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10 mark important concepts

① Describe constituents of blood and their function

① Erythrocytes (Red Blood cells)

① There are around 4.8 million/ μ l in females and 4.5 million/ μ l in males

② They are 7-8 μ m diameter, biconcave discs without nuclei, live for about 120 days

③ production of red blood cell is controlled by Erythropoietin, a hormone produced by kidney

④ Lack of nucleus makes RBC more flexible

⑤ Blood appears red because of large number of Red Blood cell, which get their colour from Haemoglobin

⑥ The process of development of red blood cells from stem cells takes about 7 days and is called erythropoiesis

Function

① Red blood cell contain a special protein called Haemoglobin, which helps carry oxygen from lungs to the rest of the body & return CO_2 from body to the lungs, so it can be exhaled

② RBC helps in maintain acid-base balance

③ It maintain intercellular ion balance

④ It helps to maintain the viscosity of blood

⑤ It contains antigens

② Leukocytes (white blood cells)

- ① There are around 5000 - 10,000 / μL
- ② Most live for few hours to few days
- Some called T & B Memory cells can live for many years

Leukocytes

Agranulocyte

- ① Lymphocytes
- ② Monocytes

granulocyte

- ① Neutrophil
- ② Eosinophil
- ③ Basophil

① Lymphocytes [few hours - days]

- ① There are around 2000 - 4000 / μL
- ② It is a spherical cell with large nucleus
 - T lymphocyte regulate function of other immune cell & directly attacks infected cell & Tumors
 - B lymphocyte give rise to antibodies and target bacteria, viruses and other foreign materials

② Monocytes [few minutes - days]

- ① There are around 200 - 1000 / μL
- ② It is a spherical cell with horse shoe - shaped nucleus
- ③ They involve in engulfing pathogens or worn out cell

③ Neutrophil [few minutes - days]

- ① There are around 2000 - 7000 / μL
- ② Nuclear lobe increase with age
- ③ They are particularly effective against bacteria

④ Eosinophils [minutes - days]

- ① There are around $0-700/\mu\text{L}$
 - ② Nucleus generally two lobed, bright orange granules
 - ③ Releases antihistamines, increases in allergies and parasitic infections
-

⑤ Basophil [lifespan unknown]

- ① There are around $0-200/\mu\text{L}$
 - ② Nucleus generally two lobed, dark purple granules
 - ③ It promotes inflammation
-

Function

- ① WBC create antibodies to defend against bacteria, virus.
 - ② They attack & kill parasites, destroy cancer cells, and help with allergic responses
-

③ platelets (Thrombocytes)

- ① There are around $1.5-4 \text{ lakh}/\mu\text{L}$
- ② They are $2-3 \mu\text{m}$ in diameter. contain many vesicles but no nucleus, live for 8-9 days
- ③ Unlike red and white blood cells, platelets are not actually cells but rather small fragments of cells
- ④ platelets helps in blood clotting process. A higher than normal number of platelets can cause unnecessary clotting which can lead to stroke & heart attack

- ⑤. production of platelet is controlled by thrombopoietin, a hormone produced by kidney
- ⑥. About a third of platelets are stored within the spleen rather than in circulation, which is released in emergency to control excessive bleeding.

Function.

- ①. Secrete vasoconstrictors which constrict blood vessels
- ②. Secrete clotting factors to promote blood clotting.
- ③. Form temporary platelet plugs to stop bleeding
- ④. Dissolve blood clots when they are no longer needed.

PLASMA.

The constituents of plasma are water and dissolved and suspended substances, including

- ① plasma proteins
- ②. Clotting factors
- ③. Electrolytes
- ④. Nutrients
- ⑤. Hormones
- ⑥. Gases

① PLASMA PROTEINS

① They are normally retained within the blood because they are too big to escape through the capillary pores into the tissues.

② plasma proteins are formed in the liver

Function

① It is responsible for creating the osmotic pressure of blood

② It also regulate pH of blood

③ It also help in transport of molecules

② CLOTTING FACTORS

① The most abundant clotting factor is fibrinogen

② clotting factors are proteins, circulates in the blood in an inactive form

Function

① It is responsible for coagulation of blood

③ ELECTROLYTES

Electrolytes ~~has~~ such as Ca^{2+} , Na^{+} have a range of functions

Function

① They involve in muscle contraction

② In transmission of nerve impulse

③ In maintenance of acid-base balance

④ NUTRIENTS

Nutrients are product of digestion which includes glucose, amino acids etc. are absorbed from alimentary tract.

FUNCTION

- ① It acts as source of Energy, Heat.
- ② It is responsible for Repair and Replacement of body tissue
- ③ It involve's in Synthesis of other blood components

⑤ Hormones

These are chemical messengers synthesized by Endocrine glands. It enters directly into blood

Functions

- ① They Influence cellular activity.

⑥ GASES

- ① oxygen is carried in combination with haemoglobin and CO_2 as bicarbonate ions dissolved in plasma
- ② Atmospheric nitrogen enters the body in the same way as other gases and is present in plasma, & it has no physiological function.

② Mention coagulation factors and write the mechanism of blood coagulation.

Factors

- ① Factor I - Fibrinogen
- ② Factor II - prothrombin
- ③ Factor III - Thromboplastin
- ④ Factor IV - Calcium
- ⑤ Factor V - Labile Factor
- ⑥ Factor VI - No factor
- ⑦ Factor VII - Stable factor
- ⑧ Factor VIII - Antihemophilic factor
- ⑨ Factor IX - Christmas factor
- ⑩ Factor X - Stuart power factor
- ⑪ Factor XI - plasma thromboplastin Antecedent
- ⑫ Factor XII - Hageman factor
- ⑬ Factor XIII - Fibrin stabilizing Factor

Coagulation

It is defined as the process in which blood loses its fluid and becomes jelly like mass, it shed after few minutes

STEPS OF BLOOD CLOTTING

- ① Formation of prothrombin activator
- ② Conversion of prothrombin to thrombin
- ③ Conversion of fibrinogen to fibrin

① Formation of prothrombin Activator

- ① Blood clotting commences with the formation of a substance called prothrombin activator which converts prothrombin into thrombin.
- ② Formation of prothrombin activator occurs through two pathways.
 - ① Intrinsic pathway
 - ② Extrinsic pathway

Intrinsic pathway

- ① During injury blood vessel is ruptured, endothelium is damaged and collagen beneath the endothelium is exposed.
- ② When platelet comes in contact with collagen of damaged blood vessel, it gets activated and releases phospholipids.
- ③ Here activated factor X reacts with phospholipids & factor V to form prothrombin Activator.

Extrinsic pathway

- ① Tissue that are damaged during injury release thromboplastin.
- ② Thromboplastin contains protein, phospholipid and glycoprotein.
- ③ Here activated factor X reacts with phospholipids & factor V to form prothrombin Activator.

② Conversion of prothrombin to thrombin

- ① prothrombin activator that is formed in intrinsic and extrinsic pathways converts prothrombin to thrombin. In the presence of calcium
- ② once formed thrombin initiates the formation of more thrombin molecules
- ③ Initially formed thrombin activates Factor V
- ④ Factor V ^{in turn} accelerates formation of both extrinsic and intrinsic prothrombin activator
- ⑤ The effect of thrombin is called positive feedback effect

③ Fibrinogen into Fibrin

- ① Thrombin converts inactive fibrinogen into activated fibrinogen. The activated fibrinogen is called fibrin monomer
- ② Fibrin monomer undergoes polymerization to form ^{loose} strands of fibrin
- ③ loose strands of fibrin is converted into dense strands by stabilizing factor
- ④ All dense threads of fibrin aggregated to form a meshwork of stable clot

Platelets come in contact with damaged blood vessels

Thromboplastin released by damaged tissue enters into blood

Intrinsic pathway

Extrinsic pathway

Prothrombin activator

Prothrombin → Thrombin

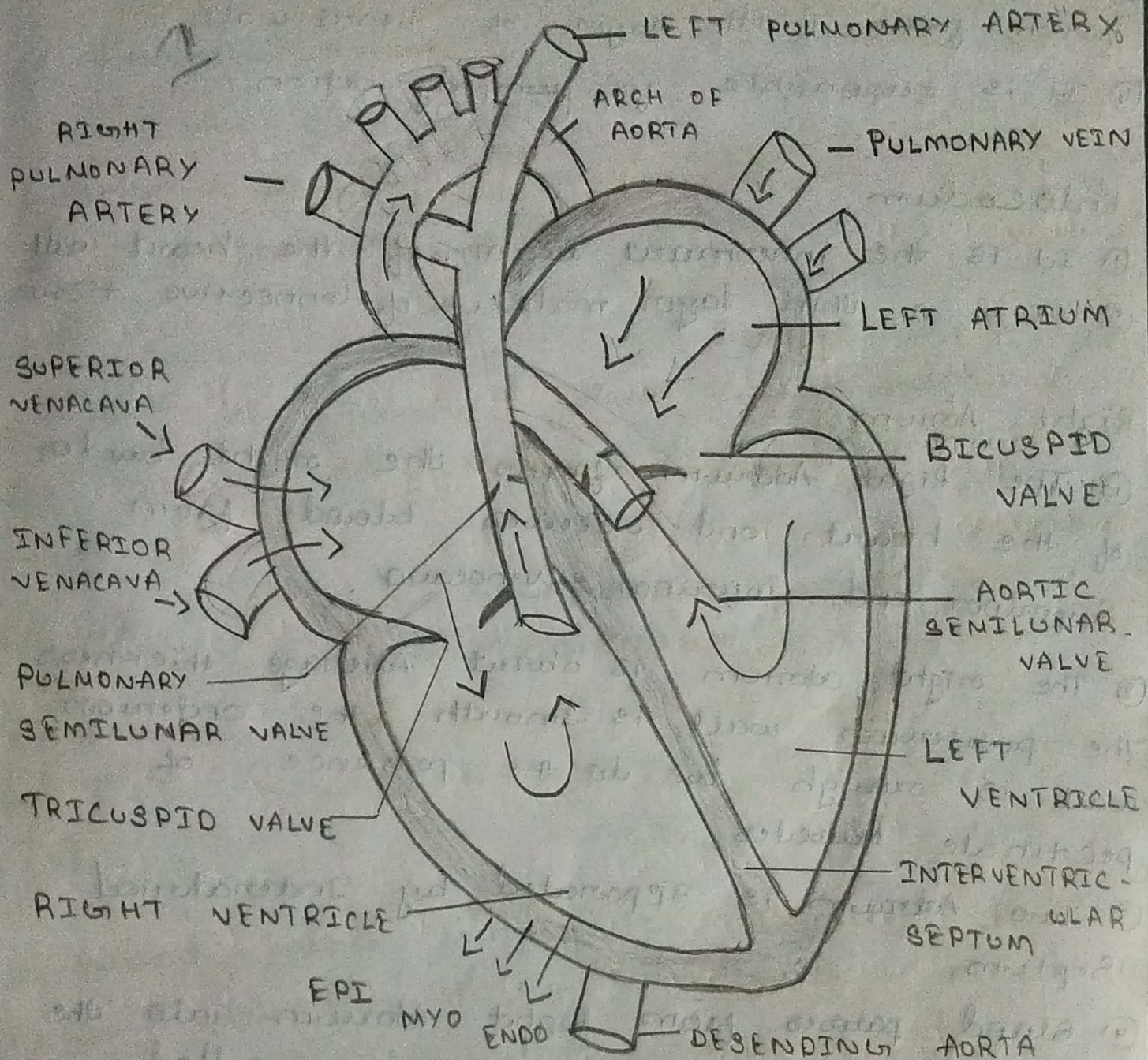
Fibrinogen → Loose fibrin

Threads

Stabilized fibrin clot

Stages of blood clotting.

③ Describe internal anatomy of heart with neat labelled diagram.



Layers of the heart wall

① The wall of the heart consists of three layers. epicardium, myocardium, endocardium.

① Epicardium.

① outermost layer of the heart wall.

② It is a transparent layer made up of connective tissue

Myocardium

- ① The middle layer of the heart wall
- ② It is made up of cardiac muscle tissue responsible for its pumping action

Endocardium

- ① It is the innermost layer of the heart wall
- ② It is a thin layer made up of connective tissue

Right Atrium

- ① The Right Atrium forms the right border of the heart and receives blood from Superior and Inferior Venacava.
- ② The right atrium is about Average thickness. The posterior wall is smooth, the anterior wall is rough due to the presence of ^{inner surface} pectinate muscles.
- ③ Two Atrium is separated by Interatrial Septum
- ④ Blood passes from Right atrium into the Right Ventricle through a valve called Tricuspid valve. It is also called Right Atrioventricular valve.

Right Ventricle

- ① The Right Ventricle is of Average thickness & forms most of the anterior surface of the heart

② Two ventricle is separated by a partition called Interventricular Septum.

③ Blood passes from Right ventricle into pulmonary artery, which further divides into Right pulmonary artery & Left pulmonary artery.

Left Atrium.

① The left Atrium forms left border of the heart and receives blood from pulmonary vein.

② The left atrium is about Average thickness. Both posterior and anterior walls were smooth.

③ Two Atrium is separated by Interatrial Septum.

④ Blood passes from left atrium to left ventricle through a valve called Bicuspid valve. It is also called left-atrioventricular valve.

Left Ventricle

① It is the thickest chamber of the heart & forms apex of the heart.

② Two ventricle is separated by a partition called Interventricular Septum.

③ Blood passes from left ventricle into Aorta. Branching Aorta and descending Aorta carry blood throughout the body.

④ what is cardiac cycle? Describe various events of cardiac cycles.

Ans: Cardiac cycles

The cyclic contraction and Relaxation of Heart is called cardiac cycle

Duration of cardiac cycle

Heart Rate = 72 times/min

i.e. In one minute 72 cardiac cycles takes place

$\therefore$ 1 cardiac cycle takes 0.8s.

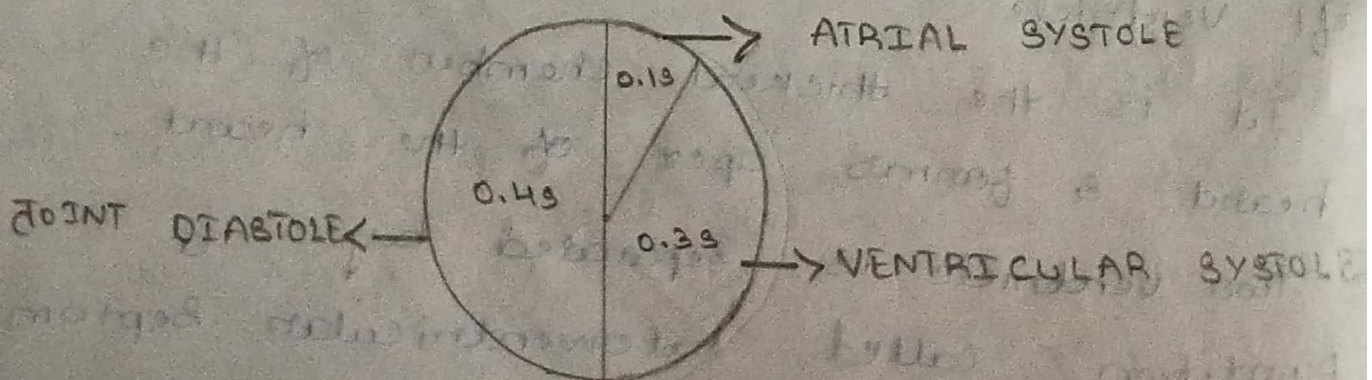
In 0.8s there will be both contraction as well as Relaxation.

Cardiac cycles occurs in two phases

① Systole: A period of contraction

② Diastole: A period of Relaxation.

Cardiac cycle is explained by plotting a pie chart, which is divided into 3 components



① Atrial Systole

- ① It lasts for 0.1 s
- ② Contraction of both the Atria takes place
- ③ This contraction pushes blood from Right atrium to Right Ventricle and Left atrium to Left Ventricle
- ④ During flow of blood from Atrium to Ventricle, both Tricuspid and Bicuspid valves are in open state
- ⑤ During Atrial Systole, Aortic valve, pulmonary vein, semilunar valve were in closed state & Atria do not receive any blood
- ⑥ The blood volume in Ventricle at the end of Atrial diastole is called End Diastolic Volume (EDV) 130 ml

② Ventricular Systole

- ① It lasts for 0.2 s
- ② Here contraction of both the ventricles takes place & Atria Relaxes
- ③ As soon as blood entered ventricle to prevent back flow of blood from Ventricle to atrium, both Tricuspid & Bicuspid valve shut close & a lub sound is produced. Lub sound is beginning of Ventricular systole

- ④ This phase is also called as Iso-volumetric contraction. i.e. there is no change in volume of blood even though the ventricular walls are contracting.
- ⑤ In Ventricular Systole, venae cavae, pulmonary veins were in open state & Semilunar valves were in closed state & Atria receive blood.
- ⑥ Contracting wall's create pressure which results in opening of Semilunar valve finally ejection of blood takes place through pulmonary artery & Aorta.
- ⑦ The blood volume in the ventricle at the end of Ventricular Systole is called as End Systolic Volume (ESV). 60ml
- ⑧ Stroke volume: The volume ejected per beat from each ventricle = $EDV - ESV$
 $130 - 60 = 70\text{ml}$

Joint diastole

- ① It lasts for 0.4 s
- ② All four chambers are in relaxed state
- ③ Beginning of Ventricular diastole produces a dub sound due to closure of Semilunar valve
- ④ Then again AV valves opens at the end of joint diastole

phase of ventricular filling.

① 70% of ventricular filling occurs during joint diastole itself.

② Remaining 30% filling occurs during atrial systole.

Blood filled during joint diastole.

① First $\frac{1}{3}$ rd filling $\rightarrow$ Rapid.

Blood collected by atria during AV valves closed. All the blood quickly moves to ventricle.

② Second $\frac{1}{3}$ rd filling $\rightarrow$ Slow

It is called as Diastasis

③ Blood filled during atrial systole

③ Last $\frac{1}{3}$ rd filling $\rightarrow$ Rapid.

It occurs during atrial systole.

⑤ Define blood pressure and discuss various factors regulating the blood pressure in human being

Ans :- Blood pressure is the pressure that the blood exerts on the walls of the blood vessels

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Factors regulating arterial blood pressure

- ① Local factors
- ② mechanical factors

local factors

central factor

peripheral factor

→ Cardiac output

→ Heart Rate

① → peripheral Resistance

② → blood volume

③ → venous return

④ → Elasticity of blood vessel

⑤ → velocity of blood flow

⑥ → Diameter of blood vessel

⑦ → viscosity of blood

① Cardiac output

① Systolic pressure is directly proportional to cardiac output.

② Increase in cardiac output increases systolic pressure.

③ Decrease in cardiac output decreases systolic pressure.

④ Cardiac output increases in muscular exercise, emotional condition etc.

⑤ In conditions like myocardial infarction, the cardiac output decreases, resulting in fall in systolic pressure.

② Heart Rate

① moderate change in heart rate do not affect arterial blood pressure much.

② However marked alterations in heart rate affects blood pressure by altering cardiac output.

③ peripheral Resistance.

① It is the resistance offered to the blood flow at the periphery.

② Diastolic pressure is directly proportional to peripheral resistance.

④ Blood volume

① Blood pressure is directly proportional to blood volume.

② Blood volume maintains the blood pressure through the venous return and cardiac output.

③ If the blood volume increases, there is an increase in venous return and cardiac output, resulting in the elevation of arterial blood pressure.

⑤ Elasticity of Blood vessels

- ① Blood pressure is Inversely proportional to the elasticity of blood vessels
- ② Due to the elasticity property, the blood vessels are able to maintain the pressure.
- ③ when elasticity property is lost, the blood vessels becomes rigid and pressure increases as in old age called as arteriosclerosis.
- ④ Deposition of cholesterol, fatty acids, and calcium ions produces rigidity of blood vessels and leads to Increased BP called as atherosclerosis.

⑥ Velocity of Blood flow

- ① pressure is directly proportional to the velocity of blood flow
- ② If the velocity of blood flow increases, the resistance increases, so the pressure is increased.

⑦ Venous Return

- ① BP is directly proportional to venous Return
- ② when Venous Return increases, there is an Increase in ventricular filling and Cardiac output, resulting in elevation of arterial BP

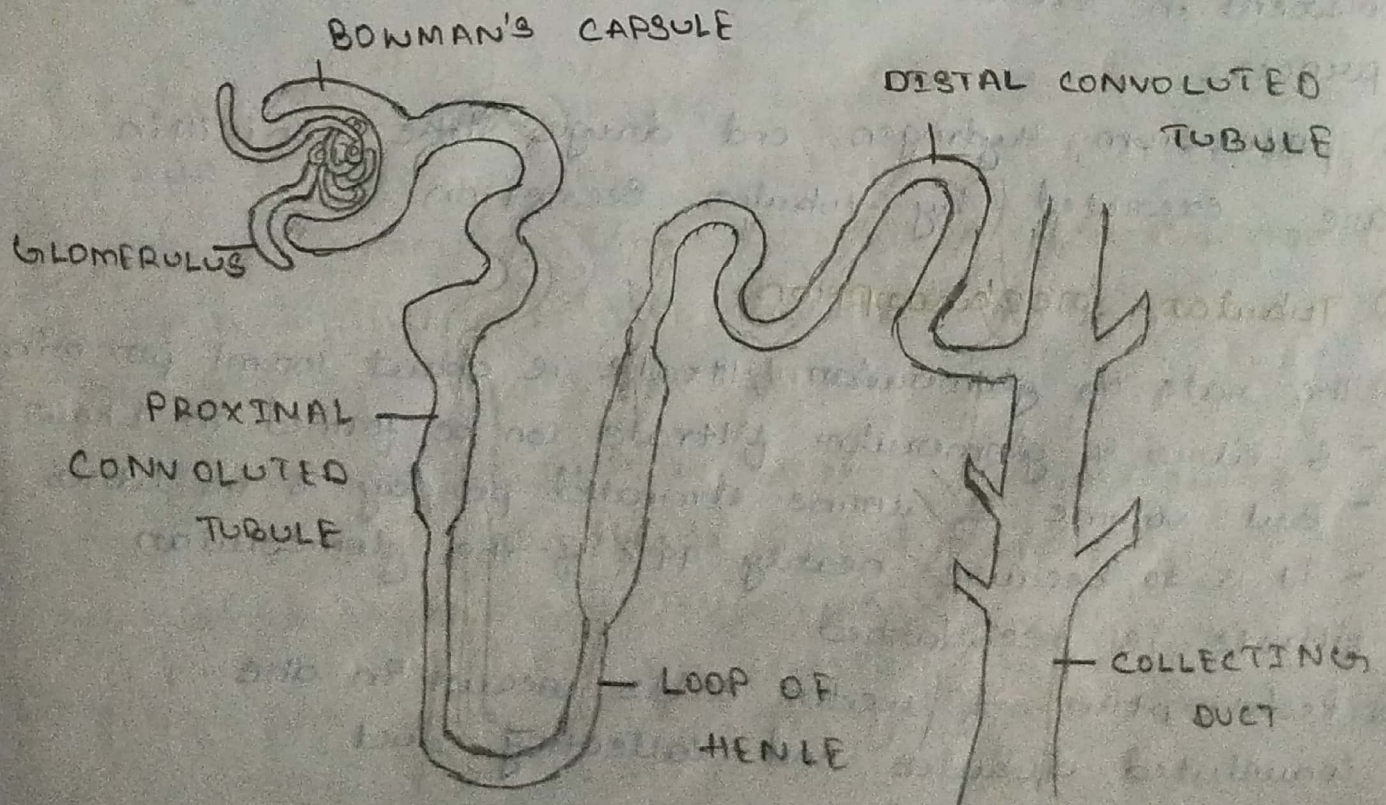
⑧ Diameter of Blood Vessels

- ① Arterial blood pressure is directly proportional to the diameter of the blood vessels
- ② If the diameter increases, the peripheral resistance increases, leading to increase in the pressure

⑨ Viscosity of Blood Vessels

- ① Arterial blood pressure is directly proportional to viscosity of the blood
- ② When the viscosity of blood vessels increases, the frictional resistance is increased and this increases pressure

- ⑥ Draw a neat, labeled diagram of nephron and describe how urine is formed?



Formation of urine

The formation of urine by kidneys involves three processes

12/1/20

① glomerular filtration

① Filtration of water, salts and other substances occur in the glomeruli

② glomerular filtrate is the fluid that is formed after filtration.

③ About 100ml of glomerular filtrate is formed per minute

④ This filtrate passes into the proximal convoluted tubule.

② Tubular Secretion.

① It is an active process which occurs in the convoluted tubules

② Abnormal substances and normal substances present in excess in blood are eliminated by this process

③ potassium, hydrogen and drugs like penicillin are excreted by tubular secretion

③ Tubular reabsorption

① The rate of glomerular filtrate is about 100ml per min

- 6 litres of glomerular filtrate can be formed in 1 hour

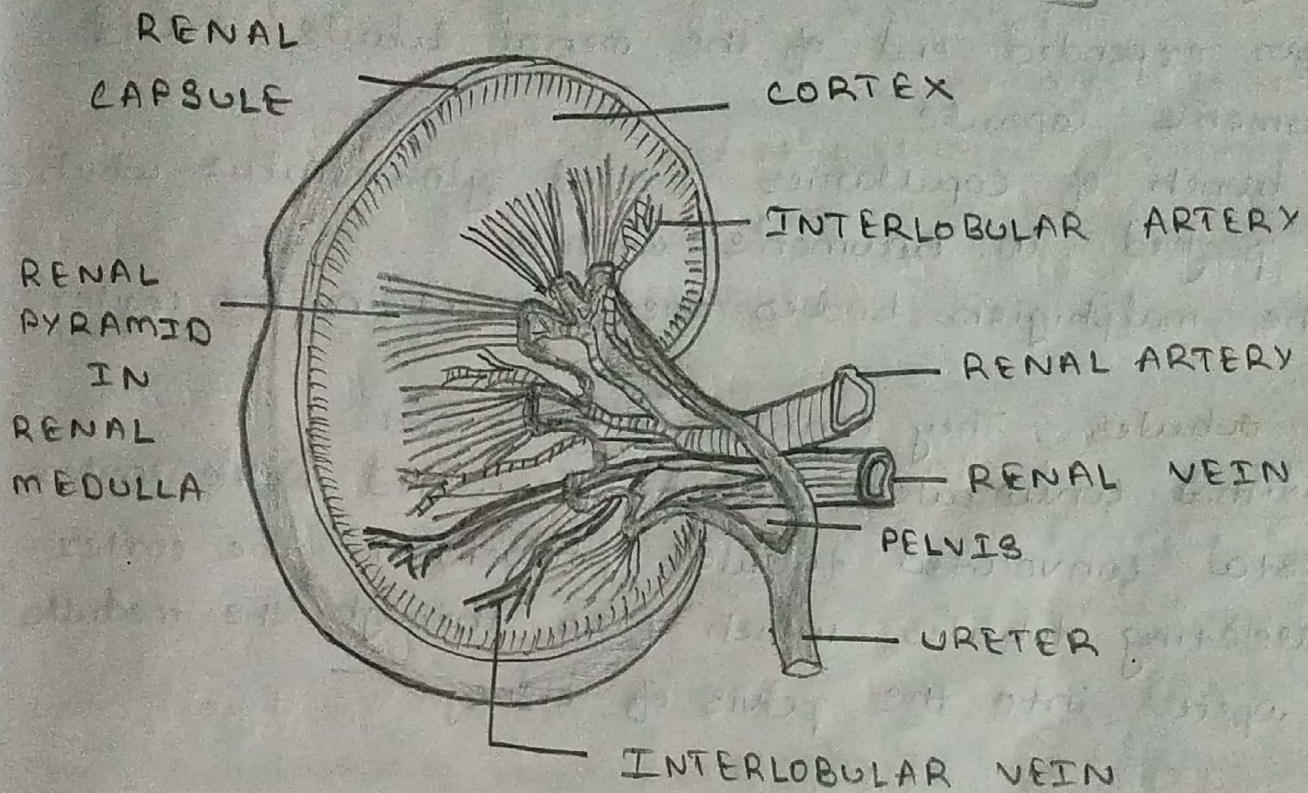
- But volume of urine eliminated per day is 1.5 litres.

- It is so, because nearly 99% of the glomerular filtrate is reabsorbed

② Reabsorption of water, salts occur in the convoluted tubules and collecting duct.

urine is the fluid that results from the above three processes. It enters collecting duct and then into the pelvis of kidney. From there, it enters the urinary bladder through ureter.

⑦ Describe the ~~str~~ of kidney & explain its function



① Kidney is surrounded by an outer fibrous capsule. Below this.

② An outer cortex which is reddish-brown in colour.

③ Inner medulla which contains pyramids of the kidney.

④ Upper expanded end of ureter called pelvis.

⑤ The kidneys are made of structural and functional units called nephrons.

⑥ There are about one million nephrons in each kidney.

A nephron consists of two parts

- ① malphigian bodies made of Bowman's capsule and glomerulus
- ② Renal tubules

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malphigian bodies: It is made of

- ① upper expanded end of the renal tubule called Bowman's capsule
- ② A bunch of capillaries called glomerulus which are packed in Bowman's capsule
- ③ The malphigian bodies are present in the cortex

Renal tubules: They consist of four parts

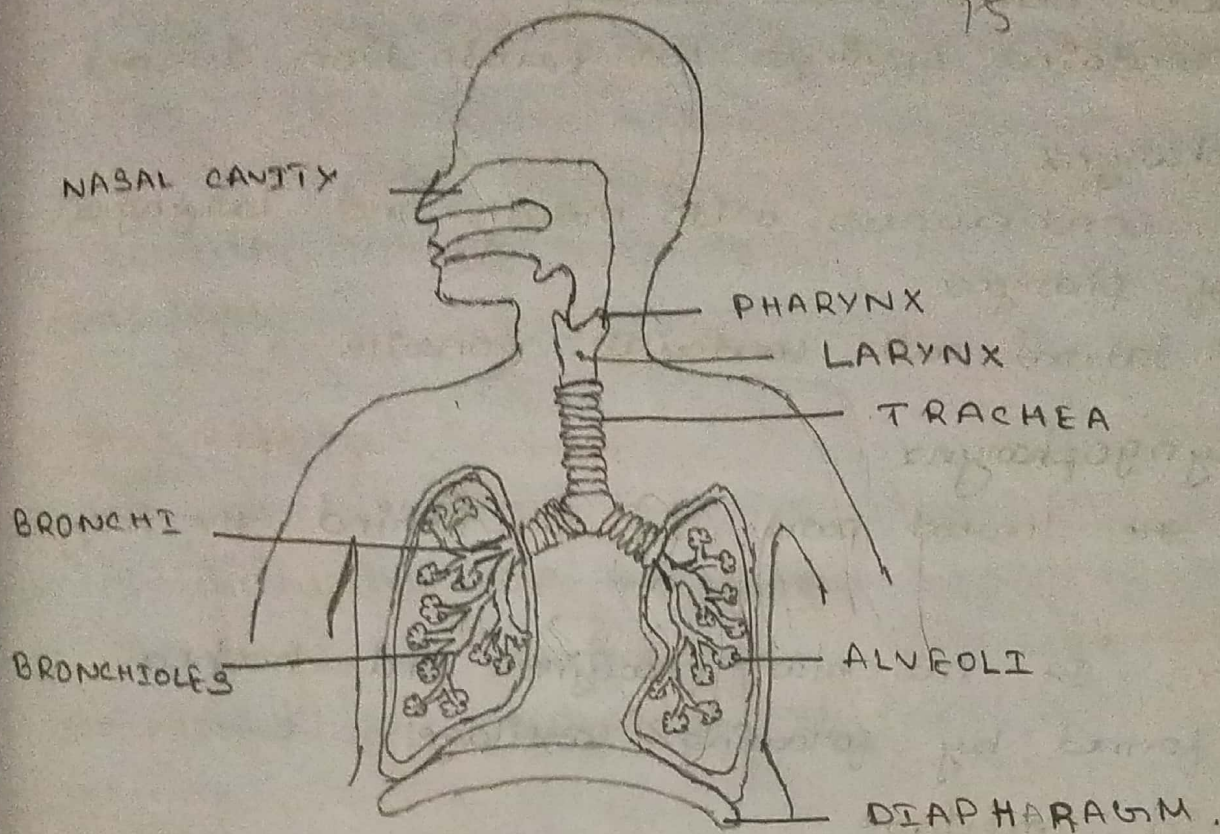
- ① proximal convoluted tubule situated in the cortex
- ② Distal convoluted tubule present in the cortex
- ③ collecting tubules which pass through the medulla and open into the pelvis of kidney.

Functions

- ① Excretion of water and waste products of protein metabolism
- ② Excretion of Excess salt
- ③ Excretion of harmful substances, drugs & toxins
- ④ Regulation of pH of blood
- ⑤ Regulation of blood pressure
- ⑥ Regulation of blood volume
- ⑦ maintenance of blood osmolarity
- ⑧ production of hormones
- ⑨ Regulation of blood glucose level
- ⑩ Regulation of blood ionic composition

④ Gross Anatomy of Respiratory System with suitable diagram.

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The respiratory system consists of following structures.

① Nasal cavity

- ① It is divided into right and left portions by means of nasal septum.
- ② The nasal cavity is lined by mucous membrane.
- ③ The entrance to nasal cavity is formed by anterior nastrils.
- ④ The back of nasal cavity contain posterior nastrils. They form the entrance to nasopharynx.

③ Pharynx: It is divided into three parts.

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(i) Nasopharynx:

- ① It lies behind nasal cavity.
- ② It contains openings for Eustachian tubes.

(ii) Oropharynx

- ① It is continuous with mouth and laryngeal part of pharynx.
- ② Its lateral wall contains tonsils.

(iii) Laryngopharynx

- ① It is the lowest part, it lies behind the larynx.

③ Larynx: It lies below pharynx and trachea.

It is formed by following cartilage

- ① Thyroid cartilage
- ② Cricoid cartilage which lies below the thyroid cartilage.
- ③ Artenoid cartilage
- ④ Epiglottis attached to the top of thyroid cartilage.

④ Trachea (wind pipe)

- ① It is cylindrical tube which is about 11 cm in length.
- ② It begins at the lower end of pharynx.
- ③ At 5th thoracic vertebra, it divides into two bronchi.
- ④ Trachea is made of sixteen to twenty C-shaped incomplete cartilages.
- ⑤ Trachea is lined by mucous membrane.

⑤ Bronchi :-

- ① The trachea ends by dividing into two bronchi namely right and left bronchi. They pass to the corresponding lung.
- ② The right bronchi is shorter and wider than the left.
- ③ Bronchi are made up of complete rings of cartilage.

⑥ Bronchioles

- ① They are formed by the division of bronchi.
- ② Bronchioles are the finest branches of bronchi.
- ③ Bronchioles do not have cartilage. They are lined by cuboidal epithelium.

⑦ Alveoli

- ① They are final termination of each bronchi.
- ② They contain a thin layer of epithelial cells surrounded by numerous capillaries.
- ③ Exchange of gases takes place through the walls of these capillaries.

⑧ Explain the mechanism of respiration ?

Ans: Mechanism of respiration in humans involves

- ① Breathing
- ② External respiration
- ③ Transport of O_2 to Tissues
- ④ Internal respiration
- ⑤ Transport of CO_2 from tissues

① Breathing

- ① This is movement of air into and out of the lungs
- ② Breathing supplies O_2 to alveoli and eliminates CO_2
- ③ The main muscles involved in breathing are Intercostal muscle and diaphragm.
- ④ Breathing depends upon change in pressure & volume in the thoracic cavity.

I. Inspiration

- ① It takes place when the size of thoracic cavity $\uparrow$ & air pressure $\downarrow$
- ② As diaphragm and Intercostal muscle contracts there is increase in size of thoracic cavity.
- ③ with increase in size of thorax, lungs expands simultaneously.
- ④ As lungs expands, the air pressure is reduced inside, so to equalize the pressure Atmospheric air rushes inside the lungs.

II Expiration

- ① It takes place when size of thoracic cavity $\downarrow$ & air pressure $\uparrow$
- ② As diaphragm and Intercostal muscle relaxes there is decrease in size of thoracic cavity.
- ③ with decrease in size of thorax lungs is compressed simultaneously.

④ As lungs is compressed, the air pressure is increased inside. So to equalize the pressure with atm pressure air is forced outside.

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② External respiration

① This is the exchange of gases by diffusion b/w alveoli and blood in the alveolar capillaries.

② Diffusion of O_2 & CO_2 depends on pressure difference.

③ The venous blood in alveolar capillaries contains high level of CO_2 and low level of O_2 .

④ CO_2 then diffuses from higher level to lower level until equilibrium is maintained.

⑤ By the same process O_2 diffuses from alveoli to venous blood in alveolar capillaries until equilibrium.

③ Transport of oxygen to tissue.

① Oxygen is carried ⁱⁿ by the blood to the tissue in two forms.

① oxyhaemoglobin: It is chemical combination of O_2 with haemoglobin.

② Solution in plasma water: O_2 dissolves in plasma of blood and carried to tissues.

④ Internal respiration

- ① This is the exchange of gases by diffusion b/w blood in the capillaries and body cells. 20
- ② In cells, oxygen carried in the form of oxyhaemoglobin get dissociated to liberate free O_2 .
- ③ The free O_2 then oxidize the glucose in the presence of respiratory enzymes to liberate CO_2 , water & energy.
- ④ Energy is utilized by the tissue for its vital activity, while CO_2 is diffused from the tissue.
- ⑤ Transport of CO_2 from Tissue
 - ① CO_2 is transported by three mechanisms
 - (i) As carbonic acid
 - (ii) bicarbonate ions
 - (iii) As carbamino haemoglobin

Finally, CO_2 are carried to lungs and expelled out by expiration process of breathing.

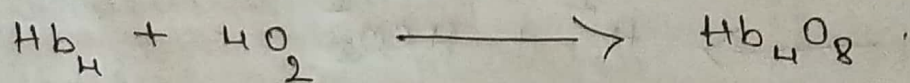
10) Give an account of transport of oxygen & carbon dioxide in blood

① Transport of O_2 to Tissue 21

① oxygen is carried in the blood to the tissue in two form

① oxyhaemoglobin

It is a chemical combination of O_2 with Haemoglobin



② Solution in plasma water

① O_2 dissolve in plasma of blood and carried to tissues

② when the level of O_2 is high in blood, it combines with haemoglobin to form oxy-haemoglobin

③ oxyhaemoglobin is unstable and under certain conditions readily dissociates and releases oxygen

④ Factors that increase dissociation include low O_2 levels, low pH, raised temperature

② Transport of CO_2 from Tissue

① It is transported by three mechanisms

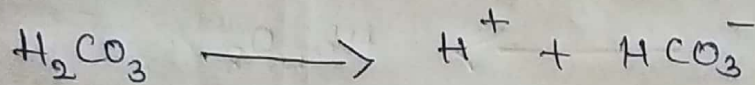
① as carbonic acid

① Some CO_2 dissolved in the plasma to form carbonic acid



② As bicarbonate ions

① Carbonic acid formed in blood plasma quickly ionizes to bicarbonates and hydrogen in the presence of enzyme carbonic anhydrase



② bicarbonate ions combined with sodium and potassium present in blood to form sodium bicarbonate or potassium bicarbonate and transported in this form

③ As carbamino haemoglobin

① Some CO_2 combined with haemoglobin to form carbamino haemoglobin



Finally CO_2 are carried to lungs and expelled out by expiration process of breathing.

III Explain Regulation of Respiration.

Ans: Respiration is regulated by two controls.

- ① Nervous control
- ② Chemical control

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① Nervous control

- ① It is exerted by respiratory centre present in the medulla oblongata of brain.
- ② From this centre afferent impulses pass to:
 - (i) Diaphragm through phrenic nerve
 - (ii) Intercostal muscles through Intercostal nerves

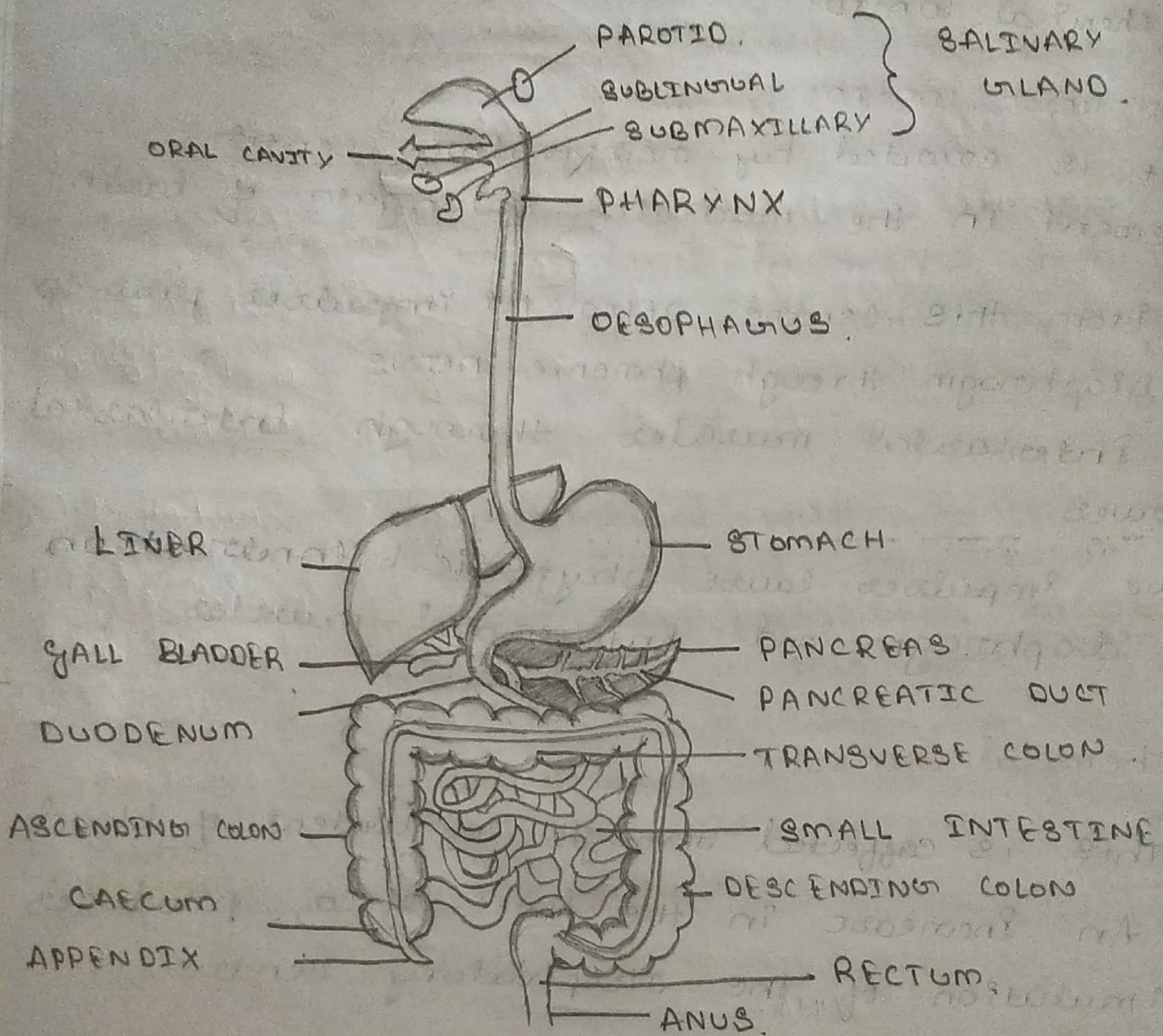
These impulses cause rhythmic contraction of diaphragm and Intercostal muscles.

② Chemical control

- ① This is affected through CO_2 content of blood
- ② An Increase in the level of CO_2 produces stimulation of the respiratory centre
- ③ A decrease in carbon dioxide level produces the opposite effect.

and hypoxia in part
the H^+ ions, from the liver and kidney - also liver ①
the liver and kidney - also liver ②

⑩ Draw a neat labelled diagram of GI tract, explain how fats are digested and absorbed
Carbohydrates
proteins



FAT metabolism.

They are classified into

- ① Animal fats - Fats present in meat, egg, butter etc
- ② Vegetable fats - Fats present in oil

Fat metabolism occurs in following stages

① Digestion of fat in Small Intestine

① Digestion of fats requires emulsification by bile salts in the Intestine

② Emulsification is breaking of complex lipid into small droplets by the action of bile salts.

complex lipid $\xrightarrow{\text{Bile salt}}$ Emulsified fat

③ Intestinal lipase and pancreatic lipase convert fats into fatty acids and glycerol

Emulsified fat $\xrightarrow{\text{Pancreatic lipase}}$ Fatty acids + glycerol

② Digestion of carbohydrates in Small Intestine

① Firstly in the mouth 30% of starch is hydrolysed by salivary amylase into disaccharide maltose.

Starch $\xrightarrow{\text{Salivary amylase}}$ Dextrin $\xrightarrow{\text{Salivary amylase}}$ maltose

② In the Intestine pancreatic amylase act on polysaccharides like starch and converts it into maltose.

Starch $\xrightarrow{\text{pancreatic amylase}}$ maltose

(iii) maltase, sucrase and lactase act on disaccharides and converts them into simple monosaccharides

maltase $\xrightarrow{\text{maltase}}$ glucose + glucose

Lactase $\xrightarrow{\text{lactase}}$ glucose + galactose

Sucrase $\xrightarrow{\text{sucrase}}$ glucose + fructose

(iv) Simple Sugar is the end-product of carbohydrate digestion. They are ready for absorption

③ Digestion of protein in Small Intestine

(i) Enterokinase converts trypsinogen of pancreatic juice into trypsin

- Active trypsin acts on proteins and converts proteins into polypeptides.

Trypsinogen $\xrightarrow{\text{Enterokinase}}$ Trypsin

proteins $\xrightarrow{\text{Trypsin}}$ polypeptides

(ii) Trypsin converts chymotrypsinogen of pancreatic juice into chymotrypsin

- Active chymotrypsin acts on proteins and converts protein into polypeptides

chymotrypsinogen $\xrightarrow{\text{Trypsin}}$ chymotrypsin

proteins $\xrightarrow{\text{chymotrypsin}}$ polypeptides

- (ii) Pepsin acts on poly peptides and converts it to amino acids

poly peptides $\xrightarrow{\text{Pepsin}}$ amino acids

- (iv) The end product of protein digestion is free amino acids, and they are ready to be absorbed.

(4) Digestion of protein in stomach

- (i) The mucous membrane of stomach contains glands which secrete gastric juice
- (ii) The secretion of gastric juice occurs due to
- (i) reflex mechanism through vagus nerve
 - (ii) gastrin, a hormone secreted by the action of food stuffs on gastric mucous membrane
 - (iii) psychological effects produced by taste or smell of food.
- (iii) gastric juice contains pepsin, renin, Hydrochloric acid and Intrinsic factor.

- (iv) pepsin is an enzyme produced by gland present in fundus and body of stomach
- In presence of HCl, pepsin converts protein into peptone

protein $\xrightarrow{\text{Pepsin}}$ peptone

- (v) Renin is an enzyme which curdles milk
- It includes the conversion of caseinogen, the soluble protein of milk into insoluble casein

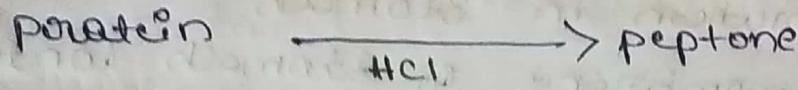
Caseinogen $\xrightarrow{\text{Renin}}$ Casein

(vi) HCl is secreted by parietal cells of gastric glands

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- HCl is useful in Neutralisation of Saliva and acidification of food

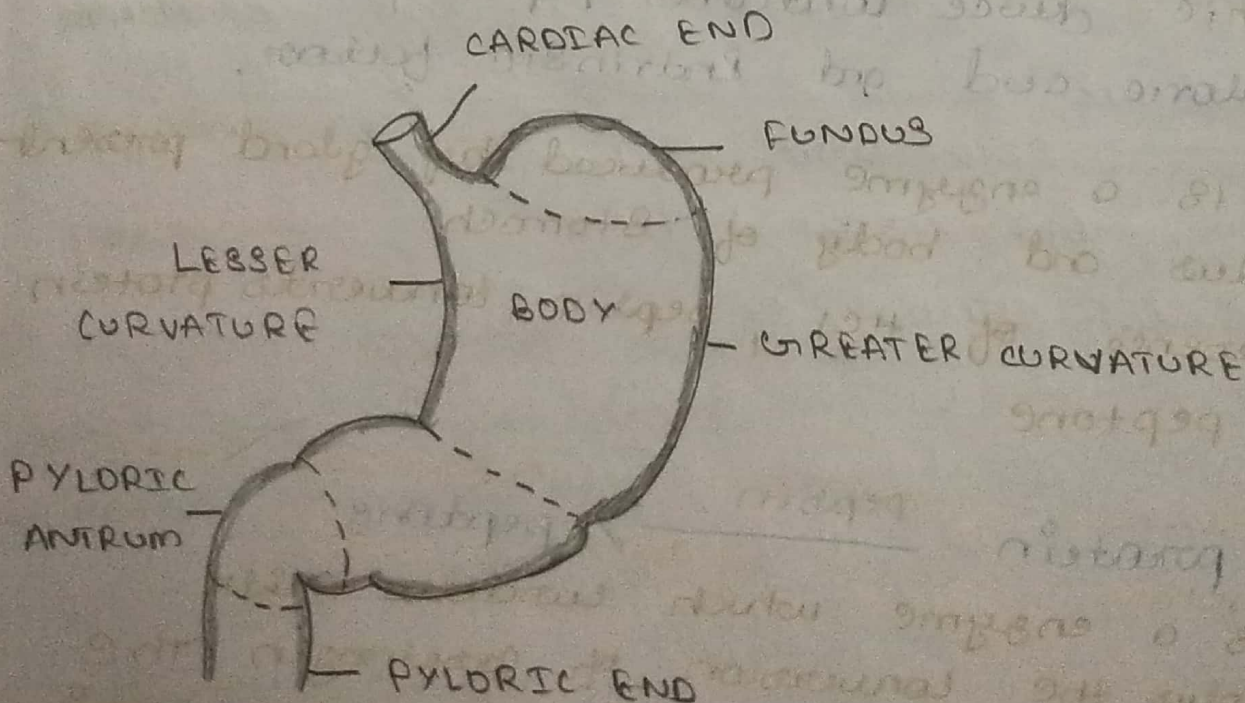
- In presence of HCl, pepsin converts protein into peptone



- Antiseptic action by killing bacteria

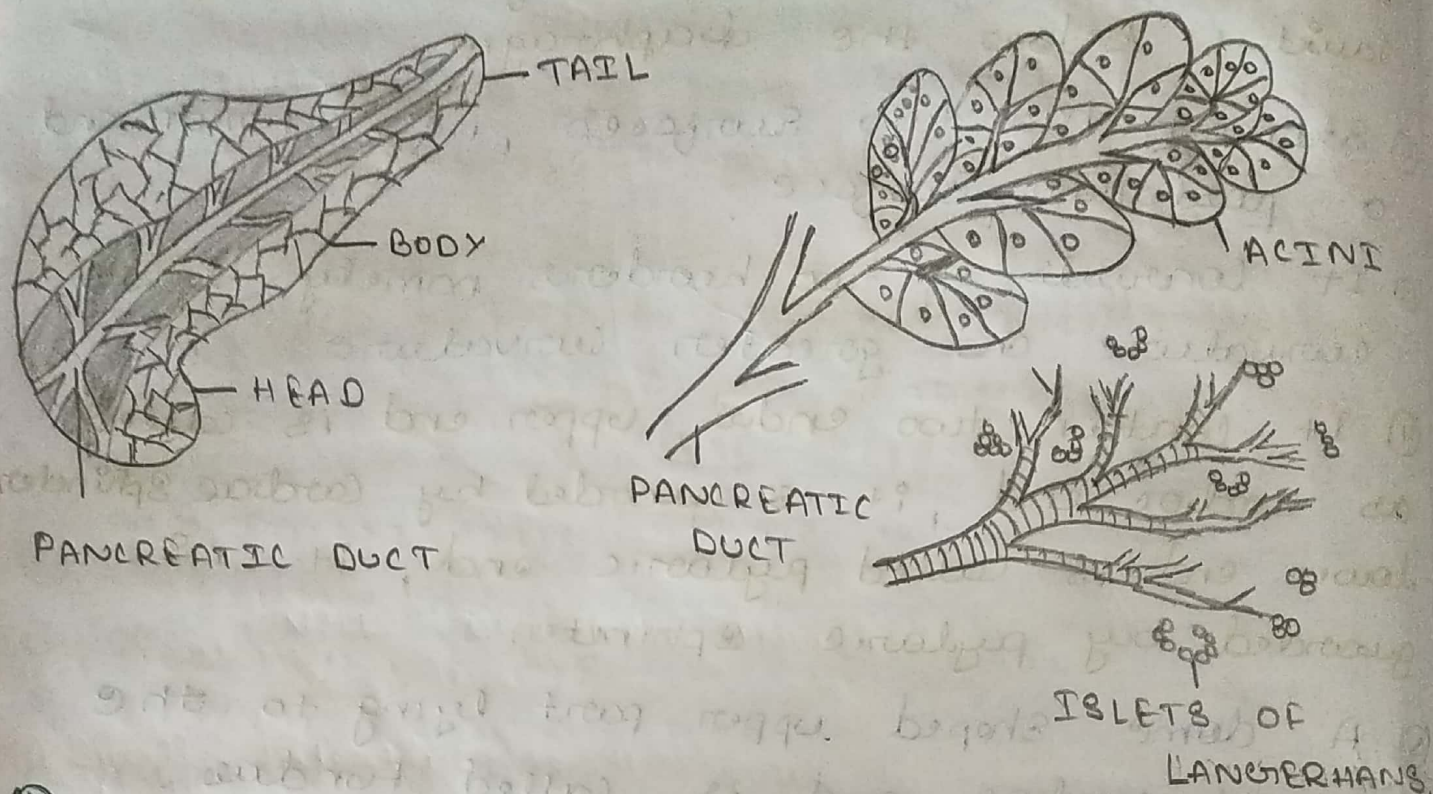
(vii) Intrinsic factor is a content of gastric juice, which is necessary for absorption of Vitamin B₁₂. The Vitamin necessary for development of RBC.

(13) gross anatomy of stomach & its function.



- ① Stomach is the dilated portion of alimentary canal and it receives food from oesophagus. It lies in the upper part of abdominal cavity below the diaphragm.
- ② Stomach has two surfaces, i.e. anterior and posterior surface.
- ③ It consists of two borders namely lesser curvature and greater curvature.
- ④ It contains two ends, upper end is called as cardiac end, it is guarded by cardiac sphincter - lower end is called pyloric end, it is guarded by pyloric sphincter.
- ⑤ A dome shaped upper part lying to the left of cardiac end is called fundus.
- ⑥ Body is the main part of stomach & the lower part is called as pyloric antrum.
- ⑦ Stomach consists of following four coats:
 - (i) peritoneal coat made of serous covering
 - (ii) muscular coat made of fibres
 - (iii) submucous coat made of areolar tissue
 - (iv) mucous coat made of mucous membrane.
- ⑧ The mucous membrane of stomach contains glands which secrete gastric juice.

Q19) Discuss anatomy of pancreas, Discuss endocrine & Exocrine Secretion



- ① pancreas is a long slender gland which lies across abdominal wall behind stomach
- ② pancreas consists of head, body and a tail
 - ① Head lies in C-shaped curve of duodenum
 - ② Body lies in front of vertebral
 - ③ Tail lies in contact with spleen
- ③ pancreas contains no of lobules called acini
In b/w the acini there are group of endocrine cells called Islets of Langerhans
- ④ Small ducts emerge from these lobules these ducts unite and reunite to form pancreatic duct
- ⑤ pancreatic duct begins at the tail and emerges from the head of pancreas and enters the duodenum along with common bile duct.

⑥ The secretion of pancreas can be classified into.

- ① Endocrine Secretion ② Exocrine Secretion

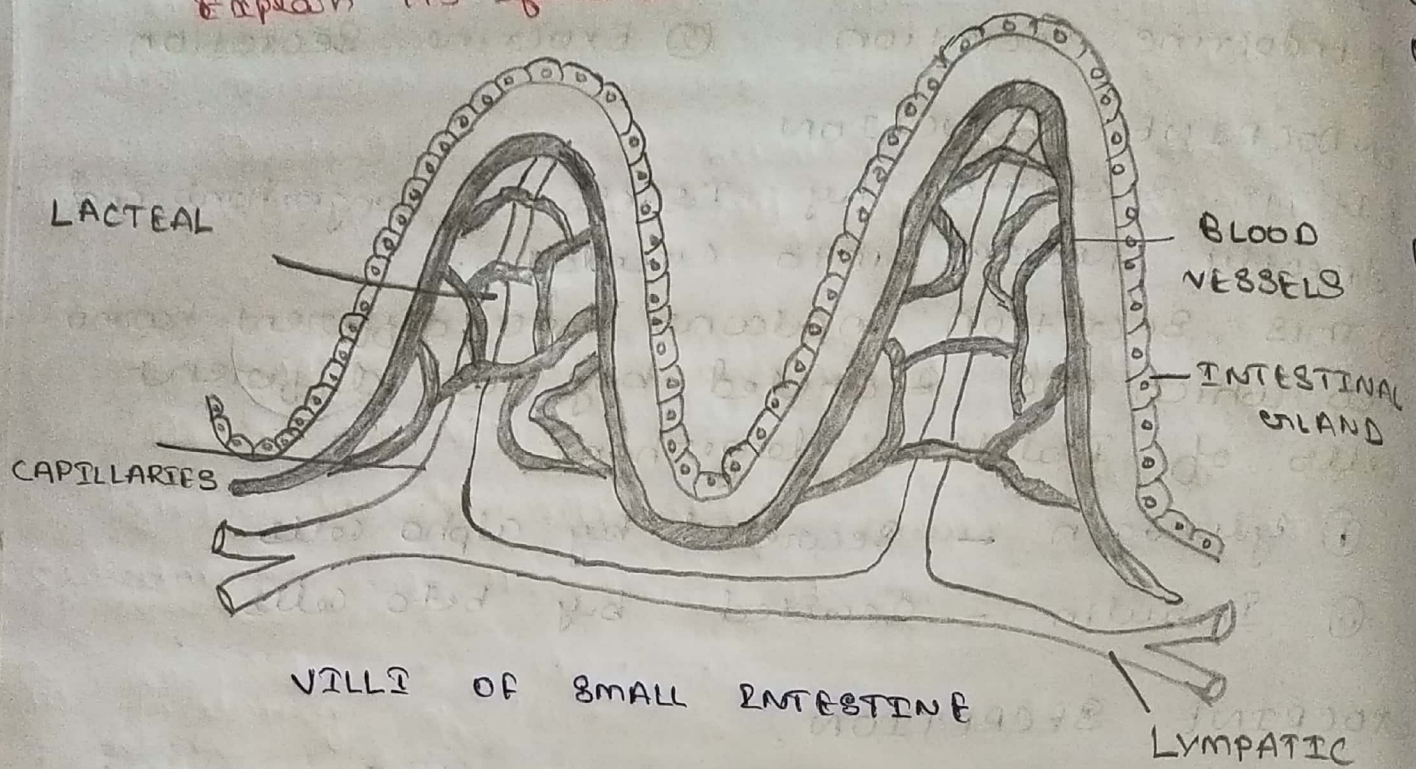
ENDOCRINE FUNCTION.

- ① It is secreted by Islets of Langerhans and directly poured into circulation.
- ② This secretion contains two different hormones which are secreted by two different cells of Islets of Langerhans.
- ① Glucagon - secreted by alpha cells
 - ② Insulin - secreted by beta cells

EXOCRINE SECRETION.

- ① The pancreatic juice which is digestive in function is carried to duodenum through pancreatic duct.
- ② pancreatic juice contains following digestive enzymes
- ① Lipase which converts fats into fatty acids and glycerol.
$$\text{Fats} \xrightarrow{\text{lipase}} \text{fatty acid} + \text{glycerol}$$
 - ② Amylase which converts starch into maltose.
$$\text{Starch} \xrightarrow{\text{Amylase}} \text{maltose}$$
 - ③ Trypsin which converts peptones into amino acid.
$$\text{peptones} \xrightarrow{\text{Trypsin}} \text{amino acid}$$

Q 15) ~~Ques~~ Ques Anatomy of Small Intestine and
Explain its function



① Small Intestine is the part of alimentary canal which extends from pyloric end of stomach to caecum.

② Small Intestine consists of three parts.

① Duodenum.

② Jejunum

③ Ileum

③ Duodenum is a C-shaped fixed part which is attached to abdominal wall by peritoneum.
+ The head of pancreas lies in the cavity of duodenum.

- Bile duct and pancreatic duct open together at the concave surface.

④ Jejunum is the continuation of duodenum and it is middle portion of small intestine.

⑤ Ileum forms the last part of small intestine.

- ⑥ Small Intestine consists of
 - ① peritoneal coat made of serous membrane
 - ② muscular coat made of fibres
 - ③ submucous coat made of areolar tissue
 - ④ mucous coat made of mucous membrane
 - ⑤ mucous coat contain villi which absorb carbohydrates, proteins and fats
- ⑦ The acidic chyme from the stomach enters into the duodenum, there it mixes with
 - ① alkaline intestinal juice called Succus entericus
 - ② alkaline secretion from liver and pancreas

Absorption in Small Intestine

- ① The Absorption of digested food occurs in Small Intestine through villi
- ② villi are minute projections which are present in the inner mucous coat of the Intestine
- ③ Each villi has
 - ① central lymphatic vessels called lacteal, Fats are absorbed into lacteal
 - ② capillaries which absorb carbohydrates & proteins are carried to liver by portal vein
 - ③ lymphoid tissue which holds together the lacteals and capillaries

Absorption of fat

- ① Fatty acids and glycerol being insoluble cannot be absorbed into the blood.

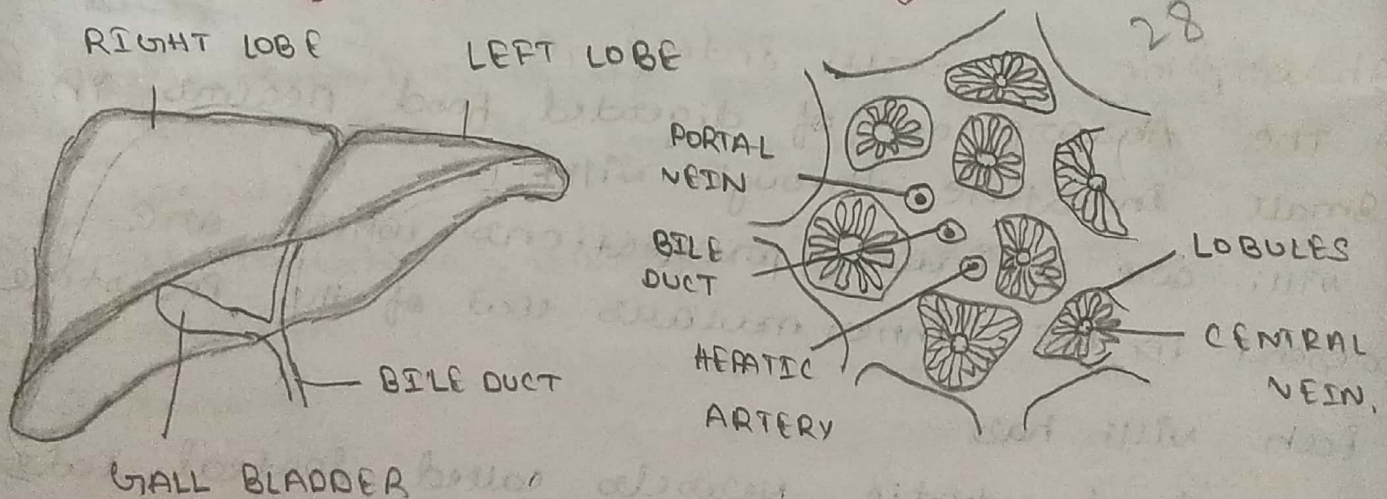
③ Bile salts combine with fatty acids and glycerol to produce water soluble complexes called micelles.

④ on contact with the mucosal layer, the lipid portion enters the cell passively, while the bile salt left behind.

⑤ The fatty acids are transported into the lymph vessels in the villi.

⑥ Lymph vessels ultimately release the absorbed substance into the blood stream.

⑩ Anatomy of liver & its function



① Liver is the largest abdominal organ lies below the diaphragm.

② Liver contains two lobes right lobe and left lobe.

③ Liver contains four surfaces.

(i) Superior surface which is in contact with diaphragm.

(ii) Inferior surface which is facing the abdominal viscera.

(iii) Anterior surface which is separated from ribs.

(iv) posterior surface which lies in front of vertebral column.

- (14) The liver consists of a large number of liver cells called lobules.
- Each lobule has central vein
- (15) The connective tissue lying in between the lobules contains the branches of
- (i) portal vein
 - (ii) hepatic artery
 - (iii) bile duct
- (16) The secretion of bile is carried through bile duct.
- The bile duct from the right and left lobes of liver unite to form common hepatic duct.
 - The hepatic duct unites with cystic duct of gall bladder to form common bile duct.
 - The common bile duct unites with pancreatic duct in the duodenum at a papilla called ampulla of Vater.

(17) Function of liver.

- (i) Secretion of bile
- (ii) Synthesis and storage of glycogen
- (iii) Formation of urea by the decarboxylation of amino acids
- (iv) Synthesis of plasma proteins like albumin and globulin
- (v) Conversion of unsaturated fats into saturated fats
- (vi) Storage of Iron and vitamin B₁₂, which is necessary for the formation of RBC.

- (vii) Synthesis of prothrombin and fibrinogen which are necessary for blood coagulation
- (viii) production of heat as a result of metabolic reaction

(ix) Inactivation of toxic substances & drugs

(x) Storage of vitamins A, D, E and K

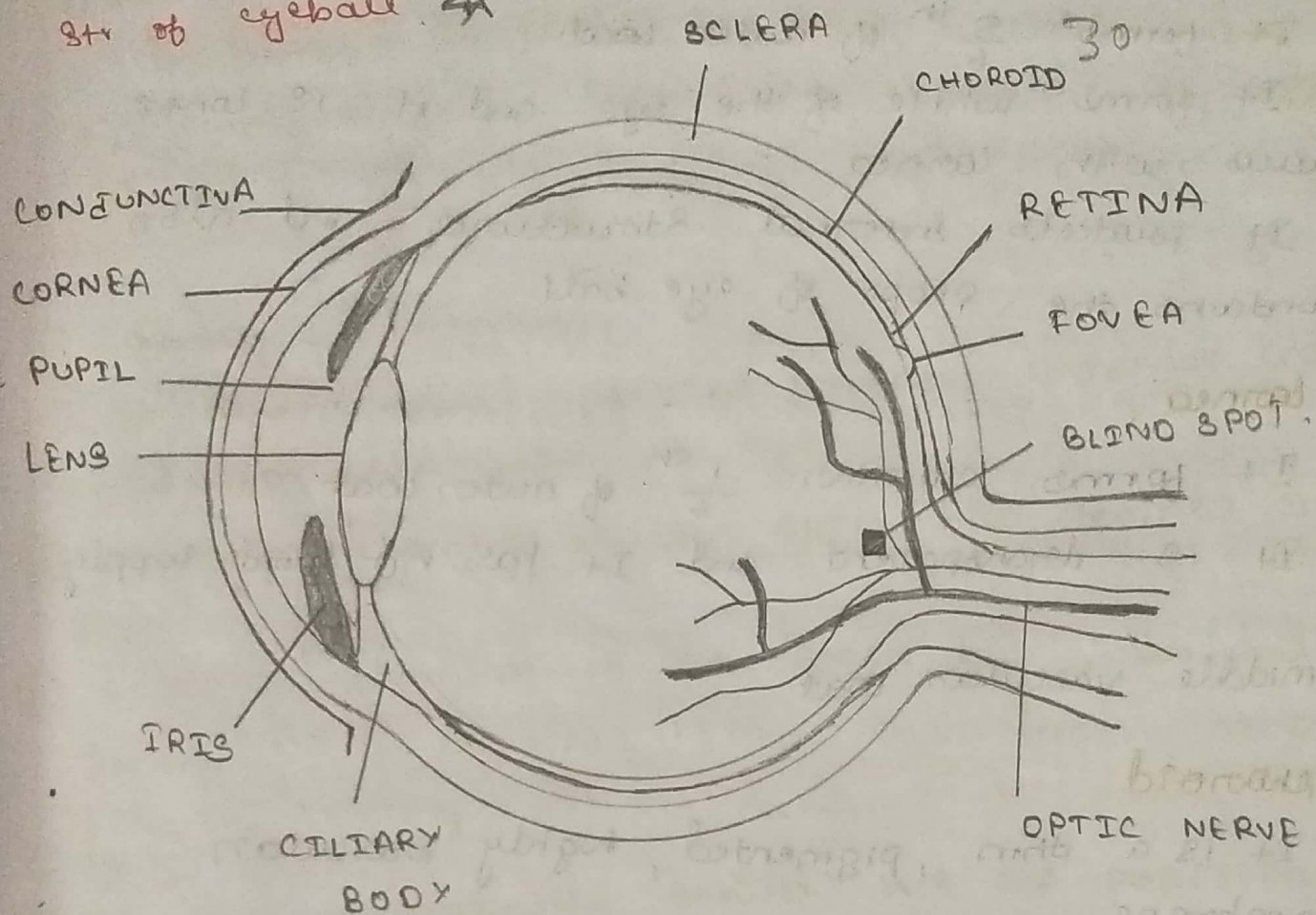
(18) Function of small intestine

- ① onward movement of its contents by peristalsis
- ② secretion of intestinal juice
- ③ completion of chemical digestion of carbohydrates, proteins and fats
- ④ protection against infection by microbes
- ⑤ secretion of hormones
- ⑥ absorption of nutrients

(19) Functions of stomach

- ① It stores swallowed food
- ② mechanical breakdown of swallowed food
- ③ secretion of gastric juice
- ④ production of Intrinsic factor, required for absorption of vitamin B₁₂
- ⑤ Mixing food with gastric secretions until it forms chyme
- ⑥ Finally sends mixture to small intestine

19) Draw a neat, labelled diagram of eye and explain the physiology of vision, Describe the str of eyeball. ★



- ① The eyeball is almost spherical in shape
- ② The eye ball contains

(i) Three coats

- outer fibrous coat
- middle vascular coat
- inner nervous coat

(ii) light transmitting structures

- aqueous humor
- lens
- vitreous humor

① outer fibrous coat

① Sclera posterior

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② It forms $\frac{5}{6}$ th of outer coat

③ It forms white of the eye and it is continuous with cornea

④ It protects internal structures and also maintains the shape of eye ball

② Cornea

① It forms anterior $\frac{1}{6}$ th of outer coat

② It is transparent and it has no blood supply

③ middle vascular coat

① choroid

① It is a thin, pigmented, highly vascular membrane

② It lies b/w inner surface of sclera and retina

④ ciliary body

① It is the anterior continuation of choroid

② Ciliary body contains ciliary muscle, ligament of lens is attached to ciliary muscle

⑤ Iris

① It is the anterior continuation of ciliary body

② Iris is a pigmented membrane, colour of eye depends on its pigment

③ Iris has central opening called pupil

③ Inner nervous coat

32

① Retina

Innermost + nervous coat of eyeball and lies immediately deeper to choroid. It contains 'Rod and cones' Light transmitting str

① Aqueous humor

① It is the fluid present in both anterior and posterior chambers of eye

② Anterior chamber is the space b/w cornea and Iris.

③ posterior chamber is the space b/w iris and lens

② Lens

① It lies immediately behind iris and pupil

② It is attached to ciliary body by means of ligament of lens

③ vitreous humor

① It is a jelly like fluid which fills the space b/w lens and retina.

② It maintains shape of the eye.

7 Physiology of vision.

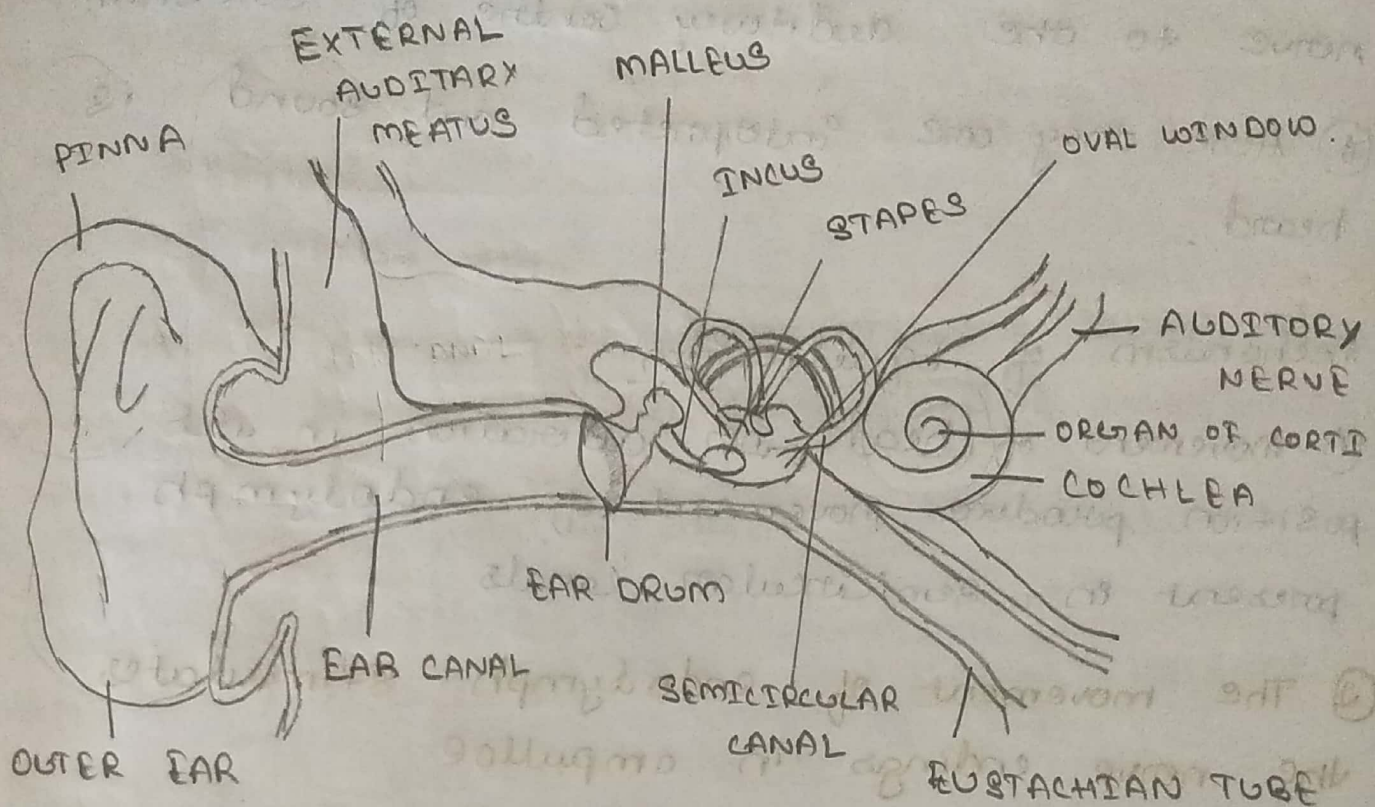
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- ① Light enters the eye through the cornea
- ② Iris and the pupil regulate the amount of light entering the eye
- ③ The image is then focussed through the lens on the retina
- ④ The pigmented choroid darkens the interior of the eye. This reduces scattering and reflection of light
- ⑤ The image then stimulates the receptors present in the rod and cones of retina
- ⑥ These impulses are then carried through optic nerve to visual cortex present in the brain, here the image is perceived.

Accommodation

- ① It is the focussing of the lens for near vision
- ② Ciliary muscles which are attached to the lens contribute to the mechanism of accommodation
- ③ The contraction and relaxation of these muscles alter the focal length of the lens
- ④ Contraction of these muscles focusses the lens for near vision
- ⑤ Relaxation of these muscles focusses the lens for distant vision
- ⑥ Focussing the lens for distant vision is called as paralysis of accommodation.

20. write a neat, labelled, diagram of ear
 Explain physiology of hearing? what is the non-
 hearing function of ear?



physiology of hearing.

- ① Sound waves in air are collected by pinna
- ② The external auditory meatus directs these waves to the ear drum which then vibrates
- ③ The vibrations are transmitted by malleus, incus, stapes to the membrane covering oval window
- ④ From the inner surface of this membrane, vibrations are transmitted to organ of Corti through perilymph and endolymph.

⑤ From the organ of Corti, the impulses produced by vibration are carried ~~to brain~~ ~~stern~~ ~~through~~ ~~to the~~ by the auditory nerve to the auditory centre of cerebrum

⑥ Here they are interpreted and sound is heard.

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Mechanisms of Equilibrium

① Movement of head or alteration in its position produce movement of endolymph present in semicircular canals.

② The movement of endolymph stimulates the nerve endings in ampullae

③ The impulses are carried to brain through the vestibular portion

④ These impulses produce sensations which make us conscious about the position of the head

⑤ If the position of head is disoriented, we can then adjust it so as to maintain balance and equilibrium.

Q2) Describe the structure of olfactory receptors.

① The receptors for smell are olfactory rods. They are present in the mucous membrane of upper part of nasal cavity.

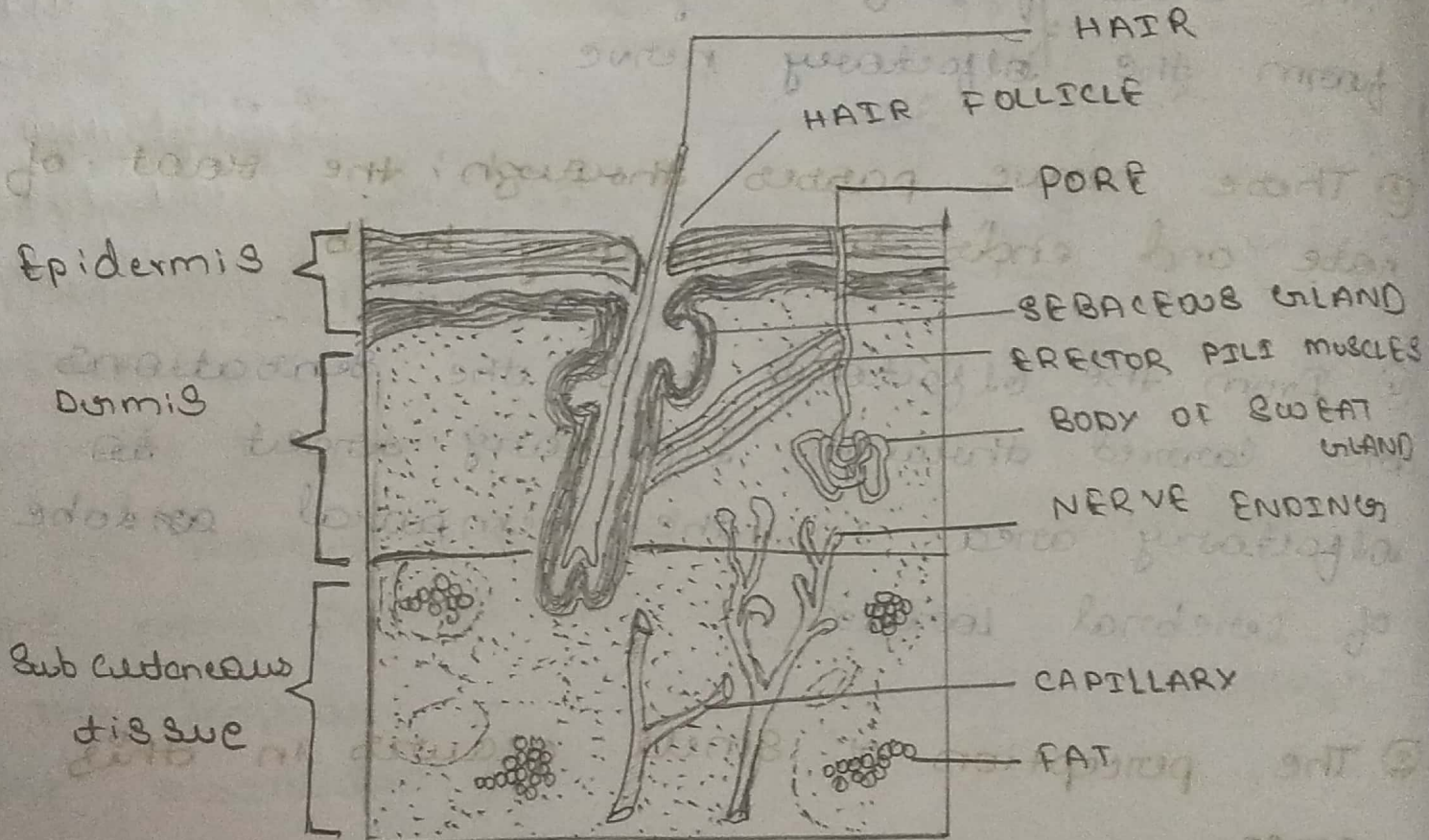
② The ends of olfactory rods collect to form the olfactory nerve.

③ These nerve passes through the roof of nose and ends in olfactory bulb.

④ From the olfactory bulb, the sensations are carried through olfactory tract to olfactory area in the temporal lobe of cerebral cortex.

⑤ The perception of smell occurs in this area.

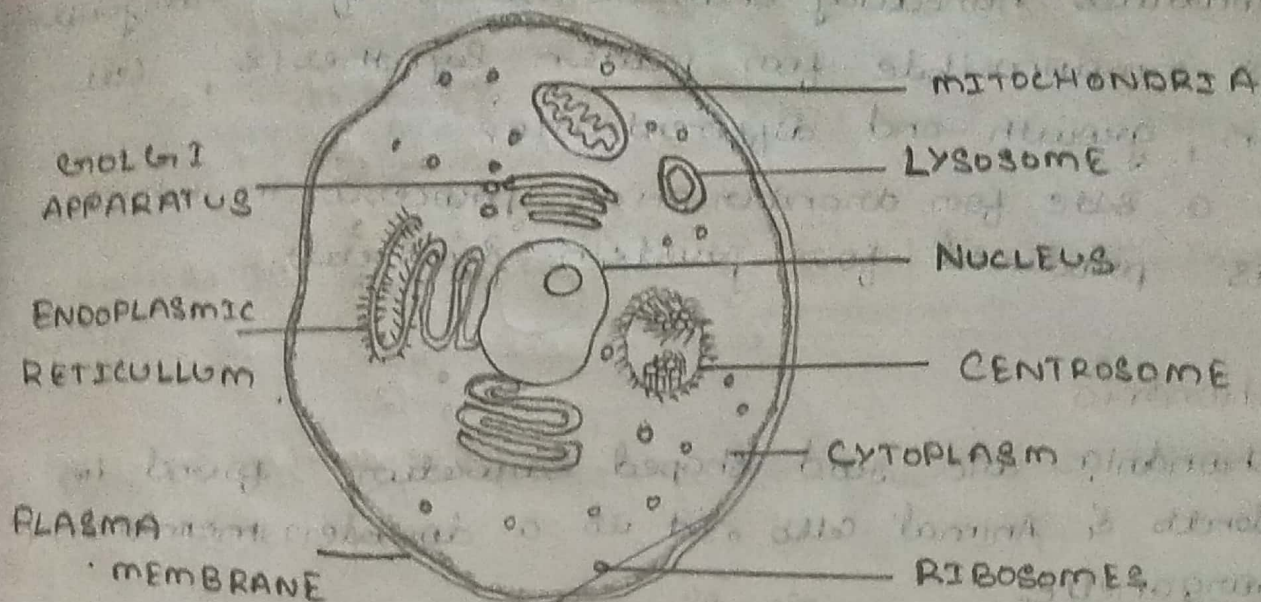
Q2 Draw a neat labelled diagram of skin



STRUCTURE OF SKIN

5 mark important concepts

① Cell and its organelles



① plasma membrane

- ① The plasma membrane consists of two layers of phospholipids with protein and sugar molecule embedded in them.
- ② The phospholipid molecule have a head which is electrically charged and hydrophilic and a tail, has no charge and is hydrophobic.

functions

- ① It acts as passage for electrolytes
- ② The plasma membrane acts as recognition site
- ③ The protein membrane involved in transport across membrane

② Nucleus

- ① Nucleus is the largest organelle and is contained within the nuclear envelope
- ② The nuclear envelope consists of phospholipids that form lipid bilayer
- ③ The nuclear envelope is perforated with numerous pores called nuclear pores. It is connected with ER.

Functions

- ① It controls heredity characteristics of an organism
- ② It is responsible for protein synthesis, cell division, growth and differentiation
- ③ It is a site for transcription process in which mRNA is produced for protein synthesis

③ mitochondria

- ① mitochondria are rod shaped structure found in both plants & animal cells. It is a double membrane bound organelle
- ② The membranes are made up of phospholipids and proteins

Functions

- ① The most important function of the mitochondria is to produce energy.
- ② It helps in maintain concentration of calcium ions within the cell
- ③ mitochondria involved in aerobic respiration

④ Ribosomes

- ① They are tiny granules composed of RNA and protein
- ② Situated in two areas of the cytoplasm
- ③ They are scattered in the cytoplasm few are connected to ER

Functions

- ① They synthesise protein from amino acids
- ② The genetic message from the mRNA is translated into proteins during DNA translation.

⑤ Endoplasmic Reticulum

- ① They are series of interconnecting membranous canals in the cytoplasm.
- ② Ribosomes found on ER, referred as Rough ER.
- ③ Smooth ER consists of tubules. This increases surface area in plasma membrane.

Function.

- ① Rough ER synthesize protein, where as Smooth synthesize lipids.
- ② It involves in transportation of proteins and carbohydrates to other organelles.
- ③ It provide increased surface area for cellular respiration.
- ④ It helps in formation of Nuclear membrane during cell division.

Smooth ER	Rough ER
① It does not contain Ribosomes on its surface. ② It synthesize lipids ③ found near cell membrane ④ composed of Tubules	① It contains Ribosomes on its surface ② It synthesize proteins ③ found near cytoplasm ④ composed of cisternae

⑥ Golgi apparatus

- ① They are membrane bound organelles, which are sac-like. They found in cytoplasm of animal cells.
- ② It contains stacks of membrane-bound structure known as cisternae.

9 Functions

- ① It mainly modify proteins that are prepared by rough endoplasmic reticulum.
- ② It is involved in transport of lipid molecule around the cell.
- ③ They also create lysosomes

⑦ Lysosomes

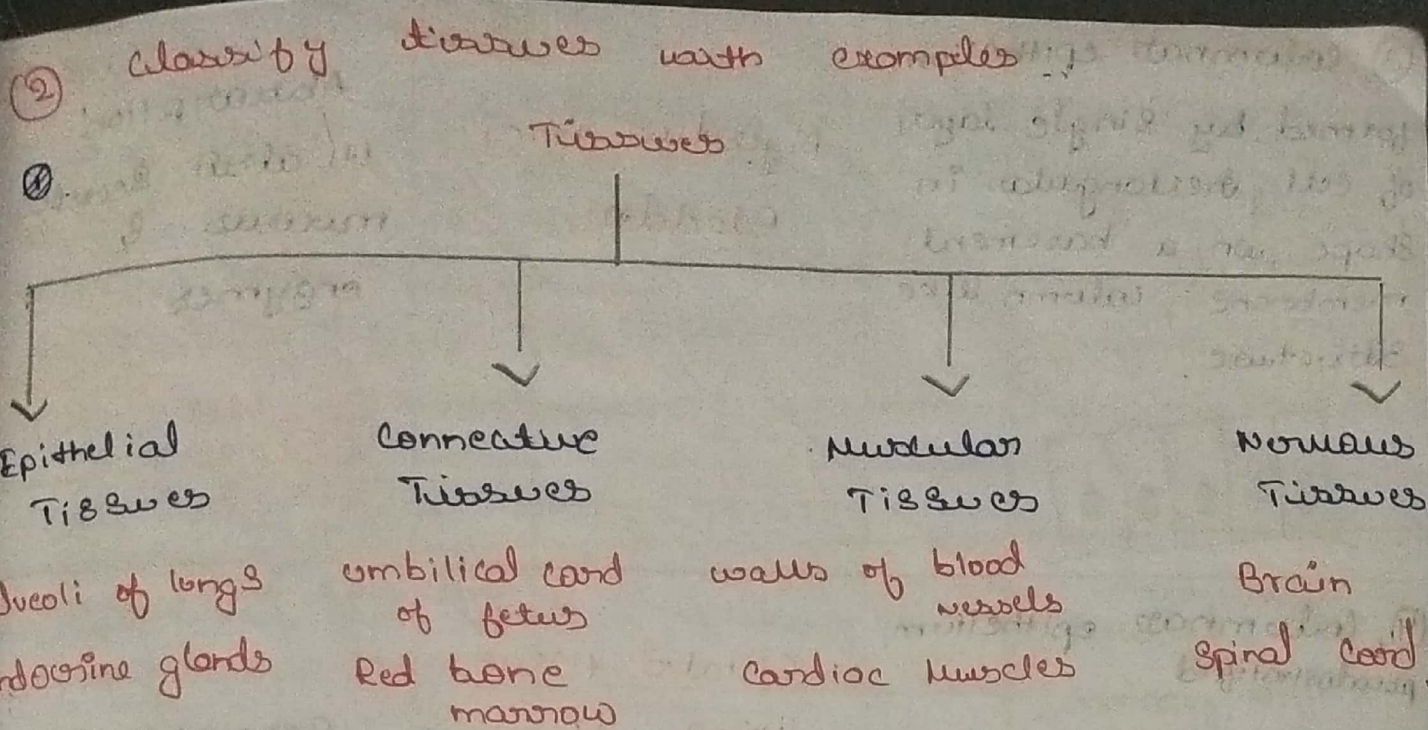
- ① Lysosomes are spheres made up of a lipid bilayer that encloses fluid
- ② They are formed by budding of golgi complex

Functions

- ① It contain variety of enzymes involved in breaking down fragments of organelles and large molecules
- ② Lysosomes in WBC digest foreign material such as microbes

⑧ Chromosomes

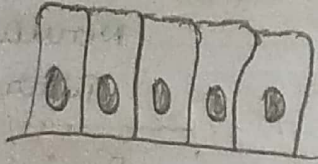
- ① In nucleus of each cell, DNA molecule is packed into thread like structures called chromosomes



③ Describe the different types of epithelial tissue with examples

Description	Location	function
① Squamous epithelium Single layer of flattened cell, cell fit closely like stone, forming thin & smooth membrane 	alveoli of lungs, lining of heart, blood vessels, lymphatic vessels	Allow materials to pass through by diffusion, filtration, secretion
② Cuboidal epithelium This consists of cube-shaped cells fitting closely together lying on basement membrane 	Ducts of glands, In kidney tubules	Secretion and absorption.

③ Columnar epithelium
formed by single layer
of cell, rectangular in
shape, on a basement
membrane, column like
structure.

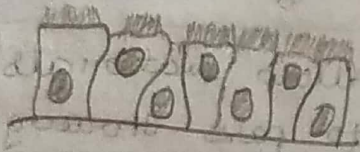


Digestive tract
Bladder

Absorption
It also secretes
mucus &
enzymes

④ Columnar epithelium,
pseudostratified

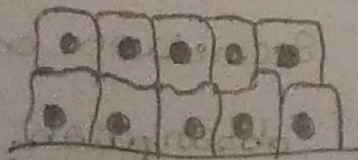
Cell nuclei are at
various levels. All
cells are attached
to basement membrane
in single layer.



Ciliated tissue
lining in
trachea, upper
respiratory tract

Secretion
of mucus

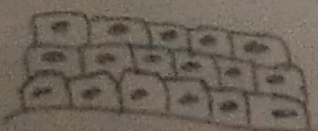
⑤ Stratified Columnar
irregular shaped
cells in basal layer
& column like cells
in apical layer



The male urethra
The ducts of
some glands

Secretion
protection

⑥ Stratified Squamous
Two or more layers
of cells, cell in deeper
layer vary from
cuboidal to columnar.

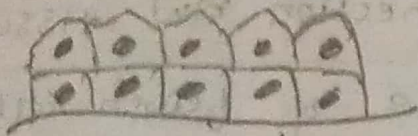


Lining in
esophagus,
mouth, vagina

protects
against abrasion

⑦ Stratified cuboidal

Two or more layers of cells, all in apical layer are cube shaped.



Sweat glands

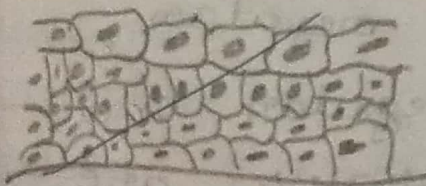
Salivary gland

Mammary glands

protective
Tissue

⑧ Transitional epithelium

variable appearance
multiple layers
elasticity make it
ideal



Lines the
bladder, urethra,
and uterus

Allows the
urinary organs
to expand
and stretch.

11

Loose Connective Tissue

- ① LCT is a type of connective tissue that surrounds blood vessels, nerves, organs
- ② consists of many cells
- ③ mainly contain fibroblasts
- ④ consists of loosely arranged fibres
- ⑤ Areolar, adipose, reticular tissues are three types
- ⑥ serve as supporting matrix for blood vessels, lymphatic vessels, organs and skin.

Dense Connective Tissue

- ① DCT is a type of tissue that contains numerous collagen fibres and provides strong connection b/w tissues
- ② consists of fewer cells
- ③ mainly contain fibrocytes
- ④ consists of numerous thick fibres
- ⑤ Dense regular, dense irregular and elastic tissues are three types.
- ⑥ produces tendon and ligaments by forming strong rope-like structure

X
24/10

④ Differentiate Skeletal, Smooth & Cardiac Muscles

SKELETAL MUSCLE	SMOOTH MUSCLE	CARDIAC MUSCLE
Striated	Not Striated	Striated
Voluntarily Controlled	Involuntarily Controlled	Involuntarily Controlled
Cells have many nuclei that are peripheral to their fibres	Cells have only one nucleus at the centre	Cells have only one nucleus at centre
Attached to bones	Found on hollow internal organs	Found on the heart's wall
Responsible for movement of the skeleton & muscles	Responsible for the movement of substances such as food, blood	Responsible for movement of blood in heart

⑤ Define Cartilage & its types & Explain
 Ans: Cartilage is a smooth elastic tissue embedded in a matrix reinforced by collagen and elastic fibres.

Description	Location	Function
① Hyaline Cartilage Hyaline cartilage is a smooth bluish-white tissue, the matrix is solid and smooth matrix. The chondrocytes were in small groups within cell nest	① on the ends of long bones that form joints ② Sternum ③ ribs	① It provides flexibility ② Support ③ Smooth surface for movement at joints

② Fibro cartilage

It consists of dense masses of white collagen fibres in a matrix similar to that of hyaline cartilage.

knee joint
hip joint
shoulder joint

It is a tough, flexible, supporting tissue.

③ Elastic cartilage

Flexible tissue consists of yellow fibres lying in a solid matrix.

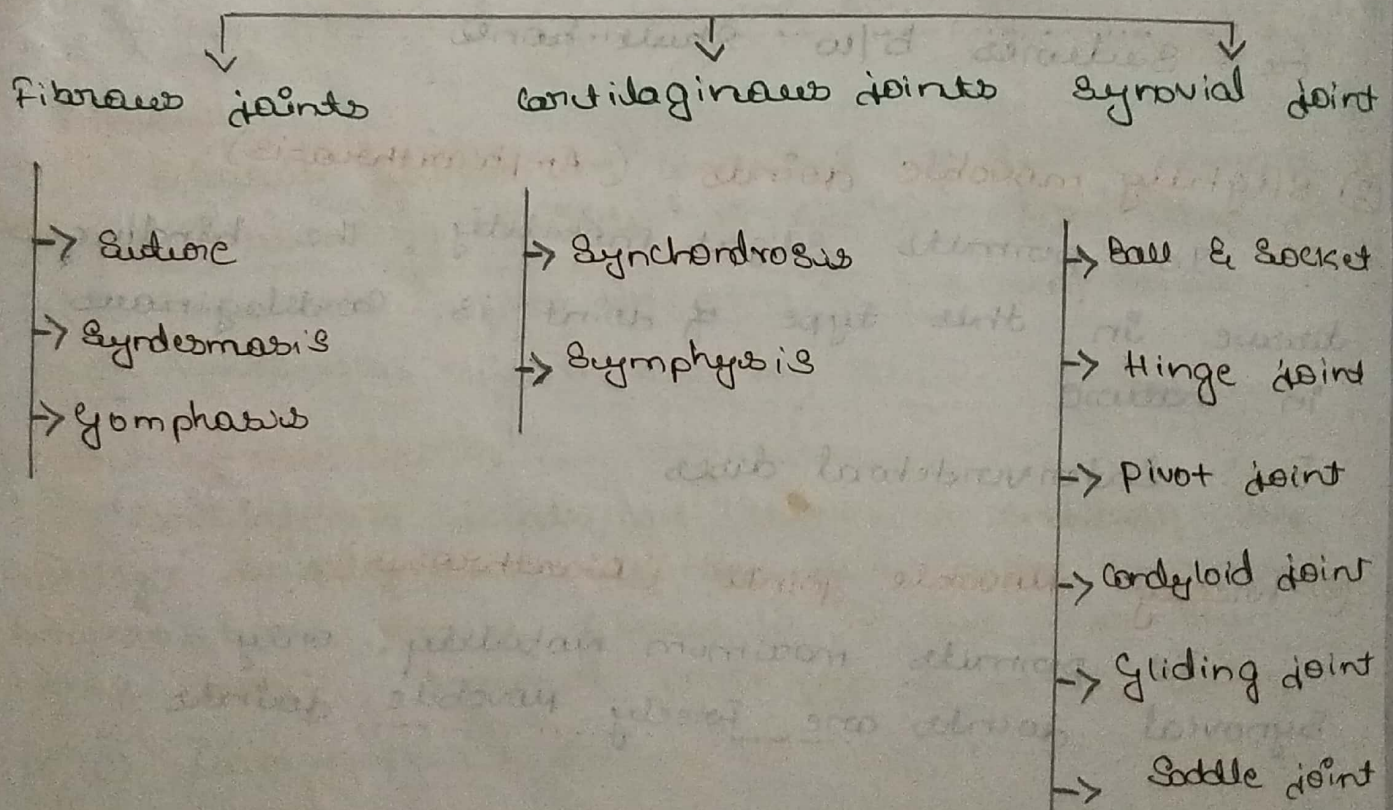
Ear pinna
Eustachian Tube
Epiglottis

It provides support and maintains shape.

④ Classify joints with example

A joint is the location at which two or more bones make contact.

on the Basis of Structure [How bones connect to each other]



① Synovial joints

- ① Synovial joints have a space b/w the articulating bones for synovial fluid.
- ② All of the synovial joints allow greatest range of movement.

③ This joint is covered by flexible articular capsule

① Ball & Socket

- ① It is composed of globe like head of one bone that fits into cup like cavity on another bone
- ② It is multiaxial.

Ex: Shoulder and hip joints

② Hinge joint

- ① It closely resembles the hinge on the lid of a box
- ② It is uniaxial.

Ex: Knee joint, Elbow joint

③ Pivot joint

- ① Pivot joint is composed of central bony pivot surrounded by collar made up of bone and ligament
- ② It is uniaxial.

Ex: Joint b/w atlas & axis

④ Saddle joint

- ① It is a modification of ball and socket joint
- ② It is biaxial

Ex: Joint of fingers

⑤ Gliding joint

- ① These joints are always small, where one bone slides on another
- ② It is multiaxial

Ex: Carpal joint
Intervertebral discs

⑥ Saddle joint

- ① Saddle joint is so named because both the bones at articulation are shaped like saddle
- ② It is multiaxial

Ex: joint of thumb

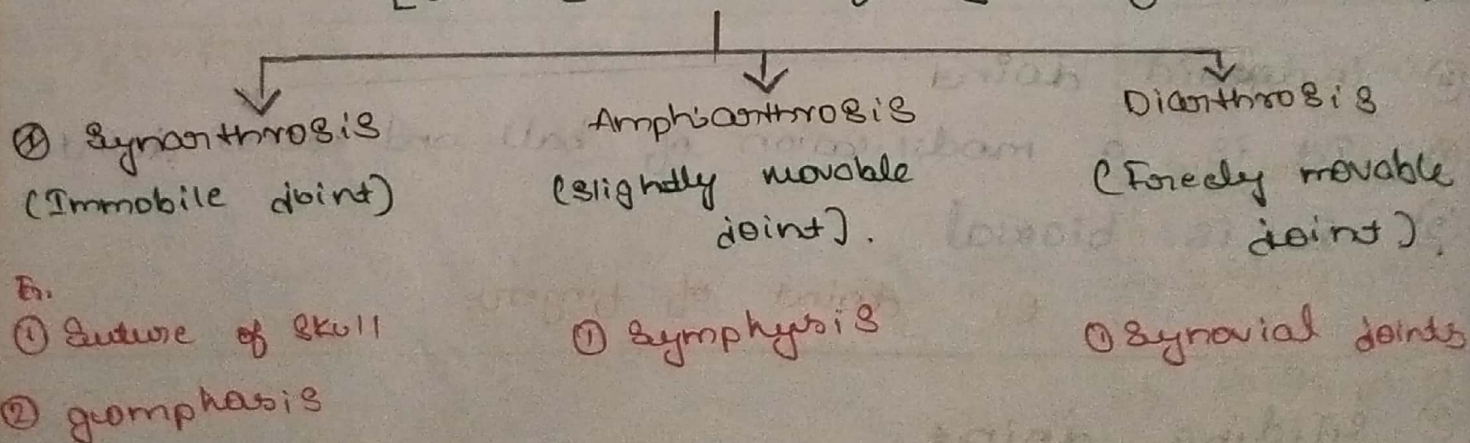
② Cartilaginous joints

- ① Synchondrosis Ex: Sternoclavicular joint
Intervertebral discs
- ② Symphysis Ex: pubis symphysis

③ Fibrous joints

- ① Suture Ex: coronal suture
- ② Syndesmosis Ex: Radius - Ulna joint
- ③ Gomphosis Ex: Root of teeth & sockets

Functional classification
[On the basis of degree of movements]



⑦ describe angular and special movements of joints.

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- ① Adduction: movement towards midline of the body, as bringing the fingers and toes together.
- ② Abduction: movement away from the center, as spreading the toes and fingers apart.
- ③ Angular motion: It comprises of Adduction, Abduction, flexion, extension based on anatomical position.
- ④ Circumduction: It is a special type of angular motion, described as making circular movements as moving the arm in a loop.
- ⑤ Elevation / Depression: occurs when a structure moves in a Superior or Inferior direction, as mandible is depressed when the mouth is opened and elevated when the mouth is closed.
- ⑥ Flexion: It is a movement in the anterior - posterior plane that reduces the angle b/w the articulating elements as in bringing head towards chest.
- ⑦ Opposition: It is a special movement of the thumb which enables it to grasp and hold on object.
- ⑧ Rotation: Includes turning of a body or a limb around the longitudinal axis, as rotating arm to screw in a light bulb.

⑨ pronation:- refers to rotation of radius across ulna. This rotation moves the wrist and hand from palm-facing-front to palm-facing-back

⑩ protraction:- refers a part of the body anteriorly in the horizontal plane as jaw face forward to gain distance at finish line

⑪ Retraction:- It is a reverse movement of protraction as in pulling the jaw back towards the spine

⑧ write 8 functions of blood

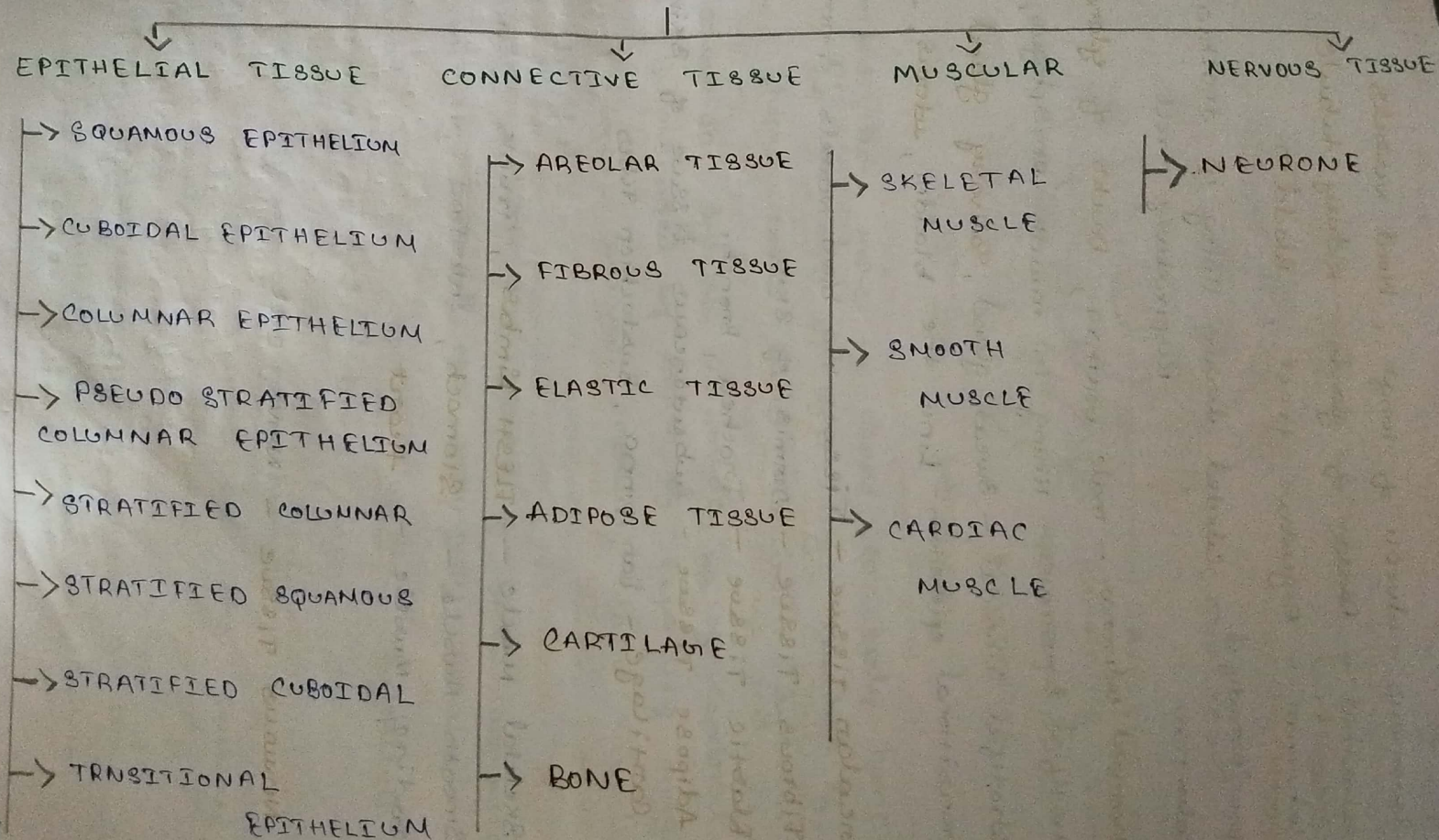
Blood is a fluid connective tissue. It circulates continuously around the body.

- ① It carries oxygen from the lungs to the tissue and carbon dioxide from tissue to lungs for excretion
- ② Carries nutrients from alimentary tract to the tissue, and cell waste to the excretory organs
- ③ Hormone secreted by endocrine gland to their target tissue
- ④ It maintain body temperature
- ⑤ It maintain PH
- ⑥ It prevent blood loss by clotting
- ⑦ It maintain fluid volume
- ⑧ It prevent infection by producing antibodies.

Q) classify Tissues with Examples

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TISSUES.

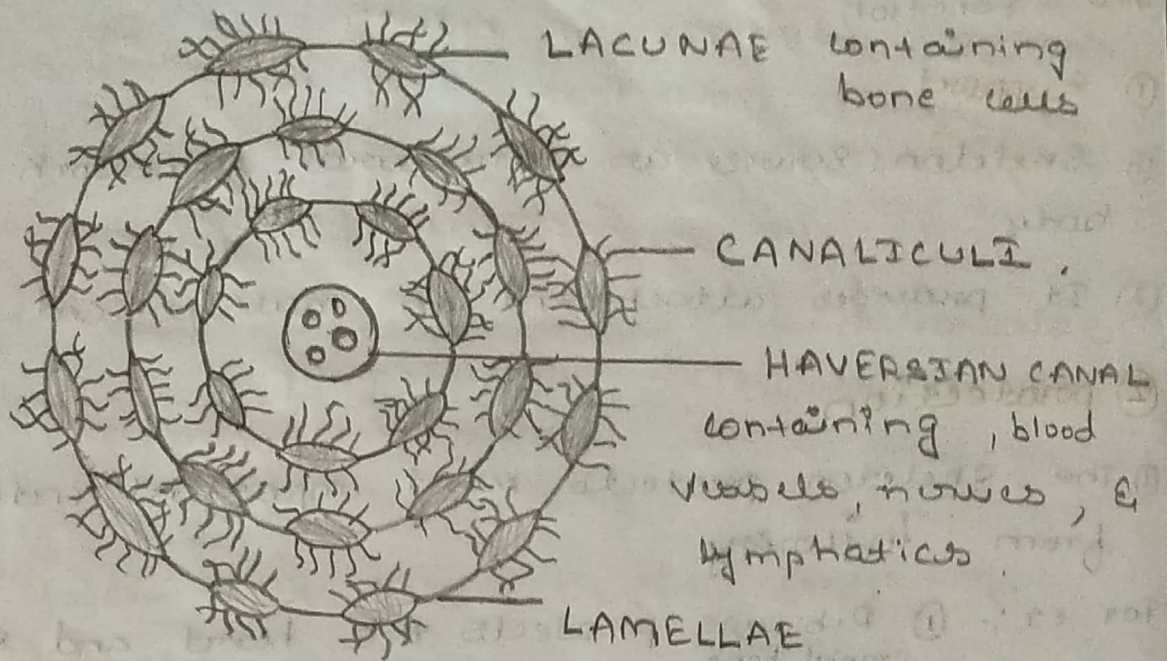


Examples:

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- ① Squamous - alveoli of lungs, blood vessels
- ② cuboidal - ducts of glands, kidney tubule
- ③ columnar - digestive tract, bladder
- ④ pseudostratified - ciliated tissue lining in trachea, columnar
Respiratory tract.
- ⑤ stratified columnar - male urethra, ducts of gland
- ⑥ stratified squamous - lining in mouth, esophagus, vagina
- ⑦ stratified cuboidal - sweat gland, salivary gland
- ⑧ Transitional epithelium - Lines the bladder, uterus, urethra
- ⑨ Areolar tissue - Tissue b/w blood vessels & nerves
- ⑩ Fibrous Tissue - Dermis of skin
- ⑪ Elastic Tissue - Trachea, Bronchi
- ⑫ Adipose Tissue - Subcutaneous tissue of skin
- ⑬ Cartilage - Ear pinna, Eustachian tubes
- ~~⑭~~
- ⑮ Skeletal muscle - FLESH Limbs, Trunk
- ⑯ Smooth muscle - Stomach, Intestine
- ⑰ Cardiac muscle - Heart
- ⑱ Nervous Tissue - Nerve cell

10 Explain Haversian canal system of bone



- ① Compact bone make up about 80% body bone mass. It is made up of a large number of tube shaped units called Haversian system.
- ② Haversian system is made up of central canal surrounded by series of expanding rings.
- ③ Central canal contains nerves, blood vessels and lymphatics.
- ④ Lamellae which are plates of bone arranged concentrically around the Haversian canal.
- ⑤ Lacunae are the spaces b/w the lamellae where they contain bone cells.
- ⑥ Canaliculi which are fine channels. They radiate b/w the lacunae and the central Haversian canal.
- ⑦ All these structure together form a unit. This unit is called as Haversian system.

⑩ write the composition & function of bone

Ans: Function

① Support

① Skeleton serves as structural framework for the body.

② It provides attachment to muscles and tendons

② protection

① The skeleton protects most important internal organs from injury

for ex:- ① Rib cage protects the heart and skull

② ^{cranial bone} ~~skull~~ protects brain

③ back bone protects spinal chord

③ Assistance in movement

① It allows the movement of body parts by

② forming joints that are moved by muscle.

④ mineral homeostasis

① Bone tissue stores calcium and phosphorus which contribute to strength of the bone

② Blood bone releases minerals into the blood to maintain mineral balance

⑤ Blood cell production

① A connective tissue called Red bone marrow produces Red blood cells, white blood cells and platelets by the process hemopoiesis

⑥ Triglyceride storage

① yellow bone marrow consists mainly of adipose cells, which stores Triglycerides.

② Triglycerides are chemical energy reserve.

③ with increase in age red bone marrow changes to yellow bone marrow

COMPOSITION

① $\frac{1}{3}$ rd of organic components

① collagen fiber matrix organized around lamellae

② Non collagen $\&$:- glycoproteins, Lipids, etc.

② $\frac{1}{3}$ rd of Inorganic components

Dense calcium phosphate in the form of Insoluble hydroxyapatite.

③ $\frac{1}{3}$ rd of water

④ cells - osteoblasts, osteoclasts, osteocytes, bone lining cells.

⑫ classify bones on the basis of shape with examples

① long bones

① It is a long bone contains shaft & two extremities

② It helps in various movements of the body

Ex:- FEMUR, TIBIA.

② short bones

① These have no shaft

② They contain spongy substance covered by shell of compact bone.

Ex:- WRIST and ANKLE bone

③ Flat bones

- ① They contain two layers of compact bone with a spongy substance in between
- ② It provides protection and extensive area for muscle attachment

Ex: Rib cage, CRANIAL BONE

④ Irregular bone

- ① They do not fall in any category
- ② They vary in the amount of spongy and compact bone present.

Ex: BACK BONES & HIP BONE

⑤ Sesamoid bones

- ① These are small bones which develop in the tendons of muscle

Ex: Patella of KNEE JOINT

⑥ Classify axial skeletal system with example

Appendicular skeletal system

① Axial skeletal system

The ASS consists of skull, vertebral column, Thoracic cage, Hyoid bone.

② Appendicular skeletal system

The ASS consists of girdle and limbs.

AXIAL SKELETAL SYSTEM.

SKULL

VERTEBRAL COLUMN

THORACIC CAGE

HYOID BONE

CRANIUM

FACIAL BONE

EAR OSSICLES

① Cervical

① Ribs

② Thoracic

② Chest bone

③ Lumbar

④ Sacrum

⑤ Coccygeal

CTLSC

- ① Ethmoid bone
- ② Sphenoid bone
- ③ Occipital bone
- ④ Frontal bone
- ⑤ Temporal bone
- ⑥ Parietal bone

① palatine

② Nasal

③ Maxillary

④ Mandible

⑤ Vomer

⑥ Lacrimal

⑦ Zygomatic

① Malleus

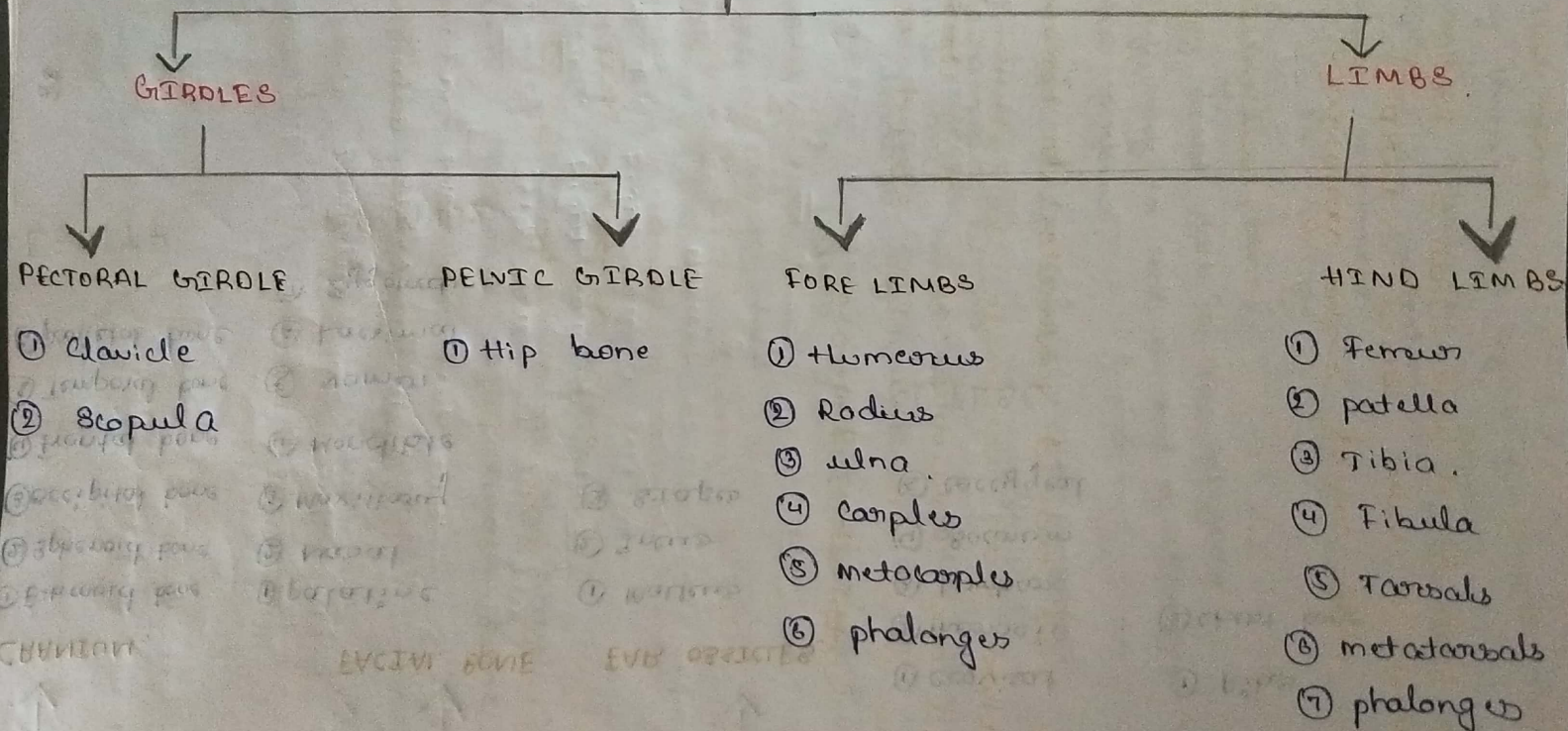
② Incus

③ Stapes

ESDFTP

PNMMVL2

APPENDICULAR SKELETAL SYSTEM



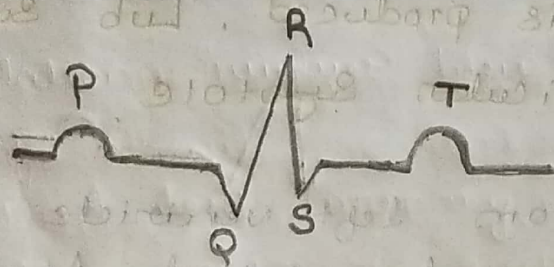
14) write a short note on heart valves and heart sounds.

- ① Blood passes from Right atrium into the Right ventricle through a valve called Tricuspid valve. It is also called right atrioventricular valve.
- ② Blood passes from left atrium to left ventricle through a valve called Bicuspid valve. It is also called left-atrioventricular valve.
- ③ As soon as blood entered ventricle, to prevent backflow of blood from ventricle to atrium both Tricuspid and Bicuspid valve shut close & a lub sound is produced. Lub sound is beginning of ventricular Systole.
- ④ Blood passes from left ventricle into the aorta through a valve called Aortic Semilunar valve.
- ⑤ Blood passes from right ventricle into the pulmonary artery through a valve called pulmonary Semilunar valve.
- ⑥ Beginning of ventricular diastole produces dub sound due to closure of Semilunar valve to prevent backflow of blood into the ventricles.

15) Explain the normal ECG with labelled diagram ?

(Electrocardiogram)

- ① ECG is the recording of electrical activity of the heart.
- ② Electrocardiograph is the instrument which is used to record the electrical current generated in the heart.
- ③ By means of this instrument, the electrical current generated in the heart is conducted to remote parts of the body.
- ④ The heart current can be recorded by connecting any two parts of the body with this instrument.
- ⑤ These connections are called as leads.



NORMAL ELECTROCARDIOGRAM

Lead I : Right arm & left arm

Lead II : Right arm & left leg

Lead III : Left arm & left leg

Connection over the chest with indifferent electrodes are also sometimes used.

The ECG recordings are represented by the letters P, Q, R, S & T

- ⑥ The wave P is caused by contraction of atria.
- ⑦ The wave Q, R, S are produced by the contraction of ventricles.
- ⑧ The wave T is produced by the relaxation of ventricles.

⑨ During diseases of the heart, these waves are abnormal in shape and position.

⑩ Explain Systemic and pulmonary circulation

① Systemic circulation

(i) It is the circulation involving blood supply to all parts of the body except lungs.

(ii) This circulation starts from aorta which carries oxygenated blood from left ventricle.

(iii) It breaks up into smaller arteries and finally ends in capillaries.

(iv) Capillaries unite to form venules.

(v) Venules join up ultimately to form two large venous trunks namely Superior & Inferior vena cava.

(vi) These two venous trunks open in the right atrium of heart.

② Pulmonary circulation.

(i) It is the part of circulation involving the purification of blood in lungs 42

(ii) Impure venous blood is pumped by the right ventricle.

(iii) The pulmonary artery carries the blood to lungs where it is oxygenated.

(iv) pulmonary veins carry this purified blood from lungs to the heart which open in the left atrium.

⑦ Explain coronary and portal blood circulation

① coronary circulation

(i) The circulation involves blood supply to the heart itself.

(ii) The right and left coronary arteries arise from ascending aorta. They supply blood to the heart.

(iii) The venous blood is collected by the coronary sinus which opens in the right atrium.

② portal circulation

(i) It is the circulation of the blood through the liver.

(ii) portal vein carries blood to the liver.

(iii) portal vein divides into capillaries. These capillaries joins with the capillaries of hepatic artery.

(iv) Venous blood of liver is collected by hepatic vein which joins with inferior vena cava.

(18) write a note on Renin - Angiotensin - Aldosterone System.

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- ① RAS is a classic endocrine system helps to regulate long term blood pressure and Extracellular volume in the body.
- ② system begins with release of angiotensinogen into circulation by liver in response to low blood pressure and adverse change in Na concentration.
- ③ The enzyme Renin secreted by kidney cleaves Angiotensinogen to form Inactive Angiotensin I.
- ④ Angiotensin converting enzyme (ACE) found in pulmonary circulation converts Inactive Angiotensin I to Active Angiotensin II.
- ⑤ Angiotensin II decreases the glomerular filtration rate by causing vasoconstriction of the Affluent arterioles.
- ⑥ Angiotensin II Enhances reabsorption of Na^+ , Cl^- and H_2O in proximal convoluted tubule.
- ⑦ Angiotensin II stimulates the adrenal cortex to release aldosterone, a hormone that in turn stimulates the principal cells in the collecting duct to reabsorb more Na^+ and Cl^- and secrete more K^+ . The ultimate consequence of reabsorbing more Na^+ and Cl^- is excreting less water, which increases blood volume.

19) Role of kidney in maintaining acid-base balance

Ans ① The kidney's control acid-base balance by excreting either acidic or basic urine.

② Excreting acidic urine reduces the amount of acid in extracellular fluid.

③ Excreting basic urine removes base from extracellular fluid.

④ The kidney regulate extracellular fluid H^+ conc through three fundamental mechanisms

i) Secretion of H^+

ii) Reabsorption of filtered HCO_3

iii) production of new HCO_3 .

⑤ In acidosis, the kidney do not excrete HCO_3 into the urine but reabsorb all the filtered HCO_3 and produce new HCO_3 which is added back to the extracellular fluid.

⑥ This reduces the extracellular fluid H^+ concentration back towards normal.

⑦ In alkalosis kidneys fail to reabsorb all the filtered HCO_3 thus increasing the excretion of HCO_3 .

⑧ In alkalosis the removal of HCO_3 raises the extracellular fluid H^+ concentration back towards normal.

20) what is micturition 9. Describe micturition reflex

Ans. ① It is the act of passing urine.

② The process of urination is known as micturition.

③ In micturition, the urine is expelled from urinary bladder through urethra.

④ Ejection of the urine in males is facilitated by the organ called as penis.

⑤ Ejection of the urine in females is facilitated by the organ called urethral opening in vulva.

⑥ Micturition is a process under voluntary control. It is the process which helps in emptying the urinary bladder.

⑦ The micturition reflex centre is present in spinal cord.

⑧ The pelvic muscle and walls of abdomen contract simultaneously with the detrusor muscle. because of which, relaxation of the external urethral sphincter takes place.

⑨ The impulse from the spinal cord causes the rhythmic contraction of the detrusor muscles.

21) write a short note on artificial respiration.

Ans: The rhythmic forcing of air into and out of the lungs of a person whose breathing has stopped.

① It is employed when respiration fails due to drowning, carbon monoxide poisoning etc.

② Artificial respiration must be given immediately when respiration fails.

③ There are many methods which are employed to increase and decrease the capacity of thorax so the air can be drawn into the lungs and expelled.

① Schaefer's method & Holger Nielson method.
Both involve compression of thoracic cavity by pressure against ribs.

② Mouth to Mouth method

It involves blowing air into lungs through mouth.

③ Rocking method

It involves compression of thoracic cavity. This method is useful in children.

④ Instrumental method

① It involves Drinker's method and Paul's method.

② These methods can be carried out only in hospitals.

(2) Describe the location and anatomy of lungs?

- ① Lungs are the principal organs of respiration
- ② They are two in number lying on each side of the chest cavity.
- ③ The two lungs are separated in the middle by heart.

(4) **SHAPE**:- Lungs are conical in shape. The apex of lung is raised slightly over the clavicle. The base of lung is near the diaphragm.

(5) **LOBES**:-

- ① Each lung is divided into lobes by means of fissures.
- ② The right lung which is bigger has three lobes. The left lung has two lobes.
- ③ Each lobe contains a small bronchial tube.
- ④ This tube divides and subdivides and ends internally in air sacs.

(6) **PLEURA**.

- ① It is a serous membrane which covers the lungs.
- ② It is made of two layers. The inner layer is called as visceral layer. The outer layer is called as parietal layer.
- ③ The space b/w two layers is filled with pleural fluid.

⑦ ROOT OF THE LUNGS

- ① The medial surface of each lung has a vertical slit called hilum
- ② Structures like blood vessels, nerves and lymphatics pass through the hilum. These structures together constitute the root of lung
- ③ The root of lung is formed by
 - ④ pulmonary arteries which carry impure blood to the lungs from heart.
 - ⑤ pulmonary veins carry oxygenated blood from lungs to the heart.
 - ⑥ Bronchial arteries which carry oxygenated blood from thoracic aorta directly to lungs. This blood nourishes the substance of lung tissue
 - ⑦ Bronchial veins which return the venous blood of lungs to superior vena cava
 - ⑧ Bronchi which divides into bronchioles
 - ⑨ Lymphatic vessels and lymph glands
 - ⑩ Nerves: Sympathetic and vagus nerve which supply the lungs

⑧ Explain lung volume and capacities

- ① The contraction of diaphragm and intercostal muscles produces expansion of the chest cavity so air enters into the lungs during inspiration.
- ② A forced inspiration can produce additional expansion, so more air can enter the lungs

lung capacity = 4000 ml

Expiration = 3800 ml

Residual = 700 ml

- ③ Similarly, a forced expiration can expel an extra volume of air.
- ④ Even after a forced expiration, some air still remains in the lungs.

The various respiratory volumes are defined as follows.

① Vital Capacity

It is defined as the volume of air that can be expelled by a forced expiration after a forced inspiration.

② Tidal air

It is the volume of air passing in and out of the lungs with ordinary quiet breathing.

③ Inspiratory reserve

It is the additional volume of air that can be taken in by forced inspiration.

④ Expiratory reserve

It is the additional volume of air that can be expelled out by forced expiration.

⑤ Residual volume

It is the volume of air which remains in the lungs on forced expiration.

⑥ Total lung capacity

It is the sum total of vital capacity and residual volume.

Q3) List out various enzymes present in the secretion of GIT.

① Carbohydrate digestion

Salivary amylase
Pancreatic amylase
Maltase

② Protein digestion

Pepsin
Trypsin
Peptidases

③ Nucleic Acid digestion.

Nuclease
Nucleosidases

④ Fat digestion

Lipase

Q4) Write composition and function of gastric juice
Composition

① pH varies from 1.5 - 2

② It contains 99% water, mucus, HCl and bicarbonates

③ It contains enzymes such as pepsin, rennin and gastric lipase

Function

① It contains HCl, so it exhibits antiseptic action by killing bacteria

② It involves in digestion of proteins

- ② It helps to form the chyme.
- ③ Acidify the food and stop the action of salivary amylase.
- ④ gastric juice containing water acts as solvent.
- ⑤ mucus acts as lubrication for the movement of food in stomach.

⑥ Name salivary glands and discuss the composition and functions of saliva.

① salivary gland.

① parotid gland

② sublingual gland

③ submandibular gland.

④ Composition

① pH varies from 6.8-7.2

② It contains 99% water, electrolytes like sodium, potassium, chlorine, bicarbonate.

③ It also contains mucus, enzymes & antibodies.

④ enzymes like salivary amylase & lingual lipase

⑤ Antibacterial enzyme lysozyme.

⑥ Functions

① It converts cooked starch into soluble sugar called maltose by salivary amylase.

② It acts as solvent for food and helps in its swallowing.

③ It moistens, lubricates and cleans the mouth.

④ Enzyme lysozyme of saliva kills some bacteria.

⑤ mention the hormones of pituitary gland.
* Discuss regulation of secretion and physiological function.

Anterior pituitary

① Growth hormone (GH)

i) Its release is stimulated by growth hormone releasing hormone (GHRH) and suppressed by growth hormone release inhibiting hormone (GHRH).

ii) Secretion of GH is stimulated by hypoglycaemia, Exercise etc.

iii) Inhibition of GH secretion occurs by negative feedback mechanism, i.e. when blood sugar level rises.

Functions

① It is necessary for normal growth and development of the body.

② GH is required for transport of amino acids into muscle cells and also for protein synthesis.

③ GH stimulates the growth of soft tissues, cartilage, bone.

④ Thyroid Stimulating Hormone (TSH)

i) Its release is stimulated by thyroid releasing hormone (TRH).

ii) Secretion of TSH is stimulated when thyroid hormone is less.

iii) Inhibition of TSH secretion occurs by negative feedback mechanisms, i.e. when thyroid hormone level increases.

Functions.

- ① It regulates the synthesis of thyroid hormone from thyroid glands.

② Adrenocorticotrophic Hormone (ACTH).

- ① Its release is stimulated by corticotrophin releasing hormone (CRH).
- ② Secretion of ACTH is stimulated by hypoglycaemia, exercise etc.
- ③ Inhibition of ACTH secretion occurs by negative feedback mechanism.

Functions.

- ① It stimulates adrenal gland to secrete adrenal hormone.

④ Follicle Stimulating hormone (FSH).

- ① Its release is stimulated by gonadotrophin releasing hormone (GnRH).
- ② Secretion of FSH is stimulated when its count is less.
- ③ Inhibition of FSH secretion occurs when its count is more.

Functions.

- ① It controls growth and reproductive activities.
- ② In females act on the ovary to stimulate the development of ovarian follicle.
- ③ In males FSH acts on the testes for the maturation of sperm.

⑤ Luteinizing hormone (LH)

- ① Its release is stimulated by gonadotrophin releasing hormone (GnRH)
- ② Secretion LH is stimulated when its count is less
- ③ Inhibition of LH secretion occurs when its count is more.

Functions,

- ① It controls growth and reproductive activities.
- ② In females, It stimulates the secretion of estrogen.
- ③ In males, It stimulates the secretion of Testosterone.

⑥ Lutetotropic hormone (LTH)

- ① It stimulates milk production in females

POSTERIOR PITUITARY

① Oxytocin

- ① Its release is stimulated by estrogen
- ② Secretion of oxytocin is stimulated by neural impulse present from stimulation of the nipples

Function

- ① Contraction of uterus during delivery and to bring about parturition
- ② Ejection of milk from the breast.

- Vasopressin**
- ① It is called as Antidiuretic hormone.
 - ② Secretion of ADH is stimulated by osmotic pressure of blood, $\propto$ -directly proportional.

Function.

- ① Decreasing urine output by increasing tubular reabsorption in the kidney.
- ② Increasing blood pressure by constricting capillaries and arterioles.

②7 Synthesis, storage, release, function of thyroid hormone?

- ① The thyroid gland synthesises and secretes two hormones

① Thyroxine [T_4] Tetra-Iodothyronine

② Tri-Iodothyronine [T_3]

- ② Synthesis of these hormones occur in following four stages

① Iodide is removed from plasma and concentrated in the thyroid gland.

② Iodide is oxidized to Iodine.

③ Iodine combines with thyrosine and yields

① Mono Iodothyrosine (MIT) ② Di Iodothyrosine (DIT)

④ Two molecules of DIT combines to form

Tetraiodothyronine

⑤ One molecule of DIT & MIT unite to form

Triiodothyronine

Regulation of Secretion

The secretion of thyroid hormones is controlled by thyroid stimulating hormone (TSH) ,

Functions of thyroid hormone

- ① Storage of Iodine
 - ② Increase in oxygen consumption and heat production in tissues
 - ③ Increase in basal metabolic rate (energy per unit time for body functions at rest)
 - ④ Increase in absorption and utilisation of glucose
 - ⑤ Anabolic effects like growth promotion and protein synthesis.
 - ⑥ Increase in the rate of cholesterol synthesis in liver
 - ⑦ Myelination of Central Nervous System.
- (28) write the functions of Insulin and Glucagon.

① Glucagon

It is the hormone secreted by the alpha cells of Islets of Langerhans

Functions

- ① Increases the blood sugar level by mobilising glycogen from the liver

- ② Mobilisation of stored fat
- ③ Release of Insulin from pancreas

② Insulin

- It is the hormone secreted by the beta cells of Islets of Langerhans
- The important action of insulin is to decrease the level of glucose in blood.

Functions -

- ① Increases glycogen synthesis by preventing glycogen breakdown in the liver.
- ② prevents fresh synthesis of glucose.
- ③ stimulates the uptake and utilisation of glucose in the skeletal muscle.
- ④ promotes conversion of glucose into fat in the adipose tissue.

② write a short note on parathyroid gland

- ① The parathyroid glands are four in number
- ② These glands are embedded on posterior surface of thyroid gland, two lying on each side
- ③ parathyroid glands are composed of epithelial cells. The cells are of two types
 - ① Chief cells
 - ② Oxyphil cells
- ④ Chief cells secrete parathyroid hormone (PTH).

Functions.

It increases calcium level of plasma and extracellular fluid

- This effect is produced by following mechanisms

- ① mobilisation of calcium of bone into the extracellular fluid
- ② Increased reabsorption of calcium in the renal tubule
- ③ Increased absorption of calcium in GIT.

Regulation of Secretion

- ① A decrease in calcium level of plasma increases the secretion of PTH and vice versa

Disorders of parathyroid function

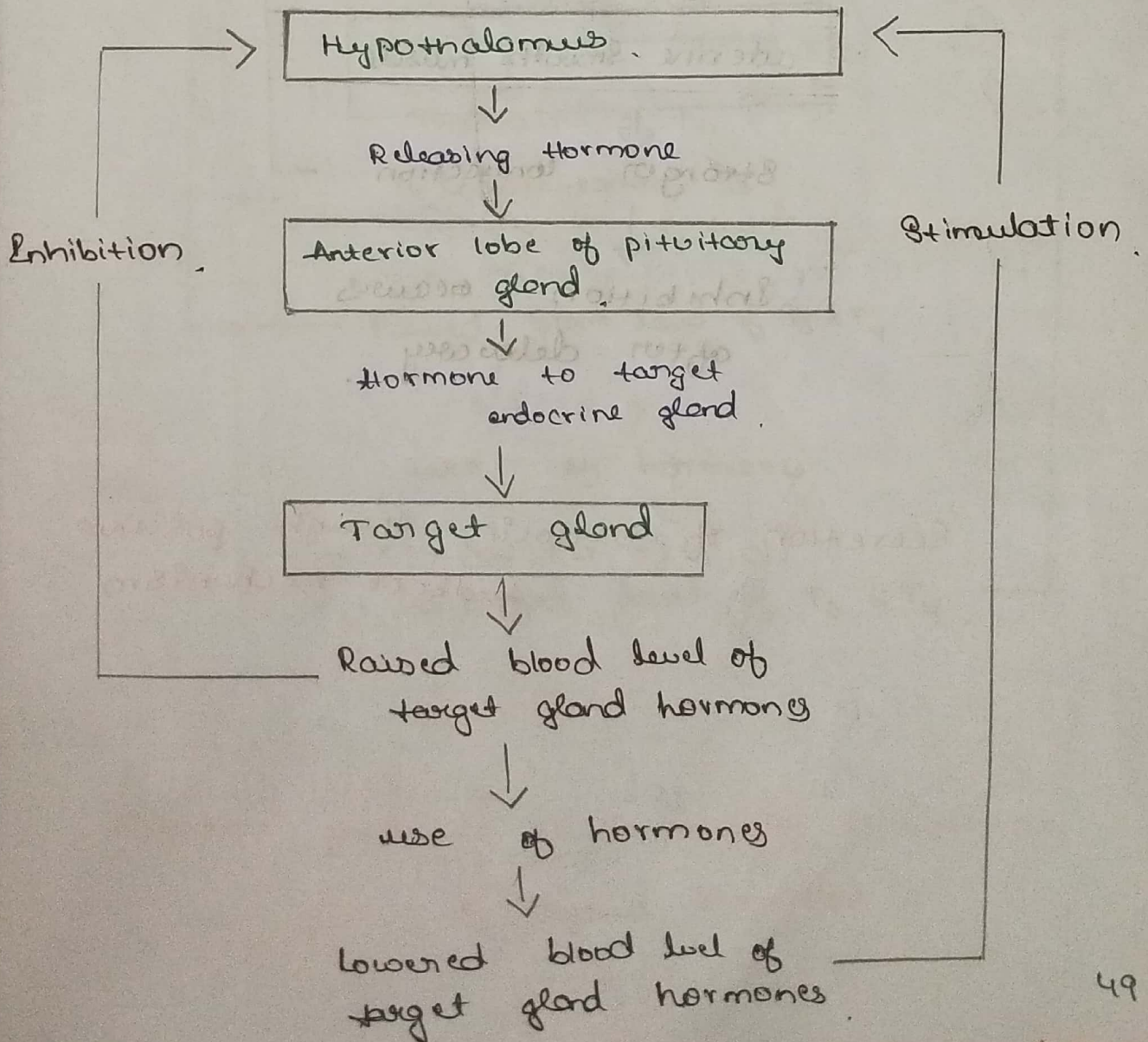
- ① Hyperparathyroidism produces osteitis fibrosa. It is characterised by decalcification of bone leading to loss of strength and fibrous appearance
- ② Hypoparathyroidism produces hypocalcaemia which leads to tetany.

30. Write the functions of glucocorticoids

- ① It involves in gluconeogenesis and hypoglycaemia.
- ② play important role in lipolysis, i.e. breakdown of triglycerides into fatty acids and glycerol, for energy production
- ③ Stimulate the breakdown of protein into amino acids.

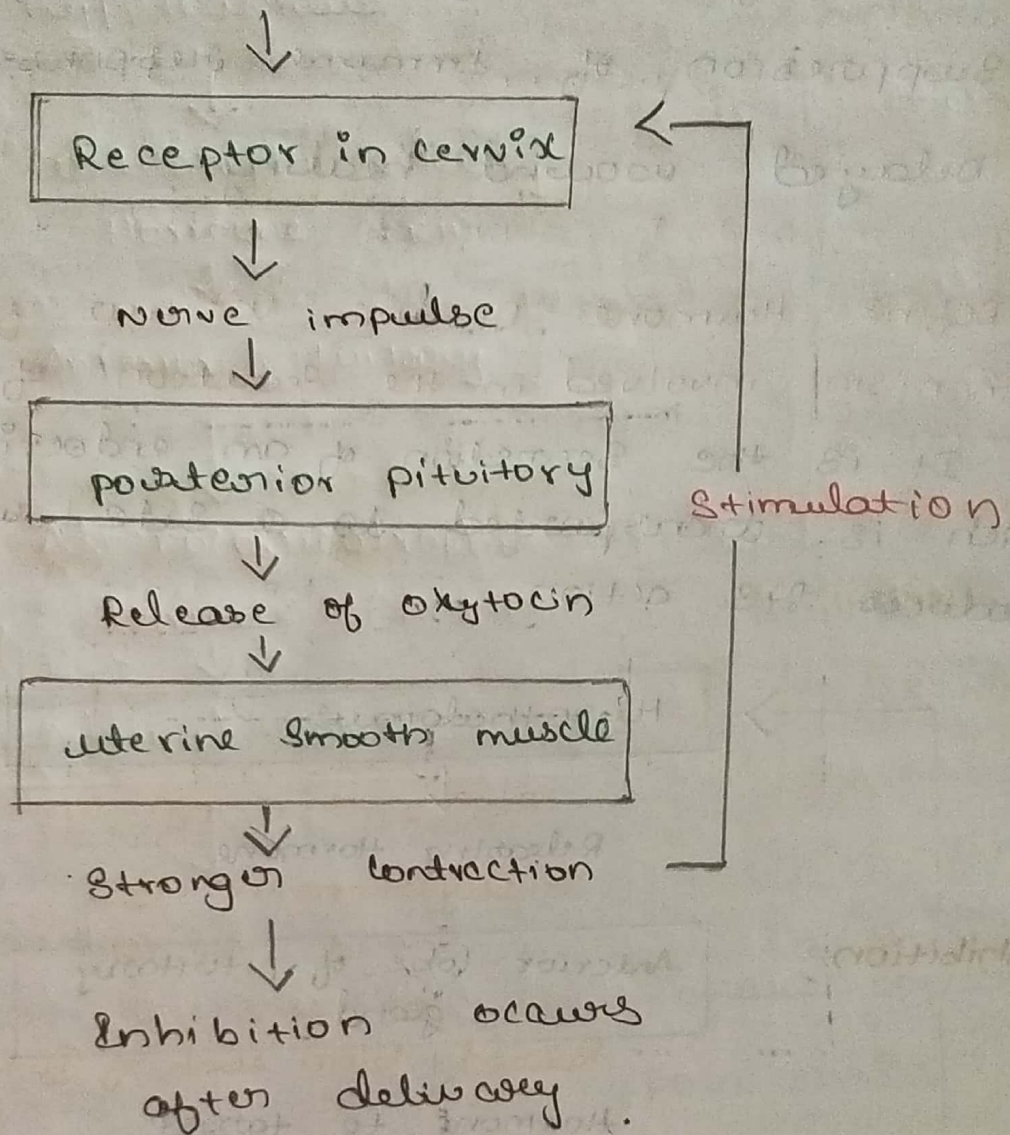
- ④ promotes absorption of sodium and water from renal tubules.
- ⑤ Anti-inflammatory and anti-allergic effect
- ⑥ suppression of immune response
- ⑦ delayed wound healing.

31. Define Hormone. Discuss various feedback mechanism involved in the secretion of hormones. Ans. It is the secretion of an endocrine gland which is transported to a site where it produces its action.



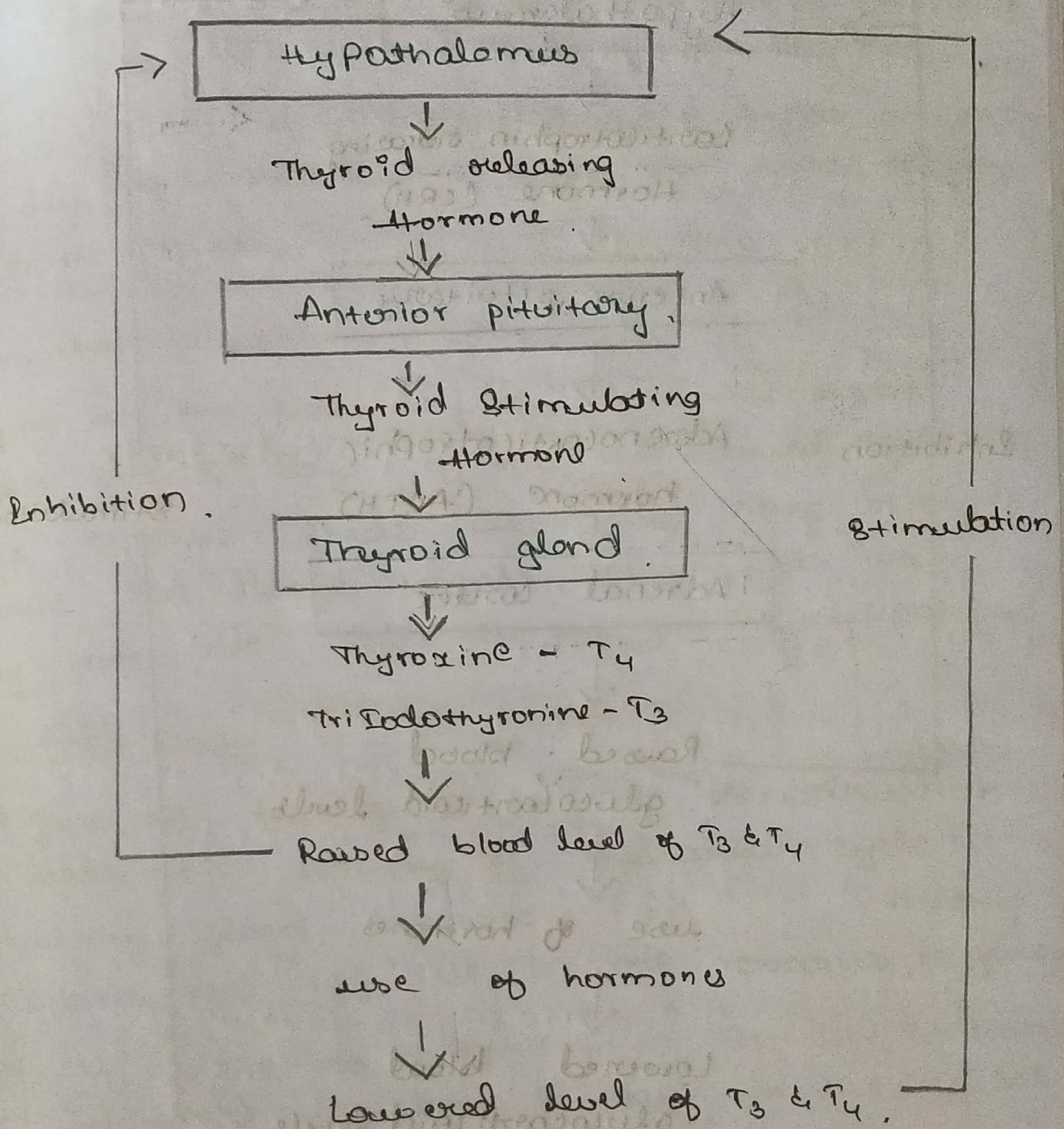
Anterior lobe of pituitary gland, negative feedback regulation

1. In delivery, uterine contraction force baby head into cervix

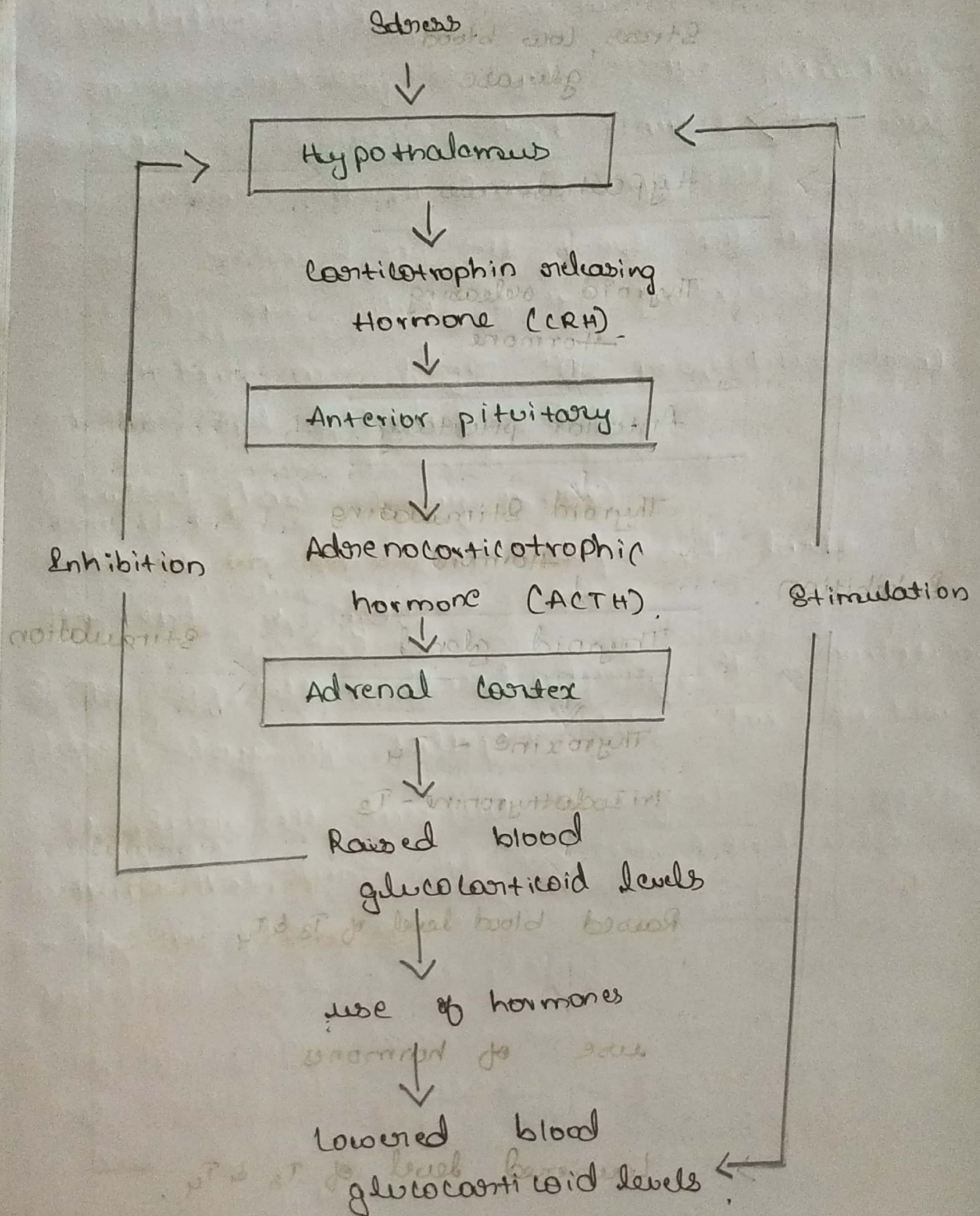


Secretion of oxytocin through positive feedback mechanism

Stress, low blood glucose



Negative feedback mechanism of stimulation of thyroid hormones.



Negative feedback of glucocorticoid secretion

Q Describe the different phases of female reproductive cycle ★

Ans! Menstrual cycle can be divided into following phases based on changes occurring in uterus

- The day count of menstrual cycle begins on the first day of menstruation when blood starts to come out of the vagina

① Menstrual phase (day 1-5)

- ① Begins on the first day of menstruation and lasts till 5th day of the menstrual cycle.
- ② The uterus sheds its inner lining of soft tissue and blood vessels which exits the body from the vagina in the form of menstrual fluid

② Follicular phase (day 1-13)

- ① Begins on the first day of menstruation and lasts till 13th day of menstrual cycle.
- ② pituitary gland secretes FSH that stimulates the egg cell in the ovaries to grow
- ③ egg cell begins to mature in a sac like structure called follicle. It takes 13 days for the egg cell to reach maturity
- ④ while the egg cell matures its follicle secretes progesterone that stimulates the uterus to develop a lining of blood vessels and soft tissue called endometrium

③ Ovulation phase (day 14)

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① On the 14th day of cycle, the pituitary gland secretes LH that causes the ovary to release the matured egg cell.

② The released egg cell moves into the fallopian tube by the cilia of the fimbriae.

③ Fimbriae are finger-like projections located at the end of fallopian tube.

④ Luteal phase (day 15-28)

① Begins on the 15th day and lasts till the end of cycle.

② The egg cell released during the ovulation phase stays in fallopian tube for 24 hours.

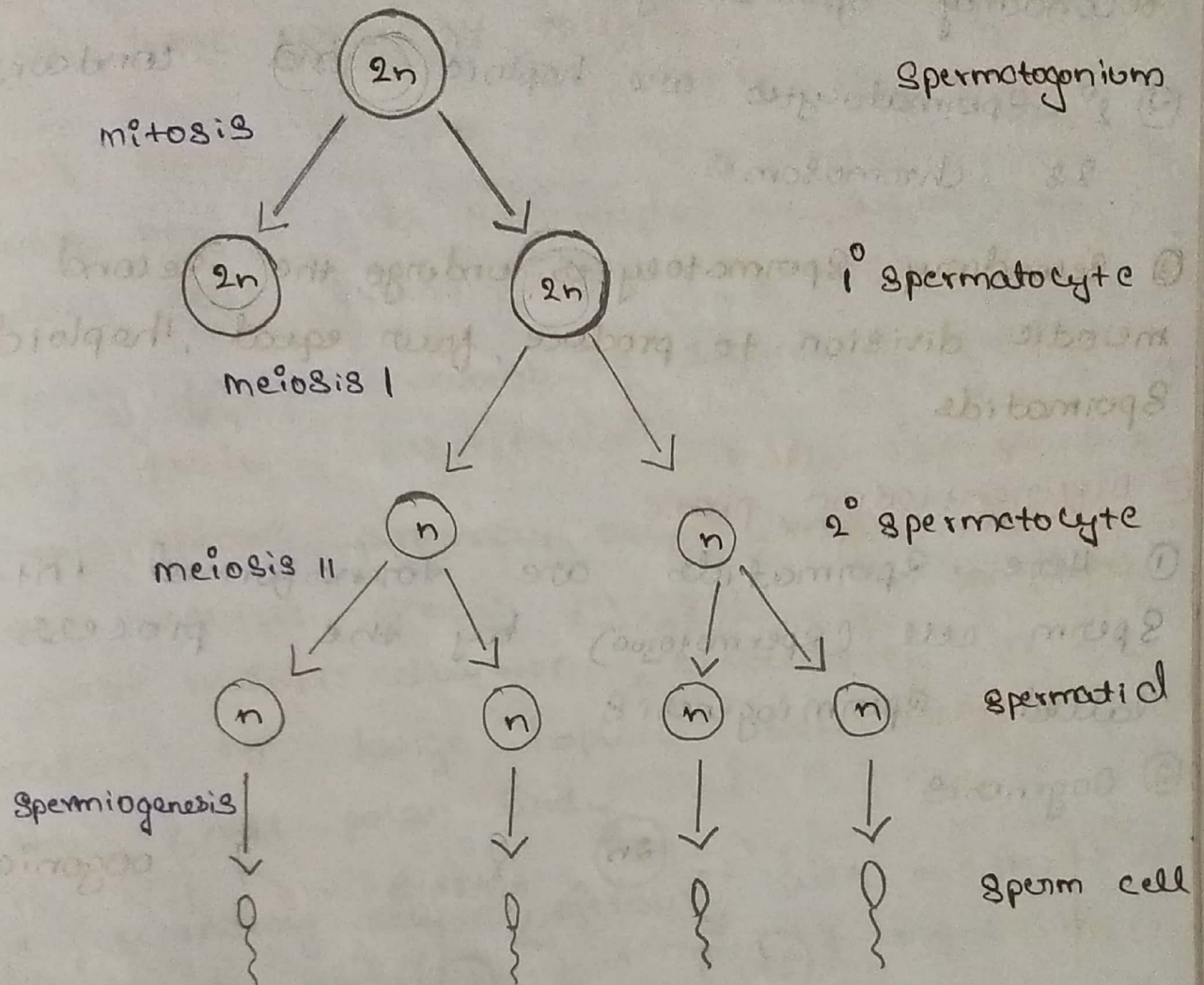
③ If sperm cell does not impregnate the egg cell within that time, the egg cell disintegrates.
a - If conception occurs, the implantation of fertilised ovum takes place.

④ If conception does not occur, the hormone that causes the uterus to retain its endometrium gets used up by the end of menstrual cycle.

⑤ This causes the menstrual phase of the next cycle to begin.

3Q Explain the steps involved in the process of spermatogenesis and oogenesis ★

① Spermatogenesis



① proliferation phase

① spermatogonia present on the inside wall of seminiferous tubule multiply by mitotic division and give rise to 1° spermatocyte

② 1° spermatocytes are diploid and contains 46 chromosomes

② meiotic phase

① primary spermatocyte undergo meiotic division and give rise to two equal haploid secondary spermatocytes

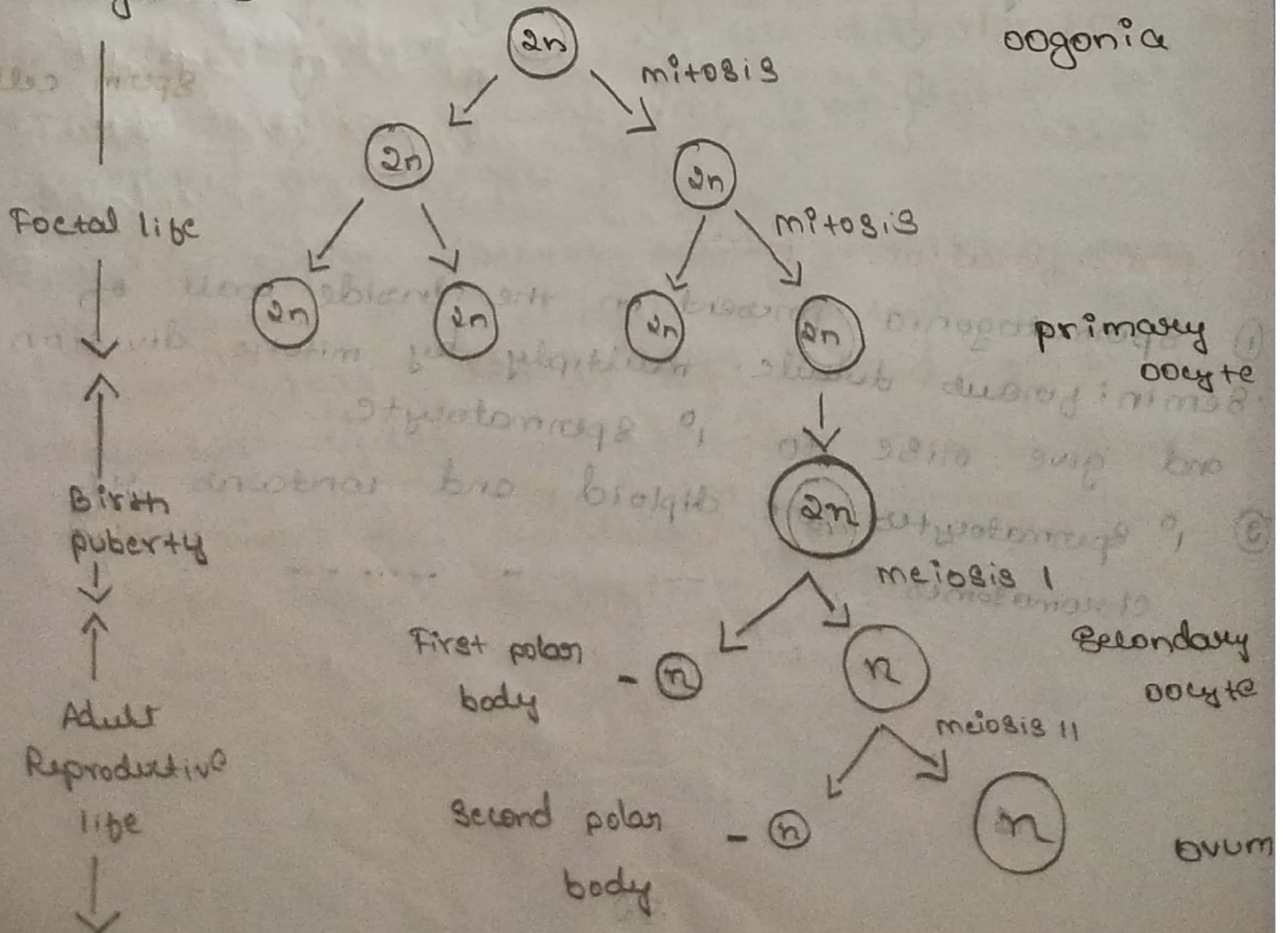
② 2° spermatocytes are haploid and contains 23 chromosomes

③ secondary spermatocytes undergo the second meiotic division to produce four equal haploid spermatids.

③ Differentiation phase

① Here spermatids are transformed into sperm cell (spermatozoa) by the process called spermiogenesis.

② Oogenesis



① multiplication phase

- ① the primordial germinal cells divide repeatedly to form the oogonia
- ② oogonia multiply by the mitotic divisions and form the primary oocytes

② growth phase

- ① primary oocytes gets surrounded by layers of granulosa cells ^{& is} called primary follicle
- ② primary follicle turns to secondary and tertiary follicle respectively

③ maturation phase

- ① In this phase primary oocyte within the tertiary follicle grows in size and completes its first meiotic division, resulting in the formation of large haploid secondary oocyte and tiny first polar body
- ② The secondary oocyte retains bulk of the nutrients such cytoplasm from primary oocyte
- ③ the tertiary follicle further changes into Graafian follicle
- ④ secondary oocyte undergo second meiotic division, resulting in the formation of ovum and tiny second polar body
- ⑤ the ovum is ready for fertilization
- ⑥ the Graafian follicle now ruptures to release matured ovum from the ovary by the process called ovulation

Q4) Write a note on sex determination?
Genetic basis.

56

- ① Sex determination depends on sex chromosomes.
- ② The total no. of chromosomes in men are 46, out of these, 44 chromosomes are ordinary chromosomes and these are called autosomes - remaining 2 chromosomes are sex chromosomes and these are called as allosomes.
- ③ In the females, the sex chromosomes are the same and are called XX.
- ④ In the males, the sex chromosomes are different and are called XY.
- ⑤ One chromosome from each pair determines the sex of the child.
- ⑥ If the child has X chromosome from the mother and X chromosome from the father then it is a female (XX).
- ⑦ If the child has X chromosome from the mother and Y chromosome from the father then it is a male (XY).

26 write about physiology of skeletal muscle contraction. write a nat on neuromuscular junction

- ① During Resting State, the muscle membrane is in polarised state. i.e. Interior of the muscle cell is negatively charged. Exterior of the muscle cell is positively charged.
- ② When a nerve is stimulated, acetylcholine is liberated at neuromuscular junction.
- ③ Acetylcholine increases the permeability of muscular membrane.
- ④ So Na^+ ions enter into the cell and K^+ ions come out of the cell. Both Interior and Exterior of the muscle cell become positively charged, now the muscle ^{membrane} become depolarised.
- ⑤ Depolarisation produces muscle contraction.
- ⑥ When the muscle contraction is over, acetylcholine is destroyed by the enzyme acetylcholinesterase.
- ⑦ Now, K^+ ions move into the cell and Na^+ ions out of the cell. This produces repolarisation of the muscle membrane.
- ⑧ Now the muscle is ready for next contraction.

Neuromuscular Junction.

- ① It is the junction b/w nerve ending and skeletal muscle
- ② At this site nerve loses its myelin sheath and gets expanded
- ③ Acetylcholine is stored in some vesicles of expanded portion
- ④ motor end plate is the part of muscle and it has enzyme acetylcholinesterase.

(26) Describe the functions of ovary

- ① The ovaries produce, store and release ova into the fallopian tube in the process called ovulation.
- ② The ovaries are also part of the endocrine system because they produce the female sex hormones
- ③ Estrogen is secreted by graafian follicle progesterone is secreted by corpus luteum. These hormones are responsible for female secondary sexual characteristics
- ④ Estrogen is secreted to thicken the walls of uterus
- ⑤ progesterone maintains the uterine lining during pregnancy.

37. Explain temporary methods of contraception in females

58

① Natural methods

These methods avoid meeting of sperm and egg without the use of medicine or devices.

① periodic abstinence

① In this method couple avoid coitus from 10th to 17th day of menstrual cycle when ovulation can be expected.

② Coitus Interruptus

① It is the withdrawal of penis by male before ejaculation. So semen is not deposited in the vagina.

③ Lactational amenorrhoea

① This method is based on fact that there is no menstrual cycle after child birth and therefore ovulation does not occur.

④ Barrier methods

In this method sperm and egg are prevented from coming closer with the help of barriers.

④ Condoms

① Male condom is a non porous rubber sac like structure worn over erect penis so that ejaculated semen will not enter into vagina.

Eg: Nirodh

② Female condoms are made up of polyurethane or latex sheath with two rings on either side can be inserted about 8 hours prior to sexual intercourse.

⑤ Diaphragm

A small saucer shaped rubber sheath with a metal coil in its rim which is fitted across ~~mouth~~ cervix.

⑥ Cervical caps

① The cervical cap is a small dome shaped rubber device fitted on the cervix.

② Diaphragm, cervical caps are used along with spermicidal creams and jellies to increase their efficiency.

③ IUD's

① Small flexible objects of various shapes and size, which are fitted into uterus through her vagina by a physician.

- ② It has two strings which are tied
- ③ strings hang through the cervix into the vagina. 31
- ④ A person can remove IUD by pulling gently on the strings with forceps.
- ⑤ IUD reduces the ability of sperm to fertilize the egg.
- ⑥ It prevents implantation of fertilized ovum.
- ⑦, Some IUD's increase viscosity of cervical mucus and prevent sperm from entering the uterus.

Three types of IUD's

- ① Non medical IUD's
Ex: Lipper Loop.
- ② Copper releasing IUD's
Ex: CuT, Cu7.
- ③ Hormone releasing IUD's
Ex: LNG-20

① Oral Contraceptives

- ① Birth control pill contain progestogen and estrogen combination
- ② They have two function. The main one is to prevent ovulation by inhibiting the secretion of FSH and LH
- ③ The second function is to disrupt the normal growth of the internal uterine lining. So that embryo cannot implant in it
- ④ pills have to be taken regularly from 6th to 25th day of menstrual cycle

Eg: Saheli, Mado D

⑤ Injections and Implants

- ① progestogen can be used by females as injections or implants under the skin
- ② Injection is given once in every three months that releases hormone slowly and prevents ovulation
- ③ Implants are matchstick sized capsule containing steroids, that is inserted under skin, under inner arm

④ capsules slowly release progestogen for 5 years and prevents pregnancy.

Eg: Mirella.

⑤ Mirella capsule thickens cervical mucus making it difficult for sperm to pass through.

⑥ Emergency contraceptive

① These pills can prevent pregnancy if taken within 72 hours after the unprotected sexual intercourse.

② These are used in emergency conditions like rape and condom break.

⑦ Creams, foams, Jellies

① These contain spermicides which are toxic to the sperm and should be applied to the vagina just before coitus.

⑧ Advantages

- i) Easy to Apply.
- ii) Do not interfere with coitus.
- iii) Act as lubricant.

Disadvantages

- i) It is not very effective always.

38) Describe the anatomy & functions of spleen.

Str

- ① It is a dark purple coloured lymphoid str
- ② It contains outer covering of fibroelastic tissue called capsule.
- ③ Trabeculae arises from the capsule and pass into the substance of the gland
- ④ The spaces b/w trabeculae contain splenic tissue. These tissue contain the lymphoid tissue
- ⑤ Spleen is supplied by splenic artery and drained by splenic vein

function

- ① Spleen produces all types of blood cell during foetal life
- ② Red blood cells are destroyed in spleen
- ③ It ingest and destroy foreign particle including bacteria
- ④ It serves as reservoir of blood
- ⑤ It also produces antibodies

39) write a note on lymph and its function

- ① Lymph is a colourless fluid which contains blood plasma and lymphocytes but not platelets

- ② compared to plasma it contain high amount of fat.

Functions

- ① lymph nodes are the sites where lymphocytes are produced
- ② lymphatics protects body against infection by filtering and destroying bacteria
- ③ lymphatics drains excess fluid from the tissue to circulation
- ④ the lymphatics carry waste products from tissues to blood

⑩ components & functions of lymphatic system

Components

- ① lymph.
- ② lymph vessels
- ③ lymph nodes
- ④ lymph organs
- ⑤ lymphoid tissue.

Function

- ① write above functions

(4) Str of lymph node

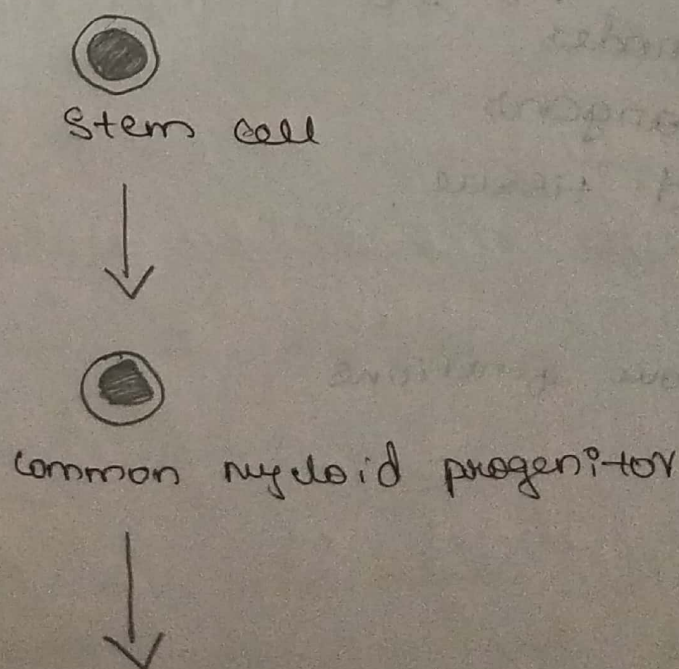
Str.

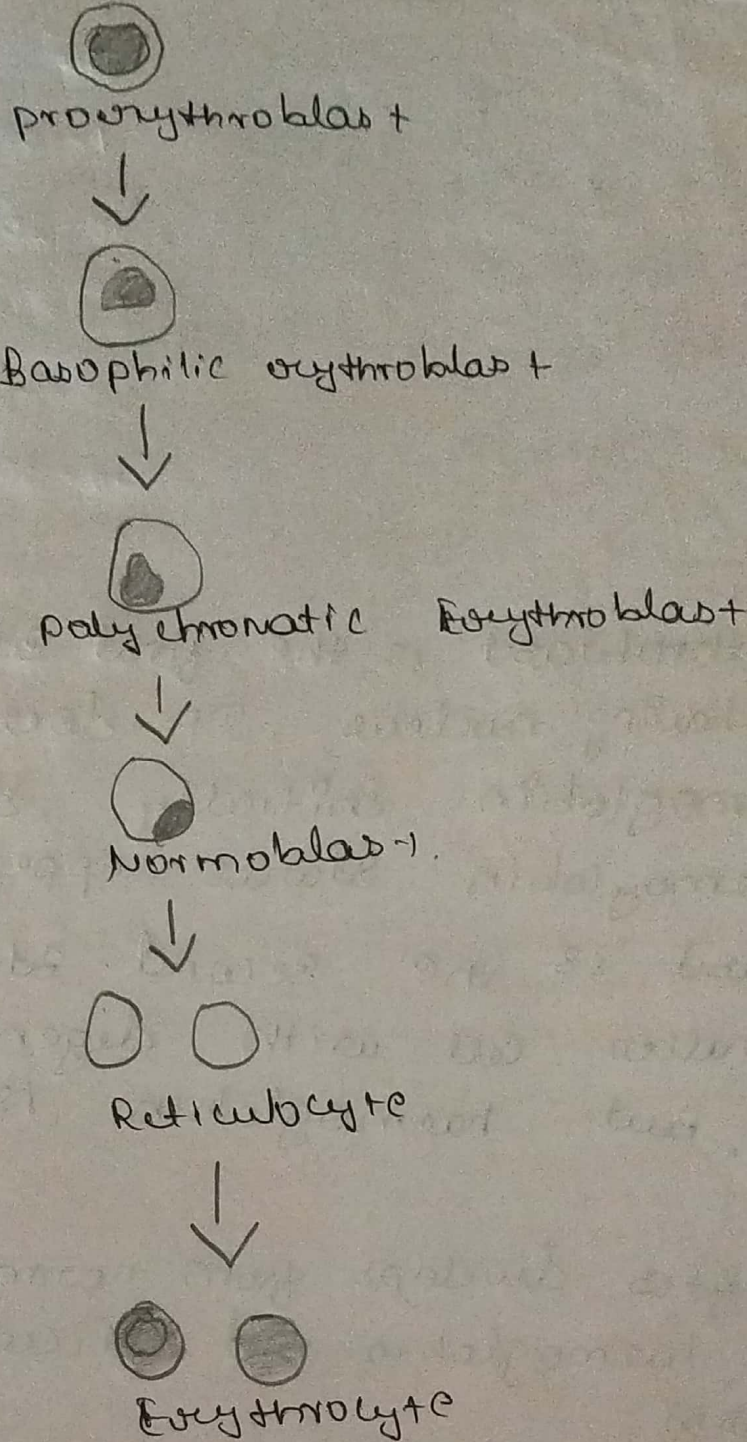
- ① It contains concave border called hilum
- ② It contains outer covering of fibroblastic tissue called capsule
- ③ Trabeculae arises from the capsule and pass into the substance of the gland
- ④ The space b/w trabeculae contain the Splenic. These tissue contain the lymphoid tissue.

Function

- ① It involves production of plasma proteins like globulin.
- ⇒ than previous functions.

Erythropoiesis.





- ① Erythropoiesis is the process by which RBC's are formed
- ② In foetus RBC's are formed in liver, spleen and in red bone marrow
- ③ After birth they are formed only in the red bone marrow of sternum, ribs, vertebrae

- ① Iron deficiency anemia
- ② vitamin deficiency anemia
- ③ Anemia of chronic disease
- ④ Aplastic anemia
- ⑤ Sickle cell anemia
- ⑥ Hemolytic anemia

① proerythroblast is the first stage. It is a large cell having nucleus, It does not have haemoglobin initially. In later stage haemoglobin starts appearing

② Normoblast is the second stage. It is a smaller cell with degenerated nucleus. But haemoglobin is fully present

③ Reticulocyte develops from normoblast. It contains haemoglobin and reticulum in cytoplasm

④ Erythrocyte which is the fully developed RBC. It does not contain reticulum but contains adequate haemoglobin

⑤ Both Vitamin B_{12} and folic acid are necessary for development of RBC

2 mark important concepts

① Angina pectoris

① It is a chest pain due to an inadequate supply of oxygen to the heart muscle.

② It occurs due to narrowing of coronary arteries (myocardial ischemia).

③ It is characterized by feeling of pressure and suffocation just behind breastbone.

② Myocardial Infarction

① It is the death of an area of cardiac tissue due to lack of coronary blood supply to that segment of the myocardium.

② It occurs due to narrowing of coronary arteries.

③ Atherosclerosis

① It is thickening of arterial walls due to the deposition of fat.

④ Congestive heart failure

① It is a condition in which the myocardium of ventricle is unable to maintain sufficient circulation of blood to meet the needs of the body.

⑤ Cardiac arrhythmia (heart)

① It is a disorder in cardiac rate and rhythm.

② It occurs due to defective impulse formation and defective impulse conduction of the heart.

⑥ Cardiac output ? How it is calculated

Ans Cardiac output is the volume of blood ejected from the left ventricle into the Aorta Each minute

$$CO = SV \times HR$$

15 $SV \Rightarrow$ Stroke volume is the volume of blood ejected per beat from each ventricle

$HR \Rightarrow$ Heart Rate is total no of heart beats per minute

⑦ Hypertension

① It is a rise in blood pressure above normal.

② It leads to cerebral hemorrhage, 25 retinal hemorrhage,

⑧ Hypotension

- ① It is a fall in blood pressure below normal.
- ② It leads to inadequate blood supply to brain, shock, myocardial infarction.

⑨ vital capacity

- ① It is defined as the volume of air that can be expelled by a forced expiration after forced inspiration.

Normal value: 4320 in male
3100 in female

⑩ 15 Note on oxygen therapy

- ① It is the use of oxygen as a medical treatment.
- ② used in low blood oxygen and carbon monoxide poisoning.

Resuscitation

- ① It is a process of correcting physiological disorder such as lack of breathing or heart rate.
 - ② 25 Important part of intensive care medicine, surgery etc.
- Ex: - cardiopulmonary & mouth to mouth resuscitation

(11) Functions of Skin

- (1) Regulation of body temperature
- (2) Secretion of sweat
- (3) Sensation
- (4) protection of underlying skin from injury
- (5) Excretion of salts like NaCl and metabolites like urea

(12) MYOPIA (Shortsightedness)

(1) This occurs due to an increase in anterior diameter of the eyeball so the image is formed in front of the retina.

(2) The patient can see nearer objects ~~clearly~~ without difficulty. But distant objects cannot be seen clearly.

(3) This is corrected by using concave lens.

(13) Hypermetropia (Long sightedness)

(i) This occurs due to decrease in antero-posterior diameter of the eye ball, so the image falls behind the retina.

(ii) The nearer objects cannot be seen clearly.

(iii) This is corrected by using convex lens.

(14) Glaucoma

(i) It is an increase in intraocular tension produced due to excessive collection of aqueous humour.

(ii) If not treated, may lead to blindness due to retinal damage.

(15) Function of photoreceptors

(1) Rods are responsible for vision at low light level

5

(2) Cones are active at higher light levels and are capable of colour vision.

(3)¹⁰ Photoreceptors respond to light by sending action potential

(4) It produces sense of sight

(16)¹⁵ What are non-auditory function of Ear

(1) Balance & Equilibrium

(i) Movement of head or alteration in its position produces movement of endolymph present in semicircular canal

(ii) ~~This produces~~

(3) Then impulses from the nerves produce sensation which make us conscious about the position of the head.

25

(3) If the position of head is disorientated, we can then adjust it so as to maintain balance & equilibrium.

5

(17) Olfactory receptors

(1) The receptors for smell are olfactory rods. They are present in the mucous membrane of upper part of nasal cavity.

(2) The ends of olfactory rods collect to form olfactory nerve.

15

(3) These nerve pass through root of nose and end in olfactory bulb.

20

(18) Gustatory receptors

(1) The receptors for the sensation of taste are taste buds.

(2) The receptors are present at the sides and base of the tongue.

25

12

Gustatory Receptors

③ There are four different types of taste which are felt at different areas of tongue

① Sweet at Tip

② Salt at front edge

③ Bitter at Back

④ Sour at Back edge

19

Mention papillae & taste buds

Ans

Papillae Taste buds

i) Filiform

① Sweet taste bud

ii) fungiform

② Salt

iii) Circumvallate

③ Bitter

④ Sour

20

Mention Ear ossicles and their location

① Malleus

②

It is connected to eardrum

25

and it forms synovial joint with Incus

Incus

- ① It forms synovial joint with malleus on its lateral side and stapes on its medial side.

Stapes

- ① It has rest within the oval window. It joins the incus.

②1 Myasthenia gravis

- ① It is a long term neuromuscular disease that leads to varying degree of skeletal muscle weakness.

- ② Symptoms include, trouble talking, trouble walking, muscle weakness.

- ③ This defect is due to rapid destruction of acetylcholin by acetylcholinesterase enzyme.

- ④ It is generally treated by giving acetylcholinesterase inhibitors.

Q2) Isotonic contraction Isometric

- | | |
|---|--|
| ① Muscle shorten | ① muscle does not shorten |
| ② Tension constant | ② Tension Increase |
| ③ no work done | ③ ^{NO} work done |
| ④ ^{more} less Release of heat | ④ ^{Less} more heat Release |
| ⑤ ¹⁰ no It is seen in muscle attached to movable part | ⑤ muscle attach to immovable part |
| ⑥ involve joint movement | ⑥ does not |

15

Eg: lifting weight

Eg: lifting heavy objects which is difficult.

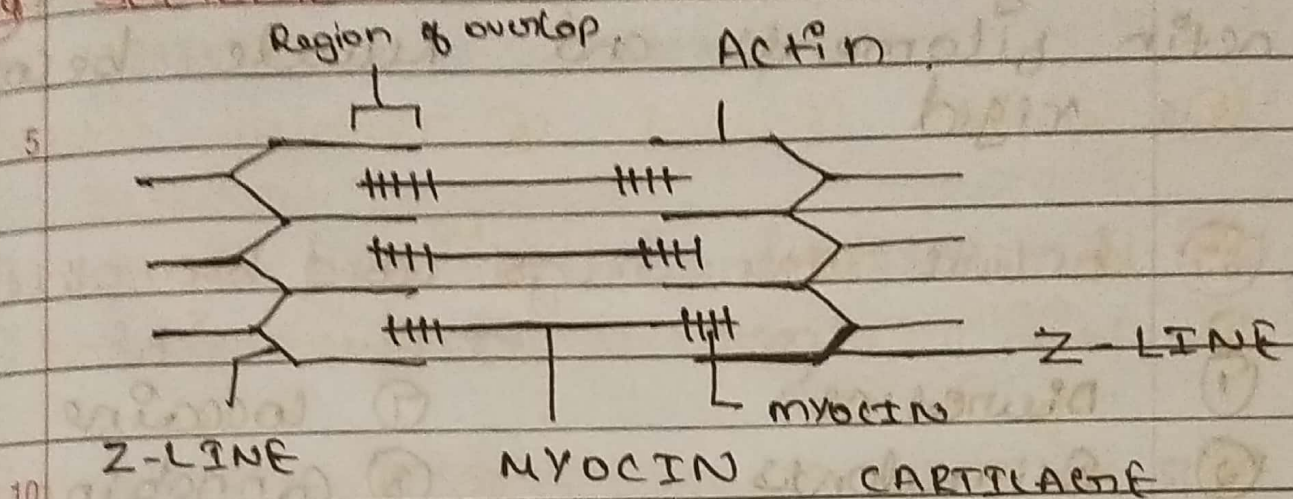
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Q3) Mention properties of Skeletal Muscles

- ① Isotonic contraction
- ② Isometric contraction
- ③ ²⁵ Fatigue
- ④ Excitability and Irritability

⑤ Tonicity

②④ Sarcomere



②③ Mention proteins of skeletal muscle

- ① actin
- ② myosin
- ③ Troponin
- ④ Tropomyosin
- ⑤ Titin

②④ 20 Rigor Mortis

- ① Stiffening of joints and muscles of a body a few hours after death
- ② It is due to biochemical change in the muscles that occurs several hours after death.

(3) ATP is the energy source required for movement. without ATP myosin molecules adhere to actin filaments and muscle become rigid

(Q7) Enlist the drugs used by athletes

- | | |
|--------------------------|------------------|
| (1) Diuretics | (7) Cocaine |
| (2) Stimulants | (8) Cannabinoids |
| (3) Anabolic steroid | (9) Alcohols |
| (4) Human growth Hormone | (10) Marijuana |
| (5) Erythropoietin | |
| (6) Creatin | |

(Q8) Effect of Exercise on CVS

- (1) Exercise helps to reduce blood pressure and increase body ability to dissolve blood clots.
- (2) Blood volume increases. body produces greater no of RBC
- (3) Stroke volume increases at rest

(29) classify Bone Marrow and functions

- ① Red Bone marrow
- ② yellow Bone Marrow

5

Function

- ① production of blood cells
- ② Store fat

(20/10) Articulation

- ① Articulation is the connection made b/w two bones of the body.

(21) ¹⁵ Bone cells

- ① osteoblast
- ② osteocyte
- ③ osteoclast

(20/20) Anemia ? How it is caused

Anemia is the inability of the blood to carry enough oxygen to meet body needs

25

(2) This is because there are low levels of haemoglobin in the blood but sometimes it is due to production of faulty haemoglobin

5

Types

- (i) Iron deficiency anaemia
- (ii) Vitamin deficiency anaemia
- (iii) Sickle cell anaemia
- (iv) 10 Thromolytic anaemia
- (v) Aplastic anaemia

(B3) Functions of plasma protein

(1) 15 Albumin

- (i) Involved in transportation of protein for several steroid hormones

(2) Globulins

- (12) Helps in attack of viruses & bacteria

(3) Fibrinogen

plays essential role in blood clotting

25

34 Serum

① Serum is the part of blood which is similar in composition with plasma but exclude clotting factor of blood

5

plasma

① plasma is considered as the medium of blood in which RBC, WBC and other components are suspended.

10

35. Haemophilia

Haemophilia is a inherited bleeding disorder where the blood doesn't clot properly. It is caused when blood doesn't have enough clotting factor.

15

Symptom

- ① nosebleed
- ② blood in the urine
- ③ tissue damage
- ④ ~~haemorrhage~~ haemorrhages in joints

25

36 Hypoxia

It is a condition in which region of the body is deprived of adequate oxygen supply at the tissue level

5

Asphyxia

It is a condition where either body does not get enough oxygen or too much of CO_2 to function properly

10

37. dysbarism

① It refers to medical conditions resulting from changes in ambient pressure

15

② various activities associated with pressure changes, underwater diving is the most frequent example

38.20 Muscles of respiration

①

Diaphragm

②

Intercostal muscles

25

39 Functions of bile

- ① Emulsification of lipids
- ② Helps the body to absorb
breakdown product of lipid
- ③ Bile salts binds with lipids to form micelles. This is then absorbed through intestinal mucosa

40 peptic ulcer

① peptic ulcers are open sores that develop on the inside lining of your stomach and upper portion of small intestine.

- ② It includes gastric & duodenal ulcers
- Symptoms
Stomach pain

41 Composition of bile

- ① water
- ② Mucus
- ③ bile pigment
- ④ bile salt
- ⑤ cholesterol

42. Liver Cirrhosis

(1) Cirrhosis is a disease in which healthy liver tissue is replaced with scar tissue

5

(2) The scar tissue blocks the flow of blood through the liver and slows the liver ability to process nutrients, hormones, drugs and toxins

10

43) Functions of Hypothalamus

(1) Controls activity of Autonomic Nervous System

(2) produces Hormones

5

(3) Regulate Emotional and behavioral patterns

(4) Contains thirst centre, which regulates drinking

(5) Contains feeding centre which regulate eating

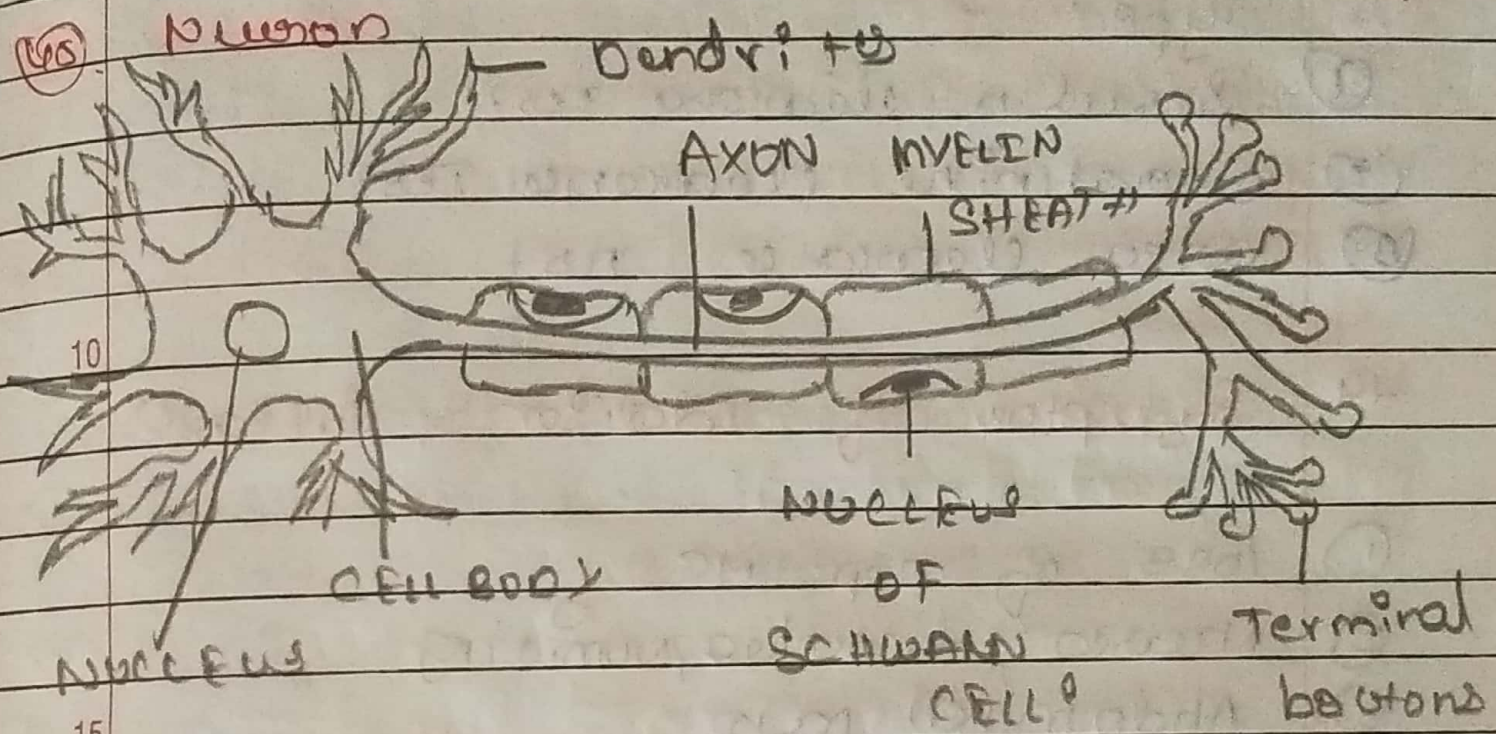
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44) Functions of Cerebrospinal fluid

(1) Supports & protects brain & spinal cord by maintaining uniform pressure

25

- Date: _____
- ② It acts as shock absorber b/w brain & spinal cord
 - ③ It keeps brain & spinal cord moist



46 ganglion

ganglion is a group of nerve cell bodies located in the autonomic nervous system & sensory system

47 Significance of Insulin Clearance

- ① used to determine the **Test** filtering capacity of glomeruli;
- ② Insulin is small, inert substance which readily passes through the glomeruli into the urine without being reabsorbed by renal tubules.

48 Renal clearance test

- ① Rate at which chemical removed from the plasma indicates kidney efficiency.

5

Type

- ① Insulin clearance test
- ② Creatinine clearance test
- ③ urea clearance test

10

49 Symptom of Addison's disease

- ① loss of appetite
- ② Nausea, diarrhea, vomiting
- ③ Abdominal pain
- ④ joint pain
- ⑤ Extreme fatigue
- ⑥ hypoglycemia

⑤ 20 mutation of hyperthyroidism

- ① This syndrome arises as the body tissues are exposed to excessive level of T_3 and T_4 .

25

main causes are

- ① Graves disease
- ② Adenoma

(51) Cretinism

(1) Cretinism refers to severe hypothyroidism in child. It is the result of maternal iodine deficiency.

5

(2) It is the condition of severely stunted physical and mental growth.

(52) function of hormones of adrenal medulla

10

(1) Increasing blood pressure

(2) Increase in heart rate

(3) Increase metabolic rate

(4) Dilating the pupils

15

(53) thyrotoxicosis

It is the syndrome resulting from serum elevation in thyroid hormone levels, especially T_3 & T_4 .

20

(54) Myxoedema

Myxoedema is a term used synonymously with severe hypothyroidism. Hypothyroidism refers to low thyroid level is a common disorder of endocrine system in which thyroid gland doesn't produce enough thyroid hormone.

25

Q5) Goitre

Goitre is swelling of neck resulting from enlargement of the thyroid gland

5

Q6) Acromegaly

① It is a disorder that results from excess GH hormone after the growth plates have closed.

10

② Initial symptoms is typically enlargement of hands & feet.

Q7) Gigantism

15

It is characterized by excessive growth and height significantly above average. This condition is caused by excessive production of

Q8) Diabetes mellitus

It is metabolic disorder that is characterized by high blood sugar level over a prolonged period

25

Q9) Diabetes Insipidus

It is a condition characterized by excessive thirst and excretion of large amount of severely dilute urine.

Q10) positive feedback mechanism

In a positive feedback mechanism output enhances the original stimulus.

During child birth oxytocin speed up contractions. The increase in contractions causes more oxytocin to be released.

Q11) Corpus luteum

Endocrine strⁿ in female ovary that ~~are~~ ~~involved in~~ that are involved in production of progesterone.

(62) gonadotrophins & their function

(1) FSH

(2) LH

5 LTH

(63) Vasectomy

procedure to cut & tie the vas deferens that carry sperm from the testicles

10

(64) Tubectomy

It is the procedure to close both fallopian tube in women. This means sperm can't get to the egg to fertilise it.

the 5

(65) Male Reproductive System in order

20

Ampulla → Ejaculatory duct → vas deferens

(66) Sex hormones

A steroid hormone that is produced especially by ovaries & testes for the function of reproductive organ.

25

(67) list of parts of male R.S.

① Scrotum, testes, Epididymis, Seminal vesicles, Ejaculatory duct, urethra, prostate gland, Cowper's gland, penis.

(68) ~~labour~~ parturition
process by which baby is expelled from the uterus through the Vagina.

(69) menarche
In female reproductive cycles normally.

(69) menarche
It is the first menstruation in the life of a girl. It occurs at the age of 11-13. It is beginning of reproductive life.

Menopause

It is the end of menstruation in the life of women. occurs at the age of 45-50, It is end of reproductive life.

① lymph nodes?

① It is a bean shaped gland present in lymphatic vessels

② usually distributed in groups

③ groups of gland are present in neck, thorax, abdomen