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.

Q. 1. Attempt Any Ten Of The Following. **(20)**

a) Define cell and tissue(01 mark for each)

Ans: 1**.Cell**: The basic structural and functional unit of any living thing. Each cell is a small container of chemicals and water wrapped in a membrane.

2. **Tissue: A** group of cells having the same origin ,similar shape and specific or common generalized function is known as tissue.

b) Name blood groups of ABO system. (1/2 mark for each group)

Ans: 1)Group A it contains A aggultinogen and b agglutinin

2) Group B it contains B aggultinogen and a agglutinin

3) Group AB it contains AB aggultinogen and no agglutinin

4) Group O it contains no aggultinogen and a and b agglutinin

c) What are functions of mitochondria and Golgi bodies..(01 mark for each function)

Ans: 1) **Mitochondria** :These structures are described as "the powerhouse of the cell" because they generate most of the cell's supply of adenosine triphosphate (ATP), used as a source of chemical energy. In addition to supplying cellular energy, mitochondria are involved in other tasks, such as signaling, cellular differentiation, and cell death, as well as maintaining control of the cell cycle and cell growth

2) **Golgi bodies:** It is of particular importance in processing proteins for secretion, containing a set of glycosylationenzymes that attach various sugar monomers to proteins as the proteins move through the apparatus.

d) Define pulse. (02 mark)

Ans: Pulse is a rhythmic beating in the arteries caused by the beating of the heart. An example of a pulse is the throbbing beat heard at the wrist. Pulse rate: 60 to 100 bits /min.

e) Name the part of respiratory tract. (Any four & 1/2 mark for each.)

Ans: 1.Nasal cavity

2. Pharynx

3. Layrnx

4. Trachea

5. Bronchi

6. Bronchioles

7. Alvoli

f) Define Respiratory rate and Tidal volume? (01 Mark for each)

Ans: Respiratory rate: The number of breaths per minute or, more formally, the number of movements indicative of inspiration and expiration per unit time.

Tidal volume: The volume of air that is inspired or expired in a single breath during regular breathing.

g) Composition of saliva. (02 Mark)

Ans: Saliva is a watery substance located in the mouths of animals, secreted by the salivary glands. Human saliva is 99.5% water, while the other 0.5% consists of electrolytes, mucus, glycoproteins, enzymes, antibacterial, and bacteria compounds such as secretory IgA and lysozyme. The enzymes found in saliva are essential in beginning the process of digestion of dietary starches and fats.

h) Name different organs of excretion (1/2 marks for each organ)

Ans: Human excretion is the process of removing excess water, waste material and harmful substances from human body. The organs involved in human excretion are listed below.

1**.Skin:** It removes excess water, salt ans some other substances from the body. It also removes excess heat from the body.

2 **Lungs:** These remove carbon dioxide and some moisture from the body.

3.**Kidneys**: It removes many different waste material and harmful substances. Main of these are urea and salt.

4.**Lower intestinal tract**: It gets rid of waste products of digestion.

i) Describe morphology of sperm. (02 Mark)

Ans : The term morphology refers to the form and structure of an object or thing. Sperm morphology is the term used to describe the appearance (size and shape) of sperm. Morphologically normal human sperm will have a smooth, oval shaped head with a long tail attached at the distal aspect of the head. Sperm is described as normal if it has an oval-shaped head that is 5 to 6 micrometers long and about 3 micrometers wide with a well-defined acrosome (cap) covering 40 to 70 percent of the head. There should be no visible vacuoles in the head, midpiece or tail, and no cytoplasmic droplets larger than half the size of the sperm head.

j) Name special sense organs? (Any four, 1/2 mark for each organ)

Ans: 1. eyes.

2. Ears.

3. Tongue.

4. Skin,.

5. Nose.

k) Define endocrine gland. Name any two glands. (Define-01 Mark, Name-01 Mark)

Ans: Endocrine gland: Endocrine glands are glands of the endocrine system that secrete their products, hormones, directly into the blood rather than through a duct. Name any two glands:

1. Pineal gland

2. Pituitary gland

3. Pancreas,

4. Ovaries,

5. Testes,

6. Thyroid gland

7. Parathyroid gland,

8. Hypothalamus and

9. Adrenal glands.

l) Function of Eye. (01 mark for each function)

Ans: Eye is the organ of vision or sight its function is to focus image on retina where retina is composed of nervous tissues which refers signals generated by light to the brain its vision centre. The sclera, or white part of the eye, protects the eyeball

m) Name sesamoid bones. . (1/2 mark for each bones)

Ans: 1) Knee

2) Hand

3) Wrist

4) Foot

5) Neck

6) Ear.

n) What is the function of gall bladder? (Any two, 01 Mark for each function)

Ans: 1) Its primary function is to store and concentrate bile, a yellow-brown digestive enzyme produced by the liver.

2) The gallbladder serves as a reservoir for bile while it's not being used for digestion.

Q. 2. Attempt any four of the following. **16 Marks**

a) What are functions of ADH? (Any 04 Functions, 04 Mark)

Ans:- ADH is produced in the hypothalamus and stored in the pituitary gland.

Functions

1) It's released from there into the bloodstream and affects how the kidneys work by letting them know how much water they need to keep in or get out of your
2) body.

2) ADH is also called arginine vasopressin. It is a water-regulating hormone made by the hypothalamus (in the brain), and s

tored in the posterior pituitary gland.

3) ADH is the chemical that tells the kidneys how much water to conserve

.4) ADH constantly regulates and balances the amount of water in the blood.

5) ADH constrict blood vessels

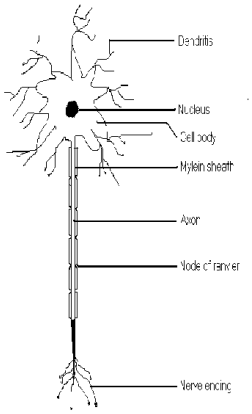
. 6) ADH also increases peripheral vascular resistance, which in turn increases arterial blood pressure.

7) It plays a key role in homeostasis, by the regulation of water, glucose, and salts in the blood.

8) some ADH may also be released directly into the brain, and accumulating evidence suggests it plays an important role in social behavior, sexual motivation and pair bonding, and maternal responses to stress

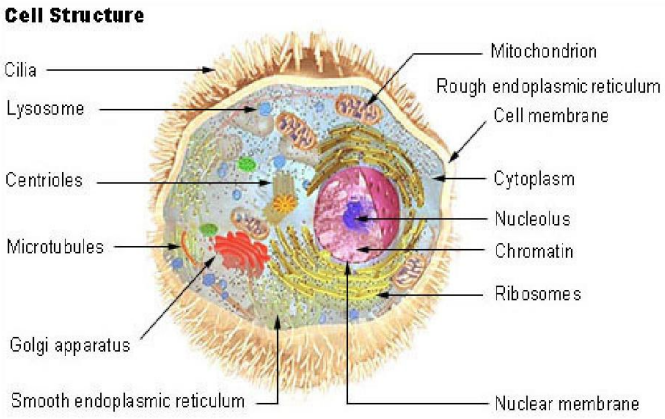
b) Describe structure of nerve cell. **4**

Ans: Neurons is a basic unit of nervous system. It has large cell body and size is varying according to the position and function. Each cell has clearly defined nucleus and protoplasm. The cell has several process called dendrites and axons. Dendrites are short branches through which impulses are enters to the cell. Axons are cylindrical single part or fiber through which impulses are passes out of cell. Axons are measuring about few millimeters to meters centimeters and continuous to the termination of cell.



c) Draw a diagram of cell. (04 marks for diagram)

Ans:



d) What are functions of blood? (Any four function. 01 mark for each)

Ans: 1) It transports oxygen and nutrients to various tissues,

2) It transports waste products to organs of excretion.

3) It carries harmons from endocrine glands to various tissues.

4) It redistributes water from one part of body to the other.

5) It contains antibodies and white blood cells which protects the body from diseases.

6) Clotting of blood protects against hemorrhage.

e) Describe valves of heart and their function (01 Marks each)

Ans: - The four valves of the heart are given below

1) Tricuspid valve: This valve is located between the right atrium and the right ventricle.
Function:i) Closes off the upper right chamber (or atrium) that holds blood coming in from the body.

ii) Opens to allow blood to flow from the top right chamber to the lower right chamber (or from right atrium to right ventricle).

iii) Prevents the back flow of blood from the ventricle to the atrium when blood is pumped out of the ventricle.

2) Pulmonary valve: The pulmonary valve is located between the right ventricle and the pulmonary artery.

Function: i) Closes off the lower right chamber (or right ventricle)

ii) Opens to allow blood to be pumped from the heart to the lungs (through the pulmonary artery) where it will receive oxygen.

3) **Mitral valve**: This valve is located between the left atrium and the left ventricle.

Function: i) Closes off the upper left chamber (or left atrium) collecting the oxygen-rich blood coming in from the lungs.

ii) Opens to allow blood to pass from the upper left side to the lower left side (or from the left atrium to the left ventricle).

4**) Aortic valve**: The aortic valve is located between the left ventricle and the aorta.

Function: i) closes off the lower left chamber that holds the oxygen-rich blood before it is pumped out to the body.

ii) Opens to allow blood to leave the heart (from the left ventricle to the aorta and on to the body).

f) Describe anatomy of lungs (04 marks for anatomy)

Ans: The lungs are located in the chest on either side of the heart in the rib cage. They are conical in shape with a narrow apex at the top and a broad base that rests on the diaphragm. They stretch from close to the backbone in the rib cage to the front of the chest and downwards from the lower part of the trachea to the diaphragm. The left lung shares space with the heart, with an angular notch in its anterior border called the cardiac notch. In addition, on the meditational surface of each lung there is a concavity called the cardiac impression at the level of the heart. The cardiac impression on the left lung is wider and deeper than that of the right lung. Because of this, and the cardiac notch, the right lung is larger in volume, total capacity and weight.

The lungs are surrounded by the pulmonary pleurae. The pleurae are two serous membranes; the outer parietal pleura lines the inner wall of the rib cage and the inner visceral pleura directly lines the surface of the lungs. Between the pleurae is a potential space called the pleural cavity containing pleural fluid. Each lung is divided into lobes by the invaginations of the pleura as fissures. The fissures are double folds of pleura that section the lungs. These sections help in the expansion of the lungs.

The lobes of the lungs are further divided into bronchopulmonary segments based on the locations of bronchioles. Segments for the left and right lung are shown in the table.[4]The segmental anatomy is useful clinically for localizing disease processes in the lungs.

Q. 3. Attempt any FOUR of the following **16**

a) Describe anatomy of kidneys

Marks – Description – 2 marks, Figure- 2 marks

These are bean shaped organs located on posterior abdominal walls, one on each side of vertebral column behind peritoneal covering at the level of 12th thoracic vertebrae to lumbar 3rd vertebrae (T12- L3). Right kidney is slightly lower than left kidney.

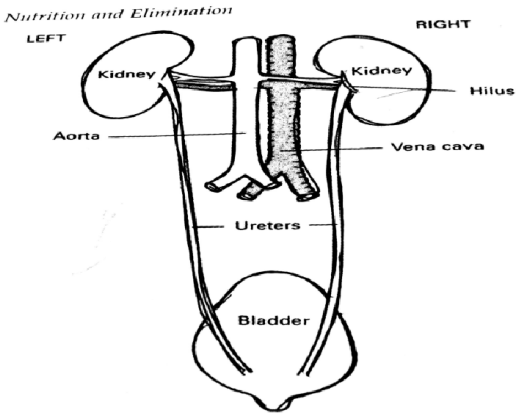


Fig. 24.3 The urinary system, viewed from the back.

Each kidney is measuring about 11 cm thick, 6 cm wide, 3 cm thick covered by renal capsule and embedded in fat called renal fat. Kidney has two ends, two borders, and two surfaces. Ends are also called as poles Upper and Lower. Upper pole is wider, locating suprarenal or adrenal glands on both kidneys. Lower poles are narrower and free.It has two borders Medial and lateral, Medial border is concave shows depression at its middle where it shows different structures either passes inside or outside the kidney i.e. Hilum of kidney (Hilus of kidney). Lateral border is convex no structures are passes inside or outside the kidney.It has two surfaces Anterior and Posterior, Anterior surface is rough or uneven because of its relation of different visceral relations. And Posterior surface is rested on posterior abdominal wall and its muscles shows flat and smooth nature.Kidneys are enclosed in capsule of fibrous tissues which can easily strip off. In vertical section of kidney it has two distinct part outer thick and dark part called cortex and inner paler part called medulla. This leads to collecting space called renal pelvis.

b) Describe anatomy of male reproductive system. 4

Ans:-Male reproductive system consist of male genital organs as follows

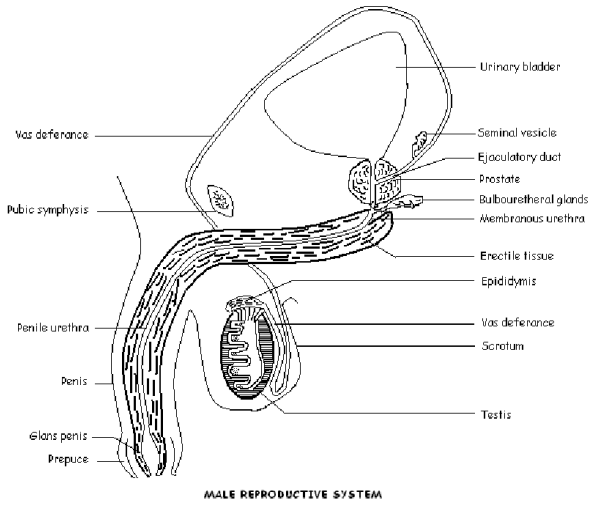
a) **Testis and epididymis**
b) **Deferent duct**
c) **Seminal vesicles**
d) **Ejaculatory duct & Penis**
e) **Prostate**
f) **Bulbouretral glands**

a) Testis –

These are reproductive glands in male suspended in scrotum by spermatic cord. They develops in abdomen and gradually descends down in scrotum before birth. In some cases it is undescended and required to locate them by surgery.

Testes are covered by pouch of peritoneum called tunica vaginalis. This pouch is obliterated, if it is not obliterated it forms possible site of hernia causes to form inguinal hernia.

Testis consist of 200 -300 lobule each contains convoluted tubules called convoluted seminiferous tubule. They help to develops spermatozoa by its epithelial lining. Tubules are supported by connective tissue which contains group of interstitial cells which secrets Testesterone hormone.



MALE REPRODUCTIVE SYSTEM

a) Epididymis –

It is a fine tightly coiled tube located and attached to back of testis. Seminiferous tubule of testis opens in to it and leads to deferent duct.

b) Deferent duct –

It is a continuation of epididymis (Tail of epididymis) passes through inguinal canal runs between base of urinary bladder and return to join duct of seminal vesicle at the base of prostate gland.

c) Seminal vesicle –

This is the gland located at the base of bladder and rectum. It secrets alkaline fluid containing nourishment which forms a large part of seminal fluid.

d) Ejaculatory duct –

It is formed by union of deferent duct and seminal vesicles. It ends at the opening of prostate utricle on posterior wall of urethra in prostate gland.

e) Penis –

It is tubular organ supplied by large venous sinuses which can fill to causes erection of penis. It passes urethra. At the tip there is enlargement called glans penis. Glans is covered by loose double fold of skin called prepuce or foreskin. It should be possible to draw foreskin back over glans penis but sometimes opening is too small known as phimosis and treated by circumcision i.e. cutting away foreskin in most severe cases.

f) Prostate –

These glands situated around urethra at the neck of urinary bladder. It is a gland of chestnut size and contains opening of ejaculatory duct. It opens to secrete semen (fluid) which provides nourishment to sperm by its alkaline nature.

g) Bulbourethral gland –

These are situated on each side of membranous part of urethra. Its duct opens in to spongy part of urethra. It secrets substance which forms part of seminal fluid.

c)Name the hormones of suprarenal gland and state their functions.
(Marks – Description including functions – 4 marks)

Ans: Adrenal glands are also known as suprarenal gland. It lies over upper pole of each kidney. Each gland consists of two types of endocrinal parts called cortex and medulla.

A] Cortex- It is again subdivided in to three zones

a) Outer zone – this produces Mineralocorticoids

b) Central zone – this produces Glucocorticoids

c) Inner zone – this produces sex hormone

a) Outer zone – Mineralocorticoids -

This hormone related with electrolyte metabolism. Aldesterone is a main mineralocorticoid which has regulatory effect on concentration of minerals in body fluid particularly sodium and potassium.Deficiency of hormone leads to increase excretion of sodium and chloride ions resulted to lowering of Ph (Acidosis).

b) Middle zone - Glucocorticoids –

These are carbohydrate metabolism. They increase the conversion of protein to glycogen for storage by liver, decrease utilization of glucose by cells leads to increase blood sugar level. High level of glucocorticoids leads to formation of ulcer, increase blood pressure and lowering of body resistance.

c) Inner zone – sex hormone –

Androgens are male hormone and oestrogens are female hormone. They are mainly responsible for development of reproductive organs. Physical and mental temperamental characteristic of male and females. Secretion of this hormone produces secondary masculine characteristic like growth of hairs on face and deepening of voice etc.Under secretion of cortical hormone leads to form "Addison's disease" characterised by anaemia, muscular weakness, low blood pressure, low blood sugar level.Over secretion of this hormone leads "Cushing syndrome" mainly because of over secretion of glucocorticoids characterised by excessive fat on trunk and face but not on limbs. Sodium retention so forming oedema and increased plasma volume and raised PH (Alkalosis).

B] Medulla – It secrets adrenalin and noradrenalin

a) Adrenalin – It increases strength and rat of heart beat causes dilatation of arteries supplying to heart and skeleton muscles but constriction of other arteries increase rate and depth respiration increase blood sugar level by promoting breakdown of liver glycogen and stimulates metabolic activities of cells

b) Noradrenalin –It has a similar effect to adrenalin.

d) Give composition and functions of pancreatic juice.

(Marks – Composition – 2 Marks, Functions – 2 Marks)

Ans:Composition of Pancreatic Juice

Pancreatic juice consists of:
1)Water
2)Mineral salts
3)Enzymes
i)Amylase
ii)Lipase
4)Inactive enzyme precursors:
i)Trypsinogen
ii)Chymotrypsinogen
iii)Procarboxypeptidase

Functions of Pancreatic Juice

Various function of Pancreatic juice are:

1) **Digestion of Proteins:** Enteropeptidase converts Trypsinogen and chymotrypsinogen into the active proteolytic enzymes trypsin and chymotrypsin. These activated enzymes convert polypeptides to tripeptides, dipeptides and amino acids

2) **Digestion of Carbohydrates:** Pancreatic amylase helps in the conversion of digestible polysaccharides (starch) not acted upon by salivary amylase to disaccharides.

3) **Digestion of Fats:** Bile salts help lipase in conversion of fats to fatty acids and glycerol. They do so by decreasing the size of the globules resulting in increased surface area.

e) Describe Rh system.

(Description – 4 Marks)

Blood groups are of four types with their rhesus factor A, B, AB and O with Rhesus factor Positive or Negative i.e. Rh + ve or Rh – ve. On different mixing of blood groups during transfusion clumping and sticky nature formed in blood because of agglutination. Which leads to obstruction to the blood vessel occurs resulted to damage of kidneys.Blood groups are named according to the presence of agglutinogenswhich are present in the red blood cells. There are two agglutinogens are called A and B. If A is present blood group is called **Group A**. If B is present blood group is called **Group B**. If both A and B are present blood group is called **Group AB** and If both are absent blood group is called **Group O.**When a sample of blood of donors mixed with sample of blood of recipient agglutination is formed if blood groups are from different groups this is because of plasma contain substance agglutinin which causes agglutination because of incompatibility of blood groups. Agglutinins are called Anti - A and Anti – B. Plasma contains all agglutinins which will not affect its own red cells. Therefore plasma of group A contains anti – B Agglutinins, Plasma of group B contains anti – A agglutinins, plasma of group AB contains no agglutinins and plasma of group O contains both anti – A and anti – B agglutinins.

Recipient →

Donor ↓

Blood Groups	A	B	AB	O
A	√	×	√	×
B	×	√	√	×
AB	×	×	√	×
O	√	√	√	√

Rhesus factor

In addition to ABO grouping there is additional factor is present in about 85% of cases, it is an agglutinogen called Rhesus factor. Those posses it are called Rhesus + ve (Rh +ve) and remaining 15% are called Rhesus – ve(Rh – ve).If a Rh-ve person receives a blood of Rh +ve donor the agglutinogen stimulates the production of anti Rh agglutinins called anti D. If a second Rh + ve transfusion were given later the transfused cells would be agglutinated and destroyedwith serious or fatal damage to the receipient. This factor also can cause difficulty during pregnancy if Rh –ve mother carrying Rh+ve fetus the mother may begin to produce anti Rh agglutinins which may destroy baby's red cells. Baby may require exchange transfusion.

f) How hearing takes place?
(Marks – Description – 4 Marks)

Ans:-Human ear is stimulated on producing sound waves at the rate of 30 and 30000/ seconds and sound waves travels at speed of 340 meter/ second. Sound waves are generally carried by air but also pass through solid and liquid. Sound waves are generally passes rapidly through solid. Hearing process is conducted by conducted by collection of sound waves which leads to the vibration of tympanic membrane when waves pass through external acoustic meatus which sets the ossicles (Ear ossicles carry the vibrations received by tympanic membrane to the internal ear) and fenestra vestibule. Vibrating causes vibration of perilymph causes vibrations of endolymph which stimulates nerve endings of vestibulocochlear nerve and this nerve carries stimulus at the centre of hearing located in temporal lobe of brain where it is appreciated or interpreted.Appreciation brought stimulus through auditory nerve to the centre of hearing but identification depends on previous experience and power of reasoning.

Q. 4.Attempt any FOUR of the following **16**

a) How will you estimate Haemoglobin by Sahlis method?

(Procedure of estimation -4 Marks)

Ans: Requirement- Sahlis haemometer (Haemoglobinometer) Hb pipette, Graduated squre tube, Stirrors needle, Lancet, Dropper, Cotton.

Reagent- N/10 Hcl, D/w.

Specimen- Free flowing capillary blood or venous blood added to suitable anticoagulants.

Procedure- Take N/10 HCL up to Lowar 2 marks in the graduated square tube. Obtained drop of blood draw in to Sahlis pipette exactly up to 20 cumm mark blow the content of pipette in to HCl in the square tube & rince the pipette with the Same HCL 2-3 time mix & wait for 10 min. insert Hb Square tube in the Comparator box. Add D/w drop & stirr with glass rod. Compare the colour of mixture with the standered colour code of Comparator box & read the result in gm% with lower meniscus when colour exactly matches with the standered colour bar.

Normal Value

In Male- 13 to 15 gms%

In Female- 12 to 14.5 gms%

In Infants- 18 to 22 gms%

Decrease in Hb value below narmal level is called as Oligochromemia.

Increase in Hb value above the narmal level is called as Hyper-chromemia.

Haemoglobinemia is the presence of free Hb in Blood Plasma

b) Which factors affects blood pressure.
(Each factor 1 Mark)

Ans:-Blood pressure is the force of blood against the walls of the arteries as the heart pumps blood throughout the body. Many factors affect blood pressure, causing it to change from day to day and throughout the day..

Exercise

Regular exercise, along with an active lifestyle, may decrease blood pressure. To significantly reduce the risk of developing high blood pressure,.

Nutrition

It is low in cholesterol and saturated fat, high in dietary fiber, potassium, calcium and magnesium and moderately high in protein.

Alcohol

Alcohol is a drug, and regular over-consumption can raise blood pressure dramatically, as well as cause an elevation upon withdrawal.

Stress

The effects of stress can vary, but long-term, chronic stress appears to raise blood pressure.

Smoking

Smoking is the third leading cause of death in the United States. Smoking causes peripheral vascular disease (narrowing of the vessels that carry blood to the legs and arms), as well as hardening of the arteries. These conditions clearly can lead to heart disease and stroke and are contributing factors in high blood pressure.

c) What happens in hyperactivity of thyroid gland?(04 marks)

Ans:-Hyperthyroidism is a disorder in which your thyroid gland makes and releases more thyroid hormone than your body needs. Your doctor may say you have an "overactive thyroid," or refer to the condition as "overactive thyroid disease."Symptoms of hyperthyroidism may be vague and can often mimic other illnesses and conditions. Thyroid enlargement, called a goiter. Other symptoms of hyperthyroidism include:

- Anxiety, nervousness, and irritability
- Frequent, loose bowel movements
- Difficulty sleeping
- Double vision
- Eyes that bulge out, or "protrude" (in patients with Graves' disease)
- Hair changes, including brittle hair, thinning hair, and hair loss from scalp
- Irregular heart beat (arrhythmia), especially in older adults
- Menstrual cycle changes, including lighter bleeding and less frequent periods
- Muscle weakness, especially in the thighs and upper arms
- Rapid fingernail growth
- Rapid heartbeat, usually over 100 beats per minute
- Shaky hands
- Sweating
- Thinning skin
- Weight loss despite increased appetite

d) Describe mechanism of respiration. 4

Ans:-Respiration consist of two process

a) Inspiration

b) Expiration

a) Inspiration – This belongs to taking air inside which leads to expansion of size of lungs and Chest wall, these changes are occurs by action given by muscles of thoracic cage During inspiration muscles covering thoracic cage and intercostals muscle are relaxed, at the same time diaphragm flattened and lower downs with relaxation of abdominal muscle

b) Expiration – During expiration opposite actions are conducted, in which abdominal muscle are contracted with diaphragm comes to its normal dome shaped form , corresponding actions are conducted of contraction of intercostals muscle & muscles of thoracic cage to help expellation of air outside.Respiration centre is located in medulla oblongata, process and impulses are carried by Glossopharyngeal & Vagus nerve

e) Describe process of circulation. 4

Ans:-Right Side: Blood enters the heart through two large veins, the inferior and superior vena cava, emptying oxygen-poor blood from the body into the right atrium.

Left Side: The pulmonary vein empties oxygen-rich blood, from the lungs into the left atrium

Atrial contraction

Right Side

Blood flows from your right atrium into your right ventricle through the open tricuspid valve. When the ventricles are full, the tricuspid valve shuts. This prevents blood from flowing backward into the atria while the ventricles contract.

Left Side

Blood flows from your left atrium into your left ventricle through the open mitral valve. When the ventricles are full, the mitral valve shuts. This prevents blood from flowing backward in to the atria while the ventricles contract (squeeze).

Ventricular contraction

Oxygen and carbon dioxide travels to and from tiny air sacs in the lungs, through the walls of the capillaries, into the blood.

Right Side

Blood leaves the heart through the pulmonary valve, into the pulmonary artery and to the lungs.

Left Side

Blood leaves the heart through the aortic valve, into the aorta and to the body. This pattern is repeated, causing blood to flow continuously to the heart, lungs and body.

f) How image formation takes place?
(Description-04 Mark)

Ans: The formation of focused images on the photoreceptors of the retina depends on the refraction (bending) of light by the cornea and the lens The cornea is responsible for most of the necessary refraction.The lens has considerably less refractive power than the cornea; however, the refraction supplied by the lens is adjustable, allowing objects at various distances from the observer to be brought into sharp focus on the retinal surface.Dynamic changes in the refractive power of the lens are referred to as accommodation. When viewing distant objects, the lens is made relatively thin and flat and has the least refractive power. For near vision, the lens becomes thicker and rounder and has the most refractive power. These changes result from the activity of the ciliary muscle that surrounds the lens. The lens is held in place by radially arranged connective tissue bands that are attached to the ciliary muscle.Adjustments in the size of the pupil (i.e., the circular opening in the iris) also contribute to the clarity of images formed on theretina. Like the images formed by other optical instruments, those generated by the eye are affected by spherical and chromatic aberrations, which tend to blur the retinal image.Reducing the size of the pupil also increases the depth of field—that is, the distance within which objects are seen without blurring. However, a small pupil also limits the amount of light that reaches the retina, and, under conditions of dim illumination, visual acuity becomes limited by the number of available photons rather than by optical aberrations.

Q. 5. Attempt any FOUR of the following. **16 Marks**

a) Name the instruments used in digestive system. Describe any one of it.

(List any four-02 Mark; Description-02 Mark)

Ans:- The instrument related to digestive system are

1. **Endoscope:** The term endoscop*y* is used to refer to an examination of the upper part of the gastrointestinal tract, known as an esophagogastroduodenoscopy

2. **X-ray**-The tests utilize barium or an iodine-containing agent that allows visualization of the digestive tract and a form of X-ray machine called fluoroscopy. Fluoroscopy allows part of the body to be studied in motion and recorded on a video monitor.
3. **Colonoscopy:** This instrument used for examining the colon or large intestine.
4. **CT:** CT images within a range that is useful for the assessment of diseases of digestive system.
5. **Ultrasound:** Ultrasonography is most commonly used in the upper digestive tract and in the respiratory system. The procedure is performed by gastroenterologists or pulmonologists who have had extensive training. For the patient, the procedure feels almost identical to the endoscopic procedure without the ultrasound part, unless ultrasound-guided biopsy of deeper structures is performed.
6. **MRI:** magnetic resonance imaging (MRI) to obtain pictures of the bile ducts. The machine uses radio waves and magnets to scan internal organs and tissues.

b) Describe structure of female reproductive system.
(Diagram-02 Mark; Description -02 Mark)
Ans:- Female reproductive system consist of internal and external genital organs

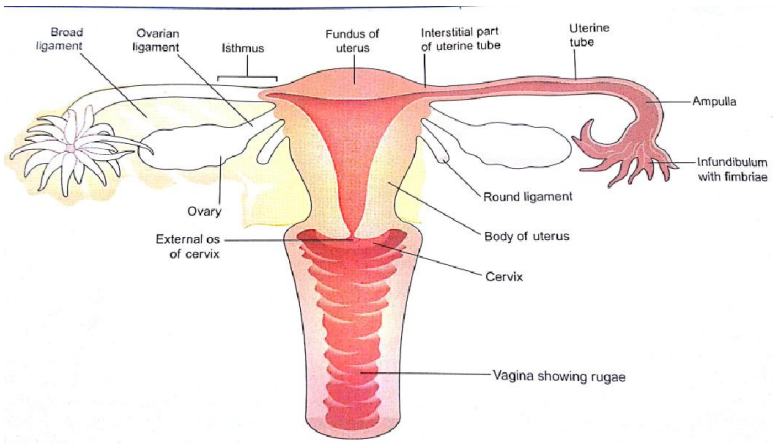
a)Internal Organs:1) ovaries 2) uterine tube 3)vagina.

b)External organs:1)moons pubis 2)labia majora and minora 3)clitoris4) vestibule of vagina 5)Greater vestibular gland.

Females are born with a large number of potential ova (female sex cells, also called egg cells). However, it isn't until after the onset of puberty, typically around age 12, that these cells are mature enough to sustain life. The cells ripen on a regular basis, but only one is released each month until a woman reaches menopause. Menopause commonly begins between the ages of 45 and 55.

The major organs of the female reproductive system include:

Vagina: This muscular tube receives the penis during intercourse and through it a baby leaves the uterus during childbirth.
Uterus: This organ holds and nourishes a developing fetus, if an egg was properly fertilized.
Ovaries: The female gonads, the ovaries produce ova. When one matures, it is released down into a fallopian tube.
Fallopian tubes: These small tubes transport ova from the ovaries to the uterus. This is where an egg waits to be fertilized.



c) List the instruments related to urinary system, mention their function.
(List any four & it's function 01 Mark)

Ans: **1.Cystoscopy:** Cystoscopy uses a cystoscope to look inside the urethra and bladder. A cystoscope is a long, thin optical instrument with an eyepiece at one end, a rigid or flexible tube in the middle, and a tiny lens and light at the other end of the tube. By looking through the cystoscope, the urologist can see detailed images of the lining of the urethra and bladder. The urethra and bladder are part of the urinary tract.

2.Ureteroscopy.:Ureteroscopy uses a ureteroscope to look inside the ureters and kidneys. Like a cystoscope, a ureteroscope has an eyepiece at one end, a rigid or flexible tube in the middle, and a tiny lens and light at the other end of the tube. However, a ureteroscope is longer and thinner than a cystoscope so the urologist can see detailed images of the lining of the ureters and kidneys. The ureters and kidneys are also part of the urinary tract.

3. Dialysis machine: A machine used in dialysis that filters a patient's blood to remove excess water and waste products when the kidneys are damaged, dysfunctional, or missing. The dialysis machine itself can be thought of as an artificial kidney.

4. Urinary catheters: Urinary catheters are hollow, partially flexible tubes that collect urine from the bladder. Catheters are generally necessary when a patient is unable to empty their bladder. If the bladder isn't emptied, urine can build up and lead to pressure in the kidneys. The pressure can result in kidney failure, which can be dangerous and may result in permanent damage to the kidneys.

5. Ultrasound: A renal ultrasound scan can detect kidney stones, cysts, tumours, congenital abnormalities of the renal tract (these are abnormalities that have been present from birth), problems of the prostate, effects of infection and trauma of the kidneys and renal tract.

d) What is role of insulin in controlling blood sugar level?(04 Marks)

Ans:- :- Insulin is a hormone which plays a key role in the regulation of blood glucose levels. A lack of insulin, or an inability to adequately respond to insulin, can each lead to the development of the symptoms of diabetes. In addition to its role in controlling blood sugar levels, insulin is also involved in the storage of fat. Insulin is a hormone which plays a number of roles in the body's metabolism. Insulin regulates how the body uses and stores glucose and fat. Many of the body's cells rely on insulin to take glucose from the blood for energy. Insulin helps control blood glucose levels by signalling the liver and muscle and fat cells to take in glucose from the blood. Insulin therefore helps cells to take in glucose to be used for energy. If the body has sufficient energy, insulin signals the liver to take up glucose and store it asglycogen. If the body has sufficient energy, insulin signals the liver to take up glucose and store it as glycogen.

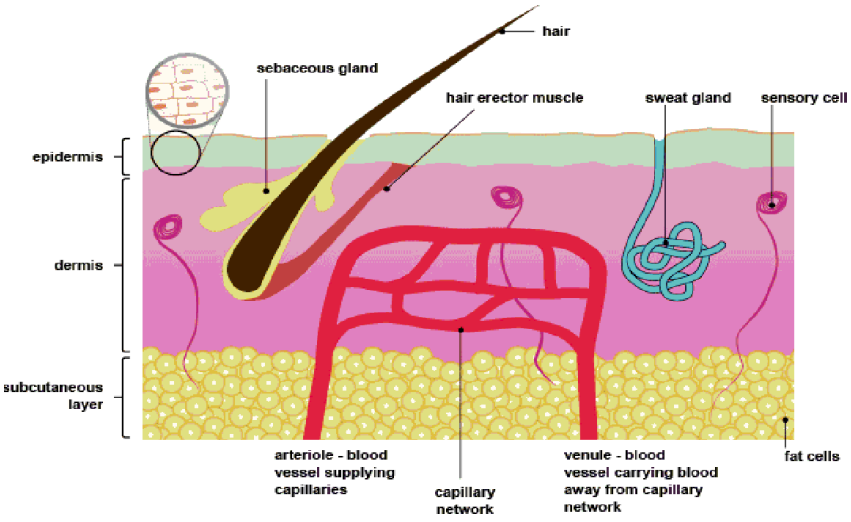
e) Describe the structure of skin. 4

Ans: **The structure of the skin**
The skin is a very important organ. It is a waterproof barrier over the surface of your body, it keeps out infection, it protects the delicate tissues underneath and it can repair itself if it is damaged. In homeostasis, the skin plays a very important part in maintaining the body temperature within narrow limits. It is important both for losing heat when your core temperature goes up and for conserving heat if your core temperature starts to fall. The structure of the skin is very well adapted to its function in temperature control.
Structure of the skin
The skin has three main layers - the epidermis, the dermis and the subcutaneous layer.
Layers of the skin
Epidermis : The epidermis is on the outside. This has a basal layer which is always forming new cells through cell division so the epidermis is made up from layers of cells. The new cells gradually move towards the surface, which takes 1-2 months. As they move up they gradually die, become flattened and develop keratin. The outermost layer of the epidermis is made of flat dead cells which are continually worn away by friction. The keratin and oil from the sebaceous help to make the skin waterproof.
Dermis: The dermis is the middle layer. It contains

- Connective tissue - packs and binds the other structures in the skin.
- Elastic fibres - make the skin stretchy and resilient.
- Capillaries - tiny blood vessels which are supplied by arterioles.
- Hair erector muscles - to move the position of the hairs.
- Sensory cells - these respond to sense touch, pressure, heat, cold and pain.
- Nerve fibres - to activate muscles and glands and relay messages from the sensory cells to the brain.

- Pigment cells which produce melanin - a very dark pigment.
- Sweat glands which open onto the surface as pores.
- Hair follicles - pits in the epidermis which grow hairs.
- Sebaceous glands - produce oil to keep hair follicle free from dust and bacteria, and to help to waterproof the skin.

The subcutaneous layer: The subcutaneous layer is the final layer of the skin. This is a layer of fat found in the lower part of the dermis and underneath it. The thickness of this layer varies depending on the place in the body and from person to person. A store of fat is useful to the body as insulation and it can be used for energy when the intake of nutrients is insufficient.
The skin has three layers. Beneath the surface of the skin are nerves, nerve endings, glands, hair follicles, and blood vessels.



g) Describe the different lobe of cerebrum and their functional areas. (01 Mark each)

Ans:- Different lobe of cerebrum and their functional areas are given below.

1. Frontal Lobe

Emotions, planning, creativity, judgment, movement and problem solving are controlled in the frontal lobe.

2. Parietal Lobe

The senses of temperature, taste, pressure, touch and pain are controlled in the parietal lobes. Some language functions may also be controlled in the parietal lobe.

3. Temporal Lobe

Most hearing and language functions are controlled in the temporal lobes. Emotion, learning and auditory processes are also located in the temporal lobes.

4. Occipital Lobe

Vision and the ability to recognize objects are controlled in the occipital lobe. The retina of the eye sends input to the occipital lobe of the brain which then interprets the signals as images.

Q. 6. Attempt any FOUR of the following. 16 marks

a) Describe formation of urine.(04 marks)

Ans:- Formation of urine takes place under three stages as follows.

i) Filtration under pressure: It occurs at glomerular capsule where because of difference in size of vessels pressure excreted over efferent vessels lead to increased permeability of vessel wall and glomerular capsule. This fluid is called as glomerular filtrate and it has same composition of plasma in that it contains glucose, amino acid, fatty acid, salt, urea and uric acid in the same

proportion. Normally 125 ml of glomerular filtrate is formed leads to 150 to 280 liters of urine is formed per day. The average amount of urine is passed per day is about 1.5 liters so it is that reabsorption must occurs.

ii) Selective reabsorption: Reabsorption of water, glucose, salts and their ions which required for body is takes place by proximal convoluted tubule because its cells are able to absorb. Mostly by absorption of water and salts resulted to passing of 1.5 litres of fluid to the tubules which consist of 2% of urea. It helps to maintain pH of about 7.4.

iii) Active secretion: It occurs because the cell lining of tubule have ability to secrete some substance from the blood in second capillary network in to lumen of tubule

b) Describe the functions oestrogen, progesterone and testosterone.(04 marks)

Ans:- Estrogens : Estrogens are present in significant amounts in both men and women. They are present significantly higher amounts in women after menarch (onset of menstrual puberty) until menopause (session of menstrual periods after completion of reproductive age). The primary function of estrogen is development of female secondary sexual characteristics. This includes breast, endometrial, regulation of menstrual cycle, etc. In male estrogen helps in maturation of the sperm and maintains of healthy libido. It helps to decelerate height increase in puberty in females, accelerate burning of body fats and muscle bulk, increases uterine growth, improves the lubrication of vagina, and thickens the vaginal wall.

Progesterone: progesterone is hormone secreted by the female reproductive system. Its main function is to thickening the inner lining of the uterus. Progesterone is produced by ovaries, peseta and adrenal glands. Progesterone Action in the Breast:

A. Effect of progesterone on proliferation of the normal breast

B. Progesterone regulation of genes associated with cell cycle progression

C. Progesterone regulation of growth factors and growth factor receptors in the breast

D. Markers of progestin action in the breast

E. Progesterone effects on lactation

Testosterone: Testosterone is a steroid hormone from the androgen group and is found in humans and other vertebrates. In men, testosterone plays a key role in the development of male reproductive tissues such as the testis and prostate as well as promoting secondary sexual characteristics such as increased muscle, bone mass, and the growth of body hair. In addition, testosterone is essential for health and well-being as well as the prevention of osteoporosis.

d) Name the instrument related to heart. What are their functions? (Any 04 for 01 mark each)

Ans:-

1. ECG machine: The ECG machine is designed to recognize and record any electrical activity within the heart. It prints out this information on ECG paper made up of small squares 1mm squared.

2. Defibrillator: Defibrillation is a common treatment for life-threatening cardiac dysrhythmias and ventricular fibrillation. Defibrillation consists of delivering a therapeutic dose of electrical energy to the heart with a device called a defibrillator

3. Pacemaker: A pacemaker is a small device that's placed in the chest or abdomen to help control abnormal heart rhythms. This device uses electrical pulses to prompt the heart to beat at a normal rate. Pacemakers are used to treat arrhythmias . Arrhythmias are problems with the rate or rhythm of the heartbeat.

4. Heart lung machine: In the operating room , the heart-lung machine is used primarily to provide blood flow and respiration for the patient while the heart is stopped. Surgeons are able to perform coronary artery bypass grafting (CABG), open- heart surgery for valve repair or repair of cardiac anomalies, and aortic aneurysm repairs, along with treatment of other cardiac-related diseases. The heart-lung machine provides the benefit of a motionless heart in an almost bloodless surgical field.

5. Heart rate meter: A heart rate monitor is a personal monitoring device that allows one to measure one's heart rate in real time or record the heart rate for later study. It is largely used by performers of various types of physical exercise.

6. Phonocardiograph: A Phonocardiogram or PCG is a plot of high fidelity recording of the sounds and murmurs made by the heart with the help of the machine called phonocardiograph, or "Recording of the sounds made by the heart during a cardiac cycle.

7. Sphygmomanometer: A sphygmomanometer is a medical instrument used to measure arterial blood pressure. A sphygmomanometer consists of a pump, dial, cuff and a valve. To measure blood pressure, the cuff is wrapped around the arm and then inflated using the pump

d) Classify bone with examples. What are the functions of bones?(classification 02 marks, Function 02 marks)

Ans:- 1. Long bone:

Function: 1. Long bones contain yellow bone marrow and red bone marrow, which produce blood cells.

2. Long bones are hard, dense bones that provide strength, structure, and mobility.

e.g. Femur, tibia and fibula.

2. Short bone.

Function:

1. Their primary function is to provide support.

2. Stability with little to no movement**.**

e.g. Wrist and ankle**.**

3. Flat bone.

Function

1. Flat bones are bones whose principle function is either extensive protection.

2. The provision of broad surfaces for muscular attachment.

e.g. pelvic bone and scapula**.**

4. Irregular bone.

Function

1. Irregular bones serve various purposes in the body, such as protection of nervous tissue (such as the vertebrae protect the spinal cord).

2. Affording multiple anchor points for skeletal muscle attachment (as with the sacrum).

3. Maintaining pharynx and trachea support.

e.g. Vertebrae and face bone**.**

5. Sesamoid Bones.

Function:

1. To resist pressure.

2. To minimize friction.

3. To alter the direction of pull of the muscle.

4. To maintain the local circulation

e.g. patella of knee joint.

e) Classify joints with examples .Which are different types of movements occur at joints?(classification 02 marks ,Movement 02 marks)

Ans: - Joints are classified as: –

1. Fibrous: The bones of fibrous joints are joined by fibrous tissue, such as the sutures in the skull or the pelvis. Fibrous joints allow no movement at all.

   Eg: Teeth

2. Cartilaginous: The bones of cartilaginous joints are joined by cartilage, such as the sternocostal joint between the sternum and first rib. These joints allow a very small amount of movement.

   Eg:Vertebrae in the spine.

3. Synovial

   Eg**:** Elbow/Knee, Top of the neck **(**atlas and axis bones), Shoulder/Hip, Wrist/MCP & MTP joints, ntercarpal joints

   Movement

   - Flexion/Extension
   - Rotation of one bone around another
   - Flexion/Extension/Adduction/
   - Abduction/Internal & External Rotation
   - Gliding movements

f) Name the instruments used for lung function tests. What is their role? (Any four 01 Mark each)

Ans: - 1.Spirometer: The spirometer is used for measurement of respiratory volume. All lung volumes and capacities can be determined by it.

2. Ventilator: It is machine designed to mechanically move breathable air into and out of the lungs to provide mechanism of breathing for a patient who is physically unable to breathe.

3. Respiration rate meter: A respirometer is a device used to measure the rate of respiration of a living organism by measuring its rate of exchange of oxygen and/or carbon dioxide.

4. X-ray: It is used to scan the lungs for examination of lung diseases.

5. Nebulizer: It is drug delivery device use to administer medication in the form of a mist inhaled into the lungs . It is generally used for the treatment of asthma.

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