla oblongata</p> <ul style="list-style-type: none">• <u>Baroreceptor reflex:</u> A rise in blood pressure in the arteries stimulates baroreceptors, increasing their input to the cardiovascular centres (CVC). The CVC responds by	4×3=12
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increasing parasympathetic nerve to the heart; this slows the heart down. At the same time, sympathetic stimulation to the blood vessels is inhibited, causing vasodilation. The net result is a fall in systemic blood pressure. Conversely, if pressure within the aortic arch and carotid sinuses falls, the rate of baroreceptors discharge falls. The CVC responds by increasing sympathetic drive to the heart to speed it up. Sympathetic activity in blood vessels is also increased, leading to vasoconstriction. Both these measures counteract the falling blood pressure.

Chemoreceptors: Rising blood CO₂, falling blood O₂ levels and / or falling arterial blood pH when all these changes detected by the chemoreceptors, they

- send signals to the CVC, which then increases sympathetic drive to the heart and blood vessels, pushing the blood pressure up to improve tissue blood supply.
- High centres in the brain: Input to the CVC from the higher centres is influenced by emotional states such as fear, anxiety, pain and anger that may stimulate changes in blood pressure.

2 Renin-angiotensin system (RAS): Slower, longer lasting changes in blood pressure are effected by the Renin-angiotensin-aldosterone system (RAAS) and the action of antidiuretic hormone (ADH). Both of these systems regulate blood volume, thus influencing blood pressure. In addition, atrial natriuretic peptide (ANP) a hormone released by the heart itself, causes sodium and water loss from the kidney and reduces blood pressure, opposing the activity of both ADH and RAAS.

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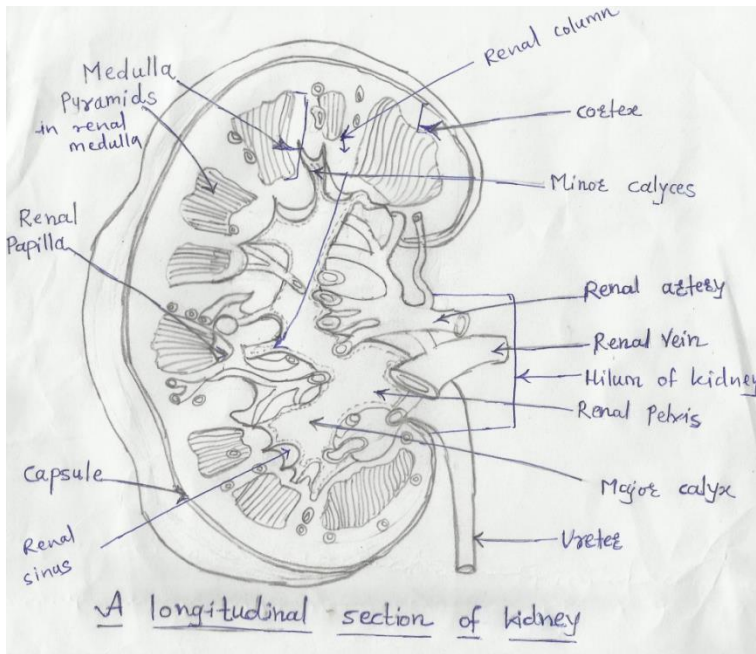
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- (b) **With the help of labelled diagram (2M) explain the microscopic structure of kidney.(1M)**
(As the question is not well defined, either of the following answer can be considered)

Diagram of Microscopic structure of kidney:



An outer fibrous capsule, surrounding the kidney .

Cortex : A reddish brown layer of tissue immediately below the capsule and outside the renal pyramids. The medulla the innermost layer consisting of conical shaped striations, the renal pyramids. The kidney consists of 1 million functional units the nephrons and much smaller no. of collecting tubules. The collecting tubules transport urine through the pyramids to the calyces giving pyramids its striated appearance. The collecting ducts are supported by connective tissue, containing blood vessels nerves & lymph vessels. **OR**

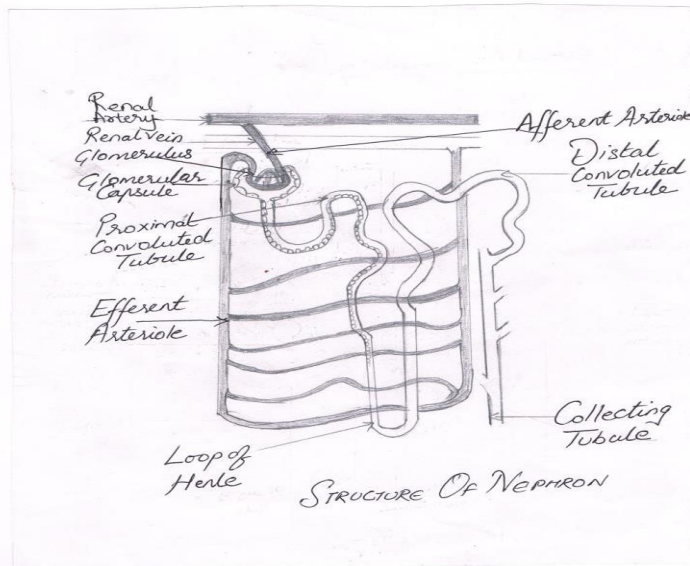
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Nephron: It is the functional unit of the kidney. Nephron consists of a long tube of which one end is closed and the other end opens into collecting tubule.

Each nephron consists of following parts:-

Malpighian body: It consists of 1) Bowman's capsule and

2) Renal glomerulus: Bowman's capsule is a balloon like hollow capsule, which begins in cortex. Renal glomerulus consists of compact tube of interconnected capillaries, formed by branching of afferent arterioles from renal artery. These capillaries reunite to form efferent arterioles which emerges out of glomerulus.

3) Renal tubule:- It is a long tube which is a continuity of Bowman's Capsule, connected by a narrow portion called neck. It is made up of single layer epithelial cells.

The renal tubule is described as:

i) Proximal convoluted tubule:- It is the first part of renal tubule and is convoluted, lined by large columnar cells & extends to medulla as loop of Henle.



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- ii) Henle's loop:- It is a hair pin like structure situated in medulla. Has descending and ascending loop, lined with columnar cells. Returns to cortex to become distal convoluted tubule.
- iii) Distal convoluted tubule:- It is lined with cuboidal cells and joins collecting tubule.
- iv) Collecting tubule:- Receives urine from distal tubule & lined with columnar cells.
- 4) Blood vessels:- Besides tubules, kidney consists of blood vessels, renal arteries-afferent and efferent arteriole which brings oxygenated blood and renal vein takes away blood from kidney.

(c)

What are taste buds?(1M) Explain physiology of taste.(2M)

Taste buds: Taste buds contain chemoreceptors (sensory receptors) that are found in the papillae of the tongue and widely distributed in the epithelia of the tongue. They consist of small sensory nerve endings of the glossopharyngeal, facial and vagus nerves (cranial nerves VII, IX and X). Some of the cells have hair-like cilia on their free border, projecting towards tiny pores in the epithelium.

Physiology of taste:

There are four fundamentals sensations of taste like sweet, sour, bitter and salt others are metallic, umami (a Japanese 'savoury' taste). However, perception varies widely and many tastes cannot be easily classified. The sensory receptors are highly sensitive and stimulated by very small amounts of chemicals that enter the pores dissolved in saliva. Nerve impulses are generated and conducted along the glassopharyngeal, facial and vagus nerves before synapsing in the medulla and thalamus. Their final destination is the taste area in the parietal lobe of the cerebral cortex where taste is perceived.

(d)

Mention the parts of alimentary tract.(1.5M) Give one function of each part.(1.5 M of any three parts)

Parts of alimentary tract:



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Mouth, pharynx, oesophagus, Stomach, Small intestine: Duodenum, Jejunum, ileum.

Large intestine: Caecum, Ascending, tranverse, descending, sigmoid colon , rectum and anal canal.

Functions of mouth: Chewing of food, formation of bolus & swallowing

Functions of pharynx Passage way for food from mouth to oesophagus.

oesophagus: Passage way for food from pharynx to stomach

Functions of stomach: Temporary storage of food . Mechanical breakdown & Chemical & digestion of food

Functions of small intestine: Completion of chemical digestion of carbohydrates, protein and fats in the enterocytes of the villi into monosaccharides, amino acids & fatty acids & glycerol & absorption.

Functions of large intestine, rectum and anal canal: Absorption of water, mineral salts, vitamins and some drugs. & defaecation

(e) **Give functions of cerebrum(1.5M) and medulla oblongata.(1.5M)**

Functions of cerebrum.

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.

Functions of medulla oblongata:

The vital centres consisting of group of cells associated with autonomic reflex activity lie in



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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 intercostal muscles which stimulate the contraction of diaphragm and intercostal muscles, thus initiating inspiration.

•**Vasomotor centre** – This controls the diameter of blood vessels especially small arteries and arterioles.

•**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.

(f)

Mention the bones forming:

(i) Cranium (1.5M)

(ii) Thoracic cage(1.5M)

(i) The bones forming cranium are:

frontal bone-1, parietal bones-2, temporal bones-2, occipital bone-1, sphenoid bone-1 and ethmoid bone-1.

(ii) The bones forming Thoracic cage are:

1. 12 Thoracic vertebrae
2. 12 pairs of ribs
3. 1 sternum or breast bone



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6	<p>(a) Attempt any FOUR of the following:</p> <p>Define 'blood clot'.(1M) Explain mechanism of blood clotting.(2M) Mention the factors affecting the same.(1M)</p> <p>Blood clot: When blood loses its fluidity & converts into semisolid mass.</p> <p>Mechanism of blood clotting: The thromboplastin (prothrombinase) released by damaged tissue cells by extrinsic or intrinsic pathway. In presence of calcium ions it converts prothrombin to thrombin. Thrombin acts on fibrinogen & converts it to insoluble fibrin. The fibrin mesh traps blood cells. <u>OR</u></p> <p>Prothrombin+ Calcium+ Thromboplastin → Thrombin</p> <p>(inactive) (from damaged tissue) (active)</p> <p>Thrombin acts on</p> <p>↓</p> <p>Fibrinogen → Fibrin</p> <p>(soluble) (insoluble)</p> <p>Fibrin+ Blood Cells → Clot</p> <p>factors which affect the clotting of blood:</p> <p>a) Physiological : during menstruation & parturition clotting time is reduced.</p> <p>b) Pathological increase in clotting time occur in haemophilia, liver disease, afibrinogenemia, vitamin K deficiency, Christmas disease</p> <p>(b) Enlist and discuss different functions of kidney.(4M)</p> <ol style="list-style-type: none">1. Formation of urine2. Maintenance of acid base balance	4×4=16
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3. Maintenance of electrolyte balance
4. Maintenance of blood pressure
5. Maintenance of water Balance
6. Formation of erythropoietin hormone for erythropoiesis

Functions of kidney are:

1. **Formation of urine:** Kidneys form the urine, which passes to the ureters to the bladder for storage prior to excretion. Formation of urine involves three processes like filtration, selective reabsorption, and tubular secretion. The urine is nothing but waste product of the body which is produced during metabolic activity. The waste products are urea, uric acid and creatinine.
2. **Maintenance of acid base balance:** In order to maintain the normal blood pH (acid-base balance), the cells of the proximal convoluted tubules secrete hydrogen ions. In the filtrate they combine with buffers.
3. **Maintenance of electrolyte balance:** Changes in the concentration of electrolytes in the body fluids may be due to changes in the body water content, or electrolyte levels. The balance between water and electrolyte concentration is maintained by several mechanisms like sodium and potassium balance, renin-angiotensin-aldosterone system and by calcium balance etc.
4. **Maintenance of blood pressure:** Kidney regulates blood volume by long term control, and maintains blood pressure by 'Renin-angiotensin-aldosterone system.
5. **Maintenance of water Balance:** The balance between the fluid intake and output is controlled by the kidneys. The minimum urinary output, i.e. the smallest volume required to excrete body waste products, is about 500 ml per day. Urinary volume in excess of this is controlled mainly by antidiuretic hormone (ADH) released into the blood by the posterior lobe of the pituitary gland. The posterior pituitary is closely related to the hypothalamus in the brain.



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(c)

6. Formation of erythropoietin hormone for erythropoiesis: Red cell numbers remain fairly constant, because the bone marrow produces erythrocytes at the rate at which they are destroyed. This is due to a homeostatic negative feedback mechanism. The hormones that regulates red blood cells is erythropoietin, produced mainly by the kidney.

Define hormones.(0.5M) Enlist any three endocrine glands(1.5M) and give their secretions.(2M)

Hormones –The secretion of by endocrine gland are known as hormone.

Endocrine glands and give their secretions

1)Pituitary gland

Anterior lobe: Growth hormone (G.H.),Adrenocorticotrophic hormone (A.C.T.H.),

Gonadotrophic hormones: (i) Follicle stimulating hormone (F.S.H.) ,(ii) Luteinising hormone (L.H.), Lactogenic hormone (Prolactin), Thyroid stimulating hormone(TSH)

Posterior lobe: Oxytocin, Antidiuretic hormone (Vasopressin) (A.D.H.)

2) Thyroid gland Thyroxine, Tri-iodothyronine, Thyrocalcitonin

3) Parathyroid glands Parathormone

4) Pancreas (islets of Langerhans). Insulin, Glucagon, somatostatin

5) Adrenal glands

Adrenal cortex Glucocorticoids mainly Hydrocortisone, Corticosterone

Mineralocorticoids mainly Aldosterone

Sex hormones Androgens

Adrenal medulla Adrenaline, Noradrenaline



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(d)

6) **Pineal gland** Melatonin

7) **Testis** Testosterone

8) **Ovary** Estrogen, progesterone

Define Digestion.(1M) Explain chemical digestion of food.(3M)

Digestion: The conversion of complex food into simple form so that it is easily absorbed in the blood is described as digestion.

Chemical digestion of Carbohydrate (polysaccharides)- The saliva contains enzyme amylase which acts on the Cooked starch & reduces them to disaccharides maltose. When the acid chyme from stomach passes into the small intestine, it is mixed with pancreatic juice (P^H- 8) which contains amylase. At this PH amylase act most effectively. The carbohydrate gets converted to disaccharide. The disac. get converted to monosac with brush border enzymes. i.e. Sucrose → Glucose + Fructose with Sucrase, Maltose → Glucose + Glucose with Maltase & Lactose → Glucose + Galactose with Lactase

Chemical digestion of protein: Protein digestion starts in the stomach. Pepsinogen an inactive enzyme in gastric juice is activated to pepsin by HCl, This digests protein to polypeptide. When the acid chyme passes into the small intestine, it is mixed with pancreatic juice. Pancreatic juice, contains inactive enzymes- trypsinogen, chymotrypsinogen procarboxypeptidase. Enterokinase activates them to trypsin & chymotrypsin. These convert polypeptides to dipeptides tripeptides & amino acids.

Chemical digestion of fats. When the acid chyme from stomach passes into the small intestine, it is mixed with pancreatic juice and bile juice. Bile salts of bile juice emulsify the fats. Pancreatic juice (P^H- 8). contains Lipase. At this PH lipase act most effectively converts fats to fatty acid & glycerol.

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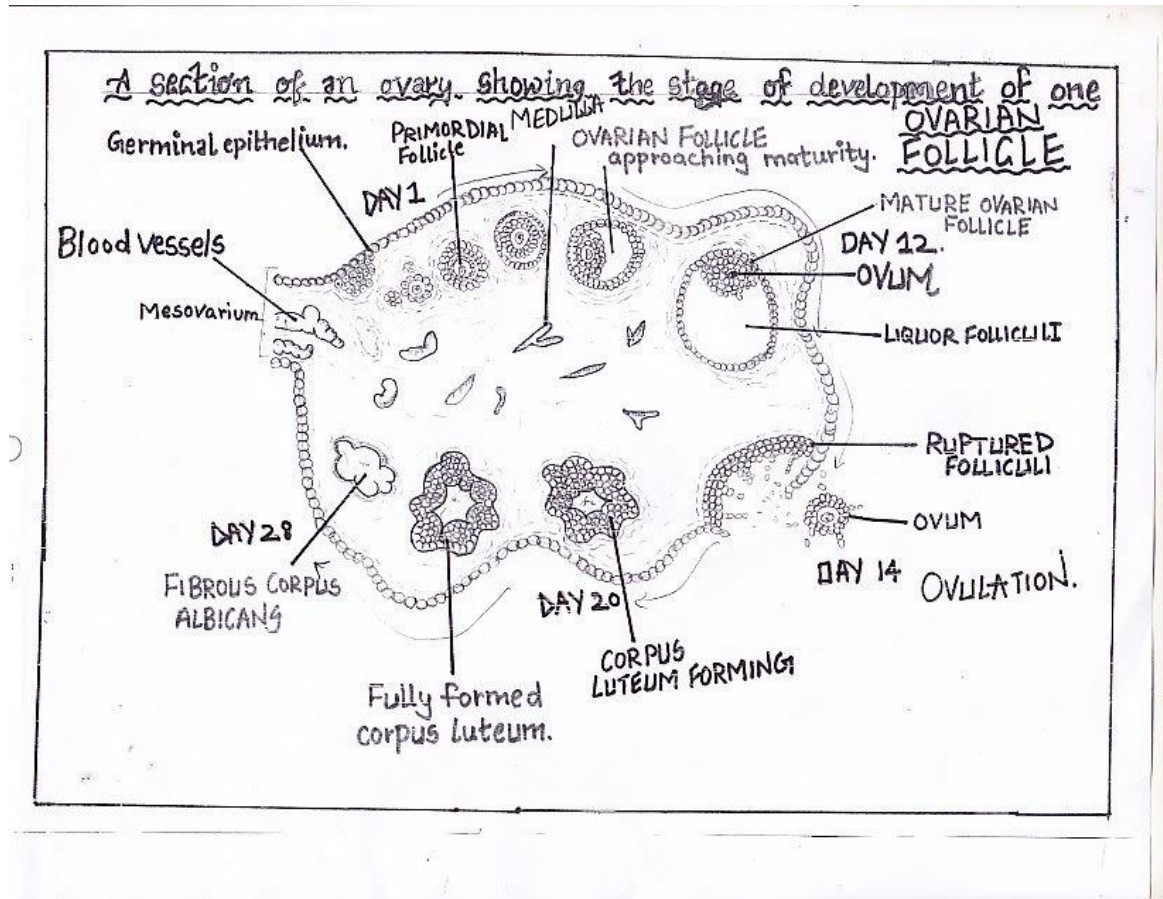
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(e) Draw (2M) and describe microscopic structure of ovary.(2M)

Diagram of microscopic structure of ovary:



Structure

The germinal epithelium is the outer layer of simple epithelium that covers the surface of ovary & is continuous with mesothelium that covers mesovarium

The tunica albugenia it is the capsule below germinal epithelium

Cortex-it surrounds the medulla.It contains ovarian follicles in various stages of maturity each contain an ovum. Before puberty it contains immature follicles(primordial follicles), which the female has from birth.During the childbearing years, (after puberty), one ovarian follicle matures (Graafian follicle) & ruptures & releases ovum in to the peritoneal cavity. . & occurs



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during each menstrual cycle. The ruptured follicle develops into the corpus luteum which in turn becomes corpus albicans.

Medulla It lies in the center & consists of fibrous tissues, blood vessels & nerves

(f)

Give composition (1M each) and function of (1M each for any two functions):

(i) CSF

(ii) Semen

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

Functions:

- 1) It supports and protects the brain and spinal cord.
- 2) It maintains a uniform pressure around these delicate structures.
- 3) It acts as a cushion and shock absorber between the brain & the skull.
- 4) 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.

(ii) Semen:

Composition of semen: Semen is the fluid ejaculated during intercourse from urethra. It consists of:

1. Spermatozoa 10%
2. A viscid fluid secreted by seminal vesicle 50-60%
3. A thin lubricating fluid produced by prostate gland 20-30%
4. Mucus



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Functions of Semen:

1. Increase motility and fertility of spermatozoa.
2. Semen is slightly alkaline, to neutralize the acidity of vagina.
3. It contains a clotting enzyme, which the semen in the vagina, increasing the likelihood of semen being retained close to the cervix.
4. It contains nutrients to nourish and support the sperm during their journey through the female reproductive tract.