

UNIVERSITY SOLVED QUESTION WITH ANSWER

Year : 2018-2019

Subject : HAP

Subject Code : BP-101T

Subject In-Charge : Arun Aniket Das &
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Registration No :

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B.Pharm
BP101T

1st Semester Regular / Back Examination 2018-19
HUMAN ANATOMY AND PHYSIOLOGY I
BRANCH : B.Pharma

Time : 3 Hours

Max Marks : 75

Q.CODE : E907

Answer Question No.1 (Part-A) and 02 (Part-B) which are compulsory and any two from Part-C.

The figures in the right hand margin indicate marks.

- Q1** **Objective Answer Type Questions (Answer All)** **(2 x 10)**
- Part-A**
- a) Outline levels of structural organization and body systems.
 - b) Define anatomy and physiology.
 - c) Differentiate anterior and posterior.
 - d) What is hemostasis.
 - e) Classify bones.
 - f) How many vertebrae present in the lumbar vertebral region?
 - g) What is anaemia.
 - h) Which blood vessel carries blood from heart to lungs?
 - i) What is lymph?
 - j) What do you mean by sagittal plane of body?

- Q2** **Focused-Short Answer Type Questions- (Answer Any Seven)** **(5 x 7)**
- Part-B**
- a) Discuss blood grouping.
 - b) Elaborately Classify tissue system of body.
 - c) Outline different steps of erythropoiesis.
 - d) Draw structure of a typical cell with proper labeling.
 - e) Make a brief note on ear.
 - f) Briefly discuss on the origin and functions of spinal nerves.
 - g) What is a skeleton, what are various functions of it?
 - h) What are different functions of lymph.
 - i) Make a brief note on physiology of muscle contraction.

- Part-C**
- Long Answer Type Questions (Answer Any Two)**
- Q3** Discuss in detail on composition and functions of blood. **(10)**
 - Q4** Write a note on the structure of heart with help of a neat and labeled diagram. **(10)**
 - Q5** Write structure and function of lymph node? **(10)**
 - Q6** Describe structure and functions of different types of epithelial tissue. **(10)**

2018-19 Semester Question Practice

- Q) Outline levels of Structural organization and body system?
- A) Life process of human body are maintained at several level of ~~tissue~~ structural organization. These include the chemical, cellular, tissue, organ, organ system and the organism level. Higher levels of organization are built from lower levels - There fore molecules combines to form tissues, tissue combines to form organ system and organ system combined to form organism.
- b) Define anatomy and physiology?
- A) Anatomy and physiology are two most basic terms and areas of study in the life science. Anatomy refers to the internal and external structures of the body and their physical relationship, where as physiology refers to the study of the function of these structures.
- c) Define Anterior or posterior?
- A) Anterior - Anterior indicates the front surface of the body and is used interchangeably with ventral. posterior indicates the back surface of the body or nearer to the back.
- d) what is hemostasis?
- A) Hemostasis is the body's process of stopping bleeding which involves a series of steps to form a blood clot at the site of injury. It includes vaso-constriction, formation of a platelet plug and blood clotting to seal the ~~wound~~ wound.

(E) Classify bones?

(A) Bones can be classified according to their shapes. Long bones such as the femur are longer than they are wide. Short bones such as the carpals are approximately equal in length, width and thickness. Flat bones are thin, but are often curved, such as the ribs. Irregular bones such as those of the face have no characteristic shapes. Sesamoid bones, such as the patellae are small and round, and are located in tendons.

(F) How many vertebrae present in the lumbar vertebrae region?

(A) The lumbar region of the ~~vertebrae~~ spine consists of five vertebrae, which are labeled L₁ to L₅.

(G) What is anaemia?

(A) Anaemia is a medical condition characterized by a lack of healthy red blood cells or hemoglobin of the blood.

- They can lead to symptoms such as fatigue, weakness, pale skin, shortness of breath.

(h) Which blood vessel carries blood from heart to lungs?

(A) The blood vessel that carries blood from heart to lungs is the pulmonary artery.

(i) What is lymph?

(A) Lymph also called lymphatic fluid, is a collection of extra fluid that drains from cells and tissue of our body and is not reabsorbed into your capillaries.

- ~~lymph~~ Lymph contains many substances, including proteins, minerals, fat, damaged cells, cancer cells and germs.

- lymph is made of: white blood cells, primary lymphocytes - which are responsible for attacking bacteria on the blood.

(J) Sagittal plane of the body?

(A) The sagittal plane is a vertical plane that divides the body into left and right sides. It runs parallel to the body's midline. Movements in the sagittal plane include flexion and extension, such as bending forward or backward at the waist.

(2) Discuss about blood grouping?

• A blood group is a type of classification of blood based on the presence and absence of various antigens and antibodies.

Types of blood group system

There are 2 type main blood group system

① ABO System

② RH System

~~Basic of~~ ABO System

- The ABO system is the most important blood group system in human blood transfusion

- Karl Landsteiner discovered the ABO blood group system in 1901

• Basic of ABO System

- Based on the presence of and absence of antigen A and antigen B

- A, B, AB, and O groups.

Blood group A

- RBC of this blood group contains A-Antigen
- These blood group contains B-antibodies
- can receive blood from group A and O.
- can donate to blood to group A and AB.

Blood group B

- RBC of this blood group contains B-Antigen.
- These blood groups contains A-antibodies
- can receive blood from group B and O
- can donate blood to group B and AB.

Blood group AB

- RBC of this blood groups contains both A and B antigens.
- There are no antibodies in blood group AB.
- They are the 'universal acceptor' can receive blood from all groups A, B, AB and O.
- They can donate to blood group AB only.

Blood group O

- RBCs of this blood groups contains no antigens
- These blood groups contain both A and B antibodies
- They can receive blood from group 'O' only.
- They are the universal donor, can donate blood to all the groups - A, B, AB and O

RH System

- RH blood group was firstly discovered by an Rhesus monkey so, it is called RH factor.
- It is known as Rhesus blood group system.
- In this system RBCs contain D antigens.
- In RH system there are no antibodies.
- Now if the RBCs contain D antigens - Rh positive
if the RBCs don't contain D antigens - Rh negative.
- In Indian population 85% people are positive.

(b) Classify tissue system of the body?

(A) Tissue is defined as group of cells having similar structure and functions.

- Histology is the branch of science that deals with the study of tissue.

Types of body tissue

According to the structure and function body tissue can be classified into 4 basic categories

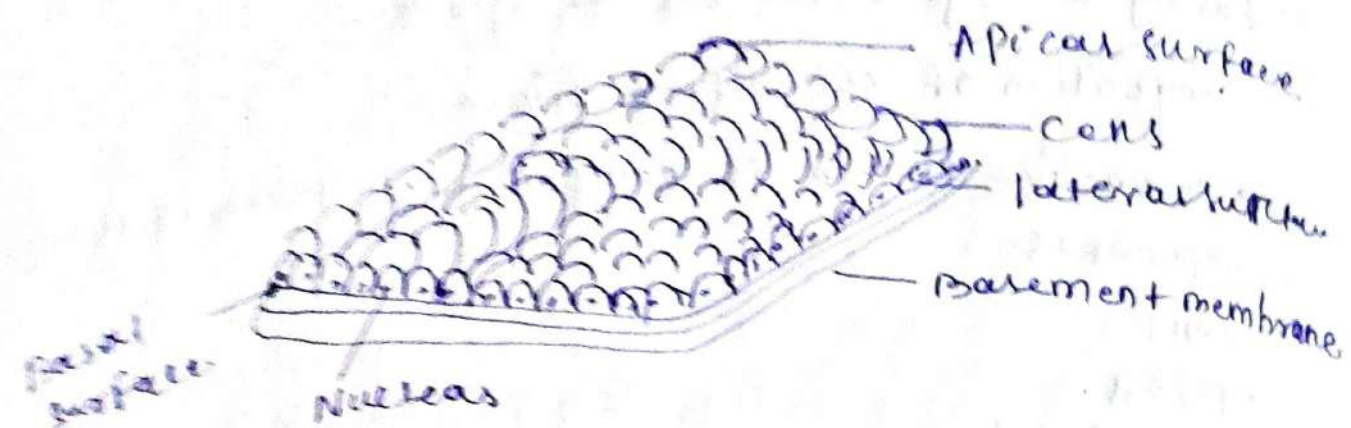
- ① Epithelial tissue
- ② connective tissue
- ③ muscular tissue
- ④ Nervous tissue

Epithelial tissue

- It is also known as epithelium.
- It forms the outer covering of body and internal organs.

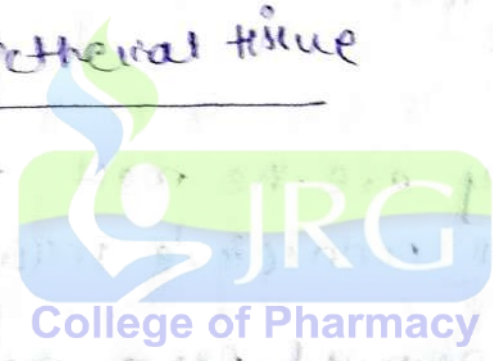
- In epithelial tissue cells are closely packed in the form of continuous sheet having no intercellular space.

- In epithelial tissue cells are connected with each other by hemidesmosomes.

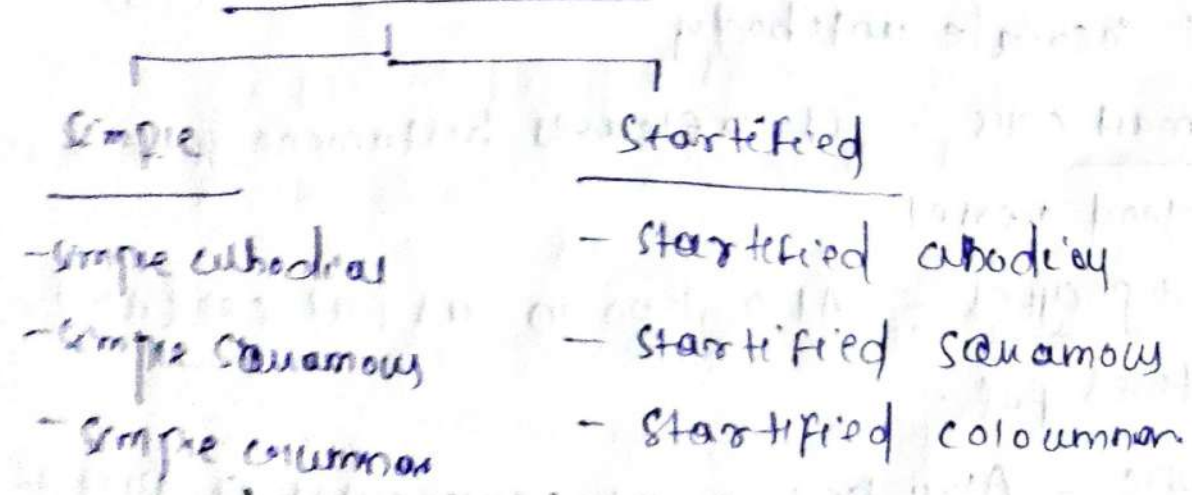


Function of epithelial tissue

- Protection
- Secretion
- Absorption
- Excretion



Types of Epithelial tissue



Connective tissue

- connective tissue as the name says, it connects, ^{support} and binds different tissue and organs of the body.
- It is the most abundant and widely distributed tissue system in the body.
- In connective tissue cells are loosely packed with having a huge intercellular space.

Composition of connective tissue

- A connective tissue is composed of following three components
 - cells
 - fibers
 - ground substance.

Cells

- Fibroblast - They are the most commonly found cell in early in all connective tissue.
- macrophages - Developed from monocytes it destroy the bacteria.
- plasma cells - Developed from B-lymphocytes and it secrete antibody.
- mast cells = It releases histamine that dilate blood vessel.
- Adipocytes = Also known as fat cells and it stores fat.
- wbc - Also known as leukocytes it protect body from infection.

- function of ~~connective~~ ^{Epithelial} tissue
- protecting underlying tissue from injury and bacterial infection.
- Secretion of sweat from sweat gland.
- Absorption of water nutrients.
- Elimination of waste products.

connective tissue

- connective tissue as the name says it connects support and binds different tissue and organs of the body.
- It is the most abundant and widely distributed tissue system of the body.
- In connective tissue cells are loosely packed having a huge intercellular space.

function of connective tissue

- It connects the different body tissue
- provide strength and protection to different body organs
- provide structural framework to body.
- Transportation and fat storage

muscular tissue

- muscular tissue also known as muscle tissue is made up of elongated cells called as muscle fibers that use to ^{ATP} generate force.
- The main function of muscle tissue are
 - produce movement
 - producing heat
 - stabilize body position and maintain posture

Nervous tissue

- Nervous tissue is the most complex tissue in the body.

- it is the main tissue of our nervous system.

- it is formed by the network of more than 100 million nerve cells.

- Nervous tissue consist 2 cells.

(1) Nerve cells or Neurons

(2) glial cells.

Function

- Regulates and control the body function.

- generates and transmit the nerve impulse.

- support, insulates and protect impulse generating neurons.

c) Erythropoiesis :- (1) Describe Erythropoiesis

- formation of RBC is called Erythropoiesis.

- Red blood cells are also known as Erythrocytes which contain

- Haemoglobin that gives red colour to blood.

- The total life span of RBC is around 120 days.

- The process of erythropoiesis takes place in the red bone marrow.

Process of Erythropoiesis

Hematopoietic stem cell



Proerythroblast



Early Normoblast



Late Normoblast

↓
Reticulocyte
↓
Erythrocyte

Changes during Erythropoiesis.

- Reduction in the size of the cell
- Disappearance of nucleus
- Appearance of hemoglobin
- Disappearance of cell organelles.

Regulation of Erythropoiesis

- Too few RBC leads to tissue hypoxia.
- Too many RBC leads to increased blood viscosity
- It is required to maintain a balance of RBC production and ~~redaction~~ destruction
- Erythropoietin regulates the production of red blood cells.
- The no of RBC remains const because the bone marrow produces the red blood cells at the rate at which they are destroyed.

(d) ~~cell~~ Discuss about cell and labelling

(A) Cell

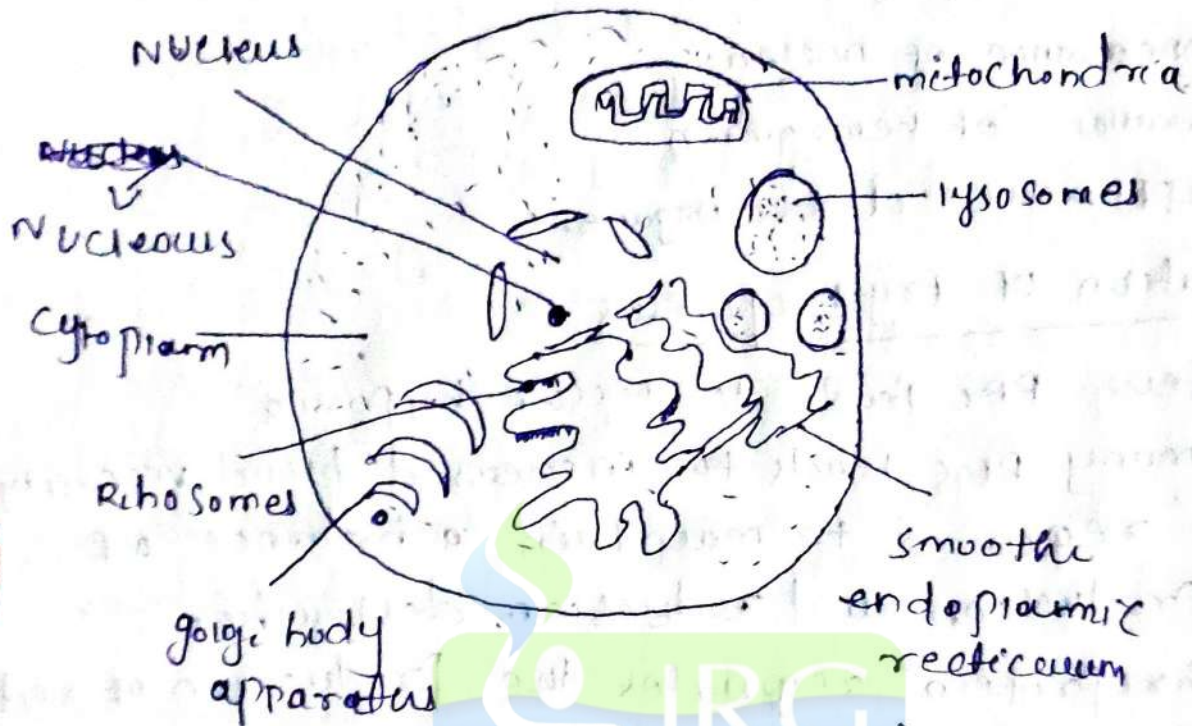
(i) A cell is the basic structural and functional unit of life.

(ii) The cell was first discovered by Robert Hooke in 1665.

(iii) The first living cell was discovered by Anton Van Leeuwenhoek

- There are 200 different types of cells present in the body,

- ~~cell~~ Study of cell is also known as cytology.



Parts of cell

A cell is divided into two major parts

- ① plasma membrane
- ② Cell organelles

- (i) Cytoplasm
- (ii) Ribosomes
- (iii) Endoplasmic reticulum
- (iv) Golgi apparatus
- (v) mitochondria
- (vi) lysosomes
- (vii) nucleus

Plasma membrane
- Plasma membrane also known as cell membrane it is thin flexible.

- It is made up of
protein (60-80%)
lipids (20-40%)
carbohydrates (1-2%)

function of plasma membrane

- (i) protection of cells
- (ii) give a specific shape to cell.
- (iii) regulate and movement of substance.

Cytoplasm ÷

- It is a gel like structure.
- It is present in whole cell from nucleus.
- cytosol contains (75-90%) ~~water~~ water, ions, amino acid, proteins, lipids different inorganic substance of salts.

Ribosomes

- These are tiny granules composed of RNA and protein.
- They synthesize protein from amino acid using RNA and hence they are also called factory of ~~RNA~~ protein.

Endoplasmic ~~reticula~~ Reticulum

- Endoplasmic reticulum is a network membrane attached with the nucleus helps in the transportation of materials.

It is divided into 2 types

- Smooth endoplasmic reticulum
- Rough endoplasmic reticulum

Golgi apparatus

- It is present near the nucleus
- It consists of 4-6 flattened sacs.
- The proteins move from endoplasmic reticulum to Golgi apparatus.

Mitochondria

- It is the power house of the cell
- It consists of two membrane bound structures:
 - 1) Outer membrane
 - 2) Inner membrane.

Lysosome

- They are membrane bound structures filled with digestive enzymes
- It helps to clean cell by digesting foreign materials and damaged cell organelles.

Nucleus

The nucleus is generally spherical or oval in shape and it is the largest structure of the cell.

- It consists of two parts:
 - ① Nuclear membrane
 - ② Nucleoplasm.

- (1) The ear is a sense organ to help in hearing
 it is also help. to maintain or balance the equilibrium of the body.
 - it collects the sound waves and convert them into electrical signal and send them to brain.



External ear

it mainly helps in collection of sound waves and it consist of various parts it is the parts side of the skull.

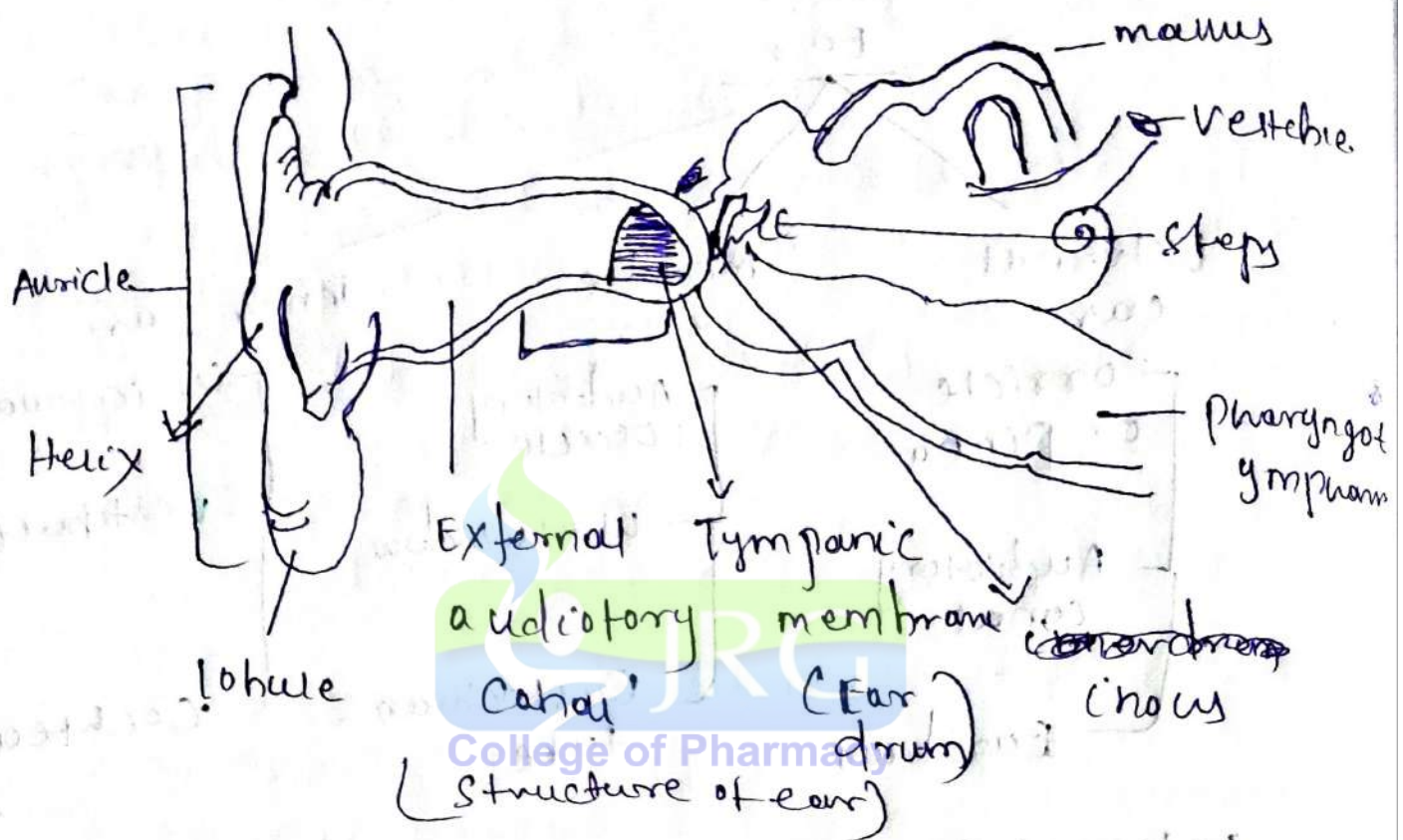
middle ear

- It is a small cavity in the temporal bone covered by epithelial tissue.
- It is also known as tympanic cavity.
- It mainly consist of auditory ossicles

Internal ear

The internal ear also called labyrinth.

- It consist 2 part
 - Bony labyrinth
 - membranous labyrinth.



3(a) Composition and function of blood

(A) Blood is a specialized liquid connective tissue

- It consist blood plasma and formed element.
- It is transfer of O_2 and CO_2 inside of our body.
- It is circulated around the body through the blood vessels.
- Hematology is the branch of science that study about blood.

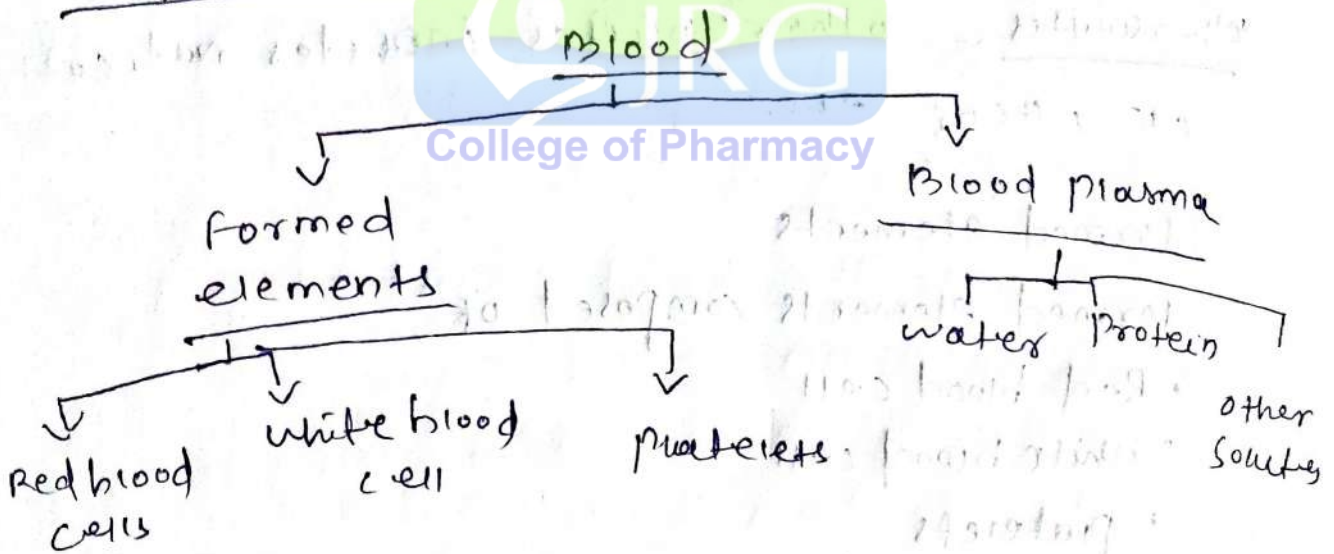
Basic properties of blood

- It is denser and more viscous than water
- The temperature of the blood is 38°C
- In males the volume is about 5-6 litres
- In females the volume is about 4-5 litres

function of blood

- The major function of blood is transportation of O_2 and CO_2 gases.
- It also helps in the transportation of nutrients and metabolic wastes.
- It regulates the body temperature.
- It regulates water balance.
- It also helps in blood clotting.

components of blood



A blood is composed 2 components

- blood plasma
- formed elements

Blood Plasma :-

- Plasma is a pale yellow coloured liquid component of the blood.
- It is about 55% total blood volume.
- It is composed various components like water, proteins, minerals.

Components of blood plasma

water :- 30% of total plasma helps in absorption and transportation.

protein :- Albumins :- maintain osmotic pressure

globulins :- In volve in the defence mechanism.

fibrinogen :- helps in blood clotting

other solutes :- other solutes includes Na^+ , Ca^{2+} , K^+

Cl^- , HCO_3^- etc

formed elements

formed elements composed of

- Red blood cell
- white blood cell
- platelets

Red blood cell

- Red blood cell also known as Erythrocytes
- It is composed of 45% of total volume.
- Its shape is generally circular or biconcave
- Its colour red due to hemoglobin.
- Its diameter about 7-8 μm and thickness about 2 μm .

- The total life span of RBC is 120 days.

White blood cells

• They are also known as leucocytes.

• Its shape is generally amoeboid.

• It is colourless in nature.

• They are less no in number compared to erythrocytes.

• The normal counts of WBC 5000-10000 WBC/41

• Increase level of WBC leads to leukemia.

Types of WBC

- granulocytes

- Agranulocytes

Platelets

• They are also known as thrombocytes.

• The normal platelets count is approx 1,50,000-4,00,000 platelets/41

• They are of disc shaped.

• The diameter about 2-4 μm

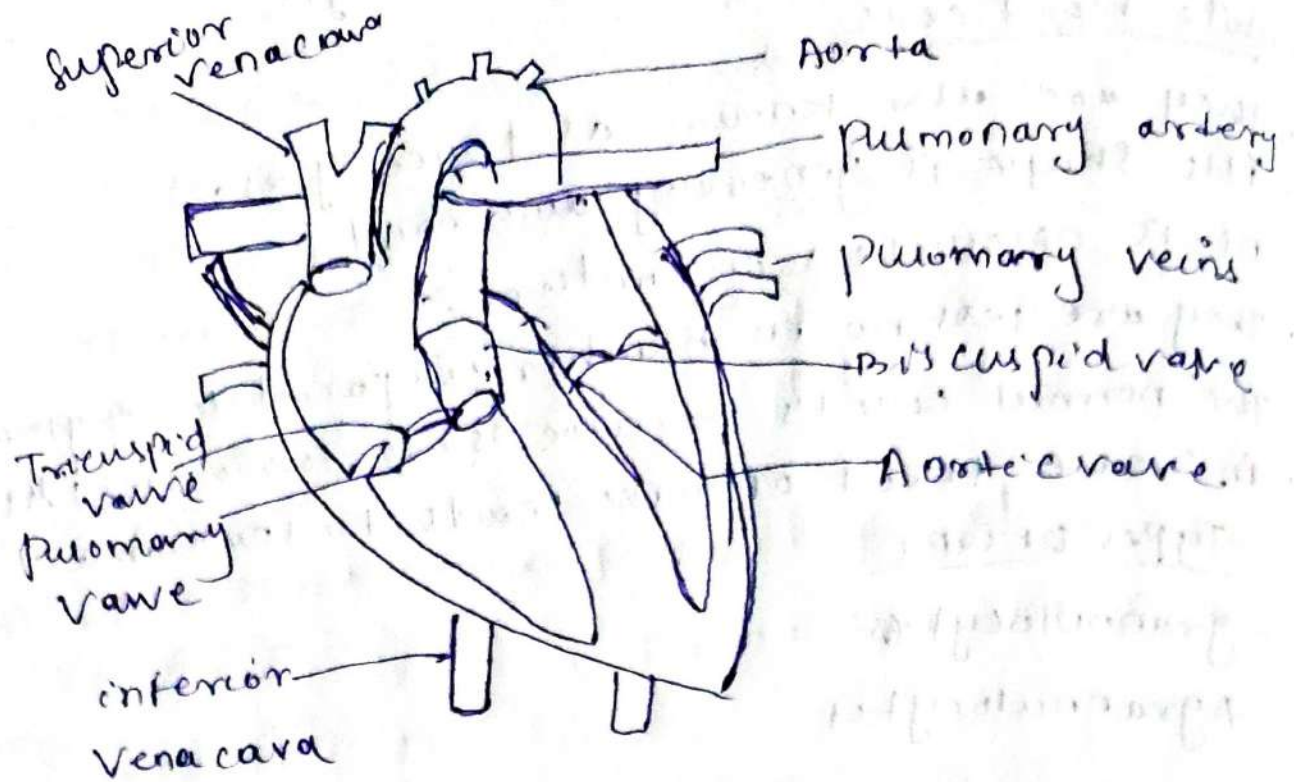
• Their life span is 5 to 9 days

• It's plays vital role in haemostasis.

(a4) Write a note on structure of heart with the help of a neat and labelled diagram?

(*) Heart is a hollow muscular organ that pumps the blood through out the blood vessel.

• It is a small structure, roughly having the size of person closed fist.



Shape - Cone shape

Dimension - $12\text{cm} \times 9\text{cm} \times 6\text{cm}$

location - mediastinum

weight - About 250g

Layers of heart

The wall of the heart consist 3 layers

1) pericardium

2) myo cardium

3) Endo cardium

Pericardium

- It is the upper most layer of the heart excise the heart and roots of the blood vessel
- It surrounds and protect the heart -
- It also divided into 2 parts
 - 1) fibrous pericardium
 - 2) serous pericardium

myocardium :-

- It is the middle layer of the heart made of cardiac muscle tissue.
- It makes up of the bulk of the heart.
- The myocardium is responsible for pumping of heart.

Endocardium :-

- It is the inner most layer of the heart.
- It is made up of thin layer of epithelial tissue.
- It provides smooth lining for chambers of heart.
- It covers valves of heart.

chambers of heart

The heart consists of 4 chambers

- ① Right Atrium
- ② Left atrium
- ③ Right ventricle
- ④ Left ventricle

Right atrium

- It is present on the upper ^{right} side of the heart.
- It received deoxygenated blood from superior and inferior vena cava.
- The average thickness of wall is 2-3 mm.

Left atrium

- It is ~~the~~ present on the upper left side of the heart.
- It received oxygenated blood from ^{lungs} ~~the~~ through pulmonary veins.

- It is smaller & shaped compared to right atrium.
- 4 pulmonary veins open in the left atrium.
- The average thickness of wall is 3-5 mm.

Right ventricle

- It is present below the right atrium.
- It receives deoxygenated blood from the right atrium.
- It forms a large part of heart.
- The average thickness of wall is 3-5 mm.

Left ventricle

- It is present below the left atrium.
- It receives oxygenated blood from left atrium.
- The wall of left ventricle is two three times thicker than right ventricle.
- The average thickness of wall is 10-15 mm.

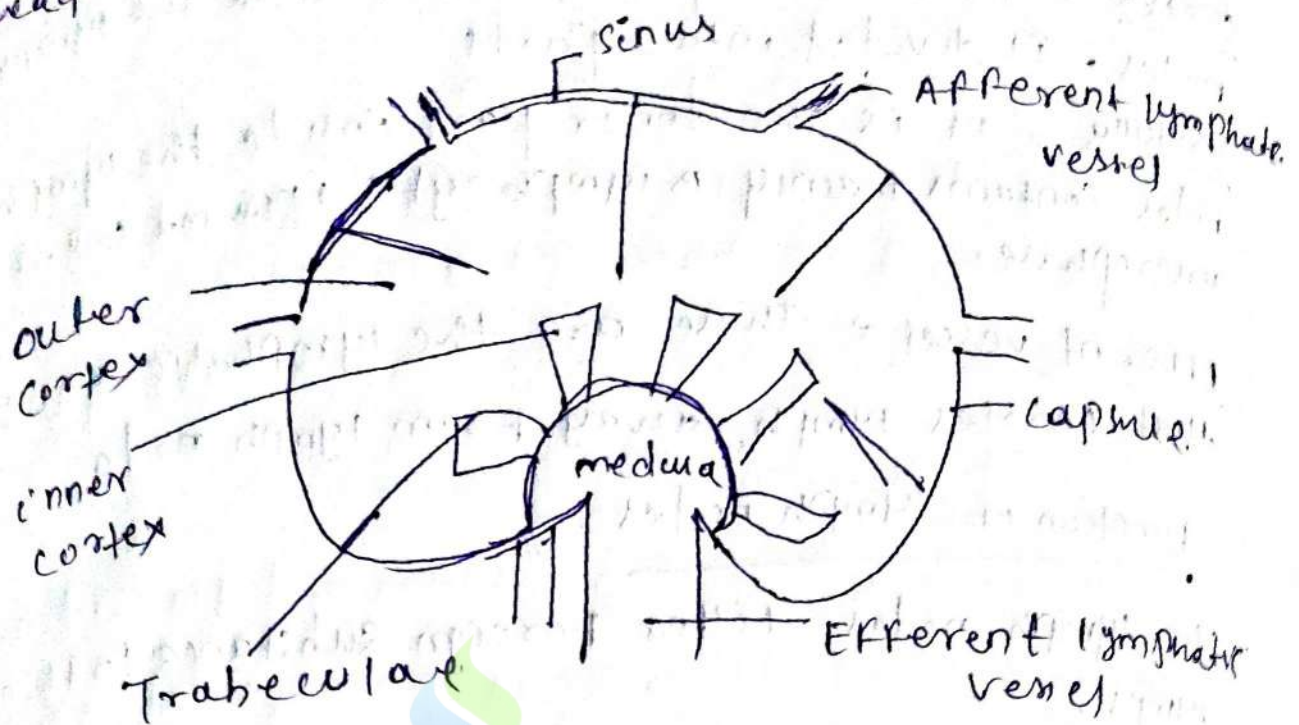
lymph nodes

Q5) Describe the function and structure of lymph node?

- (A) A lymph node is a small oval or bean shaped organ present along the lymphatic vessel.
- it filters lymph before it is returned to the blood.

They are greyish pink in colour.

- They are approximately 500-600 lymph node in the body
- These nodes vary in size. Some are small as pin head and some are as large as almond.



Structure of lymph node

- Its structure is bean or kidney shaped.
- Its length vary from 1-25mm.
- These are five major parts in the structure of lymph node

- ① Afferent lymphatic vessel
- ② capsule
- ③ cortex
- ④ medulla
- ⑤ Efferent lymphatic vessel

Afferent vessel - These are the lymphatic vessels through which lymph enters into lymph nodes.

Capsule = It is the outer covering of lymph node.

Cortex = It is the upper part inside the lymph nodes. It is divided into 2 parts.

Medulla = It is the inner part inside the lymph nodes. It contains mainly B lymphocytes, plasma cells and macrophages.

Efferent vessel = These are the lymphatic vessels that carry lymph away from lymph nodes.

Function of lymph nodes

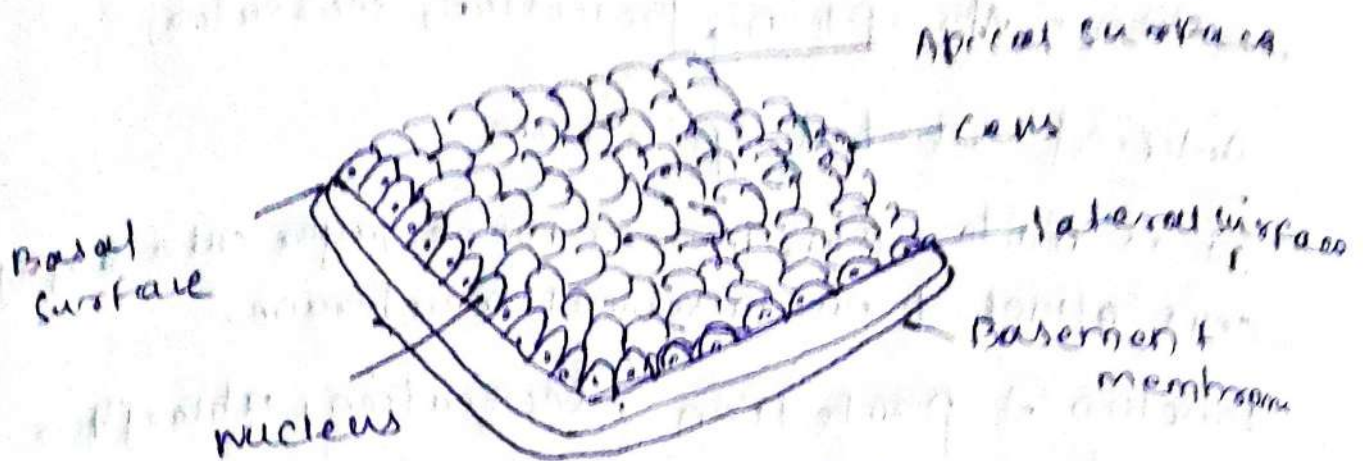
The lymph nodes filter foreign substances from the lymph.

- The lymph nodes contain B and T lymphocytes which help in defence mechanism.
- They also help in the production of plasma proteins like globulins.
- They contain macrophages that destroy foreign substances by phagocytosis.

Q) Describe structure and function of different epithelial tissue?

A) It is also known as Epithelium.

- It forms the outer covering of the body.
- In epithelial tissue cells are closely packed in the form of a continuous sheet having no intercellular space.



Epithelial tissue

Epithelial tissue

- simple cuboidal
- simple squamous
- simple columnar
- stratified cuboidal
- stratified squamous
- stratified columnar

Simple cuboidal

It consist single layer of cube shaped cells arranged basement membrane
 function: secretion, transportation, filtration.

Simple squamous

It consist a single layer of flat cells arranged base membrane.

function: Absorption and filtration

Simple columnar

It consist of single layer of rectangular shaped cells arrangement on basement membrane.

function :- Absorption, protection, secretion.

Stratified cuboidal epithelium

It is made up of two or more layer cube shaped cells attached on basement membrane.

function :- protection, secretion, absorption

Stratified squamous epithelium

It is made up multiple layer and flattened cells.

function - protection, Keratin makes ^{skin} waterproof

Stratified columnar epithelium

It is made up of several layer of rectangular shaped cells.

function :- protection and secretion

2(f) Briefly describe about the spinal nerves

(A) spinal nerves connect the spinal cord with other parts of the body. The brain communicates the body through the spinal nerves.

- There are 31 pairs of them located them along the length of spinal cord.

- spinal nerves emerge from the spinal ^{Cord} ~~nerve~~ through space between the vertebrae. Each nerve emerges as 2 short branches one at front of the spinal cord and one at the back.

- some of the spinal nerves form networks or interwoven nerves, called nerve plexuses. In plexuses, nerve fibers from different spinal nerve are sorted and recombined so that all fibers going to or coming from one area of a specific body part are put together into one nerve.

There are 2 major nerve plexuses

Brachial plexus: sorts of recombines nerve fibers travelling to the arms and hands

lumbosacral plexus: sorts and recombines nerve fibers going to the legs and feet

29) The skeletal system is the structural framework that supports the whole body and protect internal organs.

- An adult human consist 206 bones

- Bone tissue make up about 18% of the total body weight.

- Osteology is the branch that deals with the structure and function of skeletal system

- Skeletal system is mainly composed of.

(1) Bones

(2) cartilage

(3) Joints

(4) Ligaments

Function of skeletal system

Support : Hard structural frame work that support body.

Protection : protect internal organs such as brain, heart, spinal cord.

movement : provide movement as they are attached with skeletal muscle.

Storage : Storage minerals such as calcium phosphate and fat storage.

Blood production : Blood cells are produced in the red bone marrow.

(h) Lymphatic system :-

A lymph system is a network of tubes, organs and vessels that helps to maintain the body fluid balance and protect from virus and bacteria.

- The lymphatic system is mainly consist of a clear watery fluid called lymph.

function of lymphatic system

① Return fluid form tissue to blood

In the daily basis approx 3 liters of fluid loss from blood capillaries that is absorbed collected in the lymphatic vessel and again transferd the blood.

② absorb and Transport fats and large molecules

Special lymphatic capillaries called lacteals. in villi small intestine absorb lipid and fats.

College of Pharmacy

③ Body defence / immunity

lymphatic system is an important componen of immunosystem. it contains wbc that destroy bacteria.