Lala Ami Chand College of Pharmacy

Village- Abdulgarh, Barara Road, District-Ambala (Haryana)

Session 2019-20

D. Pharmacy 1ST

Subject Anatomy and Physiology.

Answers no. 1 to 25 (1 marks each)

A1. Cell is the basic structural and functional unit of life of all living organism.
A2. Histology is defined as the study of microscopic structure of tissues.
A3. Endocrine gland are ductless glands which release their products directly into the bloodstream.
A4. Bone is also known as **Osseous tissue.**
A5. Plasma is a clear liquid golden yellow in colour containing water, plasma proteins etc.
A6. Longest bone of the forelimb is **Humerus.**
A7. **Bursitis** is a painful and inflammatory condition that affects bursae which provide cushion effect to bones, tendons and muscles.
A8. The blood group **O** is universal donor.
A9. **Myocardium** is the thickest layer and consists of cardiac muscle tissue.
A10. Instrument used to measure blood pressure is **Sphygmomanometer**.
A11 Hypertension is defined as common condition in which long term force of the blood against artery walls is high enough to cause complications.
A12. Angina Pectoris is defined as chest pain caused by reduced flow to the heart muscles.
A13. Larynx is connected by Hyoid bone.
A14. COPD means Chronic obstructive pulmonary disorder.
A15. The basic structural unit of Kidney is Nephron.
A16. Normal capacity of urinary bladder is 400-600 ml.
A17. Act of passing urine is called Micturition.
A18 Oedema is a condition characterized by an excess of watery fluid collecting in the cavities or tissues of the body.
A19. Temperature regulation is controlled by Hypothalamus.
A20. A **spinal nerve** is a mixed **nerve**, which carries motor, sensory, and autonomic signals between the **spinal** cord and the body. In the human body there are 31 pairs of **spinal nerves**, one on each side of the vertebral column. **Cranial nerves** are the nerves that emerge directly from the brain (including the brainstem), in contrast to spinal nerves(which emerge from segments of the spinal cord). 10 of the cranial nerves originate in the brainstem. Cranial nerves relay information between the brain and parts of the body, primarily to and from regions of the head and neck.
A21. Smallest bone of middle ear is Stapes.
A22.The **aqueous humour** is a transparent, watery fluid similar to plasma, but containing low protein concentrations. It is secreted from the ciliary epithelium, a structure supporting the lens.
A23. Outermost layer of skin synthesise protein called Keratin.
A24. **Visceral pain** is **pain** that results from the activation of nociceptors of the thoracic, pelvic, or abdominal **viscera** (organs). **Visceral** structures are highly sensitive to distension (stretch), ischemia and inflammation, but relatively insensitive to other stimuli that normally evoke **pain** such as cutting or burning.
A25. Hormones secreted by pancreatic endocrine gland are Glucagon and Insulin.

Answers no. 26 to 40 (3 marks each)

A26. A **blood type** (also called a **blood group**) is a classification of **blood**, based on the presence and absence of antibodies and inherited antigenic substances on the surface of red **blood** cells (RBCs). These antigens may be proteins, carbohydrates, glycoproteins, or glycolipids, depending on the **blood group** system

A27. The **ball-and-socket joint** (or spheroid **joint**) is a type of synovial **joint** in which the **ball**-shaped surface of one rounded bone fits into the cup-like depression of another bone. The distal bone is capable of motion around an indefinite number of axes, which have one common center.
A28. **Connective tissue** is the most abundant and widely distributed of the primary **tissues**. **Connective tissue** has three main components: cells, fibers, and ground substance. Together the ground substance and fibers make up the extracellular matrix. ... Cartilage is avascular, while dense **connective tissue** is poorly vascularized.
A29. Blood has four main components: plasma, red blood cells, white blood cells, and platelets. Blood has many different functions, including: transporting oxygen and **nutrients** to the **lungs** and tissues, forming blood clots to prevent excess blood loss..
A30. Synovial joints are the most movable type of joint found in the human body. Joints are formed where bones come together. The six types of synovial joints are the pivot, hinge, **saddle**, plane, **condyloid**, and ball-and-socket joints.
A31. Common blood disorders include **anemia**, bleeding disorders such as **hemophilia**, blood clots, and blood **cancers** such as **leukemia**, lymphoma, and **myeloma**. Talking to your doctor is the first step to take if you believe you may have a blood condition.
A32. **Lymph** contains a variety of substances, including proteins, salts, glucose, fats, water, and white blood cells. Unlike your blood, **lymph** does not normally contain any red blood cells. The **composition** of **lymph** varies a great deal, depending on where in your body it originated.
A33. **Mechanism Of Breathing**. The action of **breathing**in and out is due to changes in pressure within the chest (thorax). This action is also known as external respiration and is created by the muscles of the chest and the diaphragm changing the size of the chest cavity (and air pressure).
A34. **Kidney and urinary system parts and their functions:**

- Two kidneys. This pair of purplish-brown organs is located below the ribs toward the middle of the back. ...
- Two ureters. These narrow tubes carry urine from the kidneys to the bladder. ...
- Bladder. ...
- Two sphincter muscles. ...
- Nerves in the bladder. ...
- Urethra.

A35. The nephrons of the kidneys process blood and create **urine** through a process of filtration, reabsorption, and secretion. **Urine** is about 95% water and 5% waste products. Nitrogenous wastes excreted in **urine** include urea, creatinine, ammonia, and uric acid.
A36. The cardiac muscle has only one job, but it is a very important one; its job is to pump blood through the miles of blood vessels in your **body**. If the cardiac muscle stops, you stop. It's a good thing you don't have to consciously think about contracting your heart muscle.
A37. The spinal cord carries out two main functions: It connects a large part of the peripheral **nervous system** to the brain. Information (nerve impulses) reaching the spinal cord through **sensory** neurons are transmitted up into the brain.
A38. Reflex Arc Components. Most reflex arcs have five main components: receptors, sensory neurons, interneurons, **motor** neurons and muscles. However, not all reflexes use interneurons. Some connect sensory neurons directly to **motor** neurons and do not use interneurons.
A39. Saliva is produced in and secreted from salivary glands. The basic secretory units of salivary glands are clusters of cells called an acini. These cells secrete a fluid that contains water, electrolytes, and enzymes, all of which flow out of the acinus into collecting ducts.Within the ducts, the composition of the secretion is altered. Much of the sodium is actively reabsorbed, potassium is secreted, and large quantities of bicarbonate ion are secreted. Bicarbonate secretion is of tremendous importance to ruminants because it, along with phosphate, provides a critical buffer that neutralizes the massive quantities of acid produced in the stomachs. Small collecting

ducts within salivary glands lead into larger ducts, eventually forming a single large duct that empties into the oral cavity.

A40.The **adrenal medulla**, the inner part of an **adrenal** gland, controls hormones that initiate the flight or fight response. The main hormones secreted by the **adrenal medulla** include epinephrine (adrenaline) and norepinephrine (noradrenaline), which have similar functions.

Answers no. 41 to 55 (5 marks each)

A41. **Spermatogenesis** is the process by which haploid spermatozoa develop from germ cells in the seminiferous tubules of the testis. This process starts with the mitotic division of the stem cells located close to the basement membrane of the tubules.The process of **oogenesis** occurs in the ovary's outermost layer. A primary oocyte begins the first meiotic division, but then arrests until later in life when it will finish this division in a developing follicle. This results in a secondary oocyte, which will complete meiosis if it is fertilized.
A42.The ovaries produce the egg cells, called the ova or oocytes. The oocytes are then transported to the fallopian tube where fertilization by a sperm may occur. The fertilized egg then moves to the uterus, where the uterine lining has thickened in response to the normal **hormones** of the reproductive cycle.
A43. The digestive functions of saliva include moistening food, and helping to create a food bolus, so it can be swallowed easily. Saliva contains the enzyme amylase that breaks some starches down into maltose and dextrin. Thus, **digestion** of food occurs within the **mouth**, even before food reaches the stomach.
A44. Joints connect bones within your **body**, bear weight and enable you to move. They are made up of bone, **muscles**, synovial fluid, cartilage and ligaments.

A45. **Coagulation**, also known as **clotting**, is the process by which blood changes from a liquid to a gel, forming a blood clot. It potentially results in hemostasis, the cessation of blood loss from a damaged vessel, followed by repair. The mechanism of coagulation involves activation, adhesion and aggregation of platelets along with deposition and maturation of fibrin. Disorders of coagulation are disease states which can result in bleeding (hemorrhage or bruising) or obstructive clotting (thrombosis).[1]

Coagulation begins almost instantly after an injury to the blood vessel has damaged the endothelium lining the blood vessel. Exposure of blood to the subendothelial space initiates two processes: changes in platelets, and the exposure of subendothelial tissue factor to plasma Factor VII, which ultimately leads to fibrin formation. Platelets immediately form a plug at the site of injury; this is called *primary hemostasis*. *Secondary hemostasis* occurs simultaneously: Additional **coagulation factors** or **clotting factors** beyond Factor VII (listed below) respond in a complex cascade to form fibrinstrands, which strengthen the platelet plug

A46. The 2 main thyroid hormones are T3 (triiodothyronine) and T4 (thyroxine). T3 and T4 regulate your body's temperature, metabolism and heart rate.The amount of thyroid hormones secreted is controlled by another hormone, called thyroid stimulating hormone (TSH), which is released from the pituitary gland in your brain. TSH stimulates the thyroid to make T3 and T4. Blood tests are done for TSH levels when doctors investigate for thyroid disease. T3 and T4.

A47.The liver's main job is to filter the blood coming from the digestive tract, before passing it to the rest of the **body**. The liver also detoxifies chemicals and metabolizes drugs.

A48. The **small intestine** (**small bowel**) is about 20 feet long and about an inch in diameter. Its job is to absorb most of the nutrients from what we eat and drink. Velvety tissue lines the **small intestine**, which is divided into the duodenum, jejunum, and ileum. The colon absorbs water from wastes, creating stool

A49. The individual motor neuron plus the **muscle** fibres it stimulates, is called a motor unit. When an impulse reaches the **muscle** fibres of a motor unit, it stimulates a reaction in each sarcomere between the actin and myosin filaments. This reaction results in the start of a **contraction** and the sliding filament theory

A50. The **cardiac cycle** includes two phases: diastole and systole. In the systole phase, blood is forced to flow from the two atria into their respective ventricles as the atrial muscles contract due to the depolarization of the atria.

A51. **THE THREE MAIN COMPONENTS OF ANY PLANT OR ANIMAL CELL ARE:**

1. PLASMA MEMBRANE/ CELL MEMBRANE

Structure- a bilipid membraneous layer composed of proteins and carbohydrates. It is fluid like.

Function - the cell membrane separates the cell from its external environment, and is selectively permeable (controls what gets in and out). It protects the cell and provides stability.

Proteins are found embedded within the plasma membrane, with some extending all the way through in order to transport materials.

Carbohydrates are attached to proteins and lipids on the outer lipid layer.

2. CYTOPLASM

Structure - The jelly-like substance composed of mainly water and found between the cell membrane and nucleus. The cytoplasm makes up most of the "body" of a cell and is constantly streaming.

Function - Organelles are found here and substances like salts may be dissolved in the cytoplasm.

3. NUCLEUS

Structure - The largest organelle in the cell. It is dark and round, and is surrounded by a double membrane called the **nuclear envelope/membrane**. In spots the nuclear envelope fuses to form pores which are selectively permeable. The nucleus contains genetic information (DNA) on special strands called **chromosomes**.

Function - The nucleus is the "control center" of the cell, for cell metabolism and reproduction.

THE FOLLOWING ORGANELLES ARE FOUND IN BOTH PLANT AND ANIMAL CELLS.

1. "ER" OR ENDOPLASMIC RETICULUM

The Endoplasmic Reticulum is a network of membranous canals filled with fluid. They carry materials throughout the cell. The ER is the "transport system" of the cell.

There are two types of ER: rough ER and smooth ER.

Rough Endoplasmic Reticulum is lined with ribosomes and is rough in appearance and smooth endoplasmic reticulum contains no ribosomes and is smooth in appearance.

2. RIBOSOMES

Ribosomes are small particles which are found individually in the cytoplasm and also line the membranes of the rough endoplasmic reticulum. Ribosomes produce protein. They could be thought of as "factories" in the cell.

3. GOLGI BODY / APPARATUS

Golgi bodies are stacks of flattened membranous stacks (they look like pancakes!). The Golgi Body temporarily stores protein which can then leave the cell via vesiciles pinching off from the Golgi.

4. LYSOSOMES

Lysosomes are small sac-like structures surrounded by a single membrane and containing strong digestive enzymes which when released can break down worn out organelles or food. The lysosome is also known as a suicide sac.

5. MITOCHONDRIA

The mitochondria are round "tube-like" organelles that are surrounded by a double membrane, with the inner membrane being highly folded. the mitochondria are often referred to as the "powerhouse" of the cell. the mitochondria releases food energy from food molecules to be used by the cell. This process is called respiration. Some cells(muscle cells) require more energy than other cells and so would have many more mitochondria.

6. VACUOLES

Vacuoles are fluid filled organelles enclosed by a membrane. They can store materials such as food, water, sugar, minerals and waste products.

A52. The human heart is about the size of our own fist and is mainly divided into four chambers namely two ventricles and two atria. The ventricles are the chambers that pump blood and atrium are the chambers that receive blood. Among which both right atrium and ventricle make up the "right heart," and the left atrium and ventricle make up the "left heart. The right and the left region of the heart are separated by a wall of muscle called the septum. The right ventricle pumps the blood to the lungs for re-oxygenation through the pulmonary arteries. The right semilunar valves close and prevent the blood from flowing back into the heart. Then, the oxygenated blood is received by the left atrium from the lungs via the pulmonary veins.

Pericardium

As we all know, our heart is situated to the left of the chest and is enclosed within a fluid-filled cavity described as the pericardial cavity. The walls and lining of the pericardial cavity are made up of a membrane known as the pericardium.

The pericardium is a fibre membrane found as an external covering around the heart. It protects the heart by producing a serous fluid, which serves to lubricate the heart and prevent friction between the surrounding organs. Apart from the lubrication, the pericardium also helps by holding the heart in its position and by maintaining a hollow space for the heart to expand itself when it is full. The pericardium has 2 exclusive layers—

- **Visceral Layer** directly covers outside of the heart.
- **Parietal Layer** forms a sac around the exterior region of the heart that contains the fluid in the pericardial cavity.

Structure of the Heart Wall

The heart wall is made up of 3 layers, namely:

- **Epicardium** – This is the outermost layer of the heart, which is composed of a thin layer of membrane that protects and lubricates the outer section.
- **Myocardium** – This is a layer of muscle tissue and it constitutes the middle layer wall of the heart. It contributes to the thickness and responsible for the pumping action.
- **Endocardium** – It is the innermost layer that lines the inner heart chambers and covers the heart valves. It also keeps blood from sticking and prevents the formation of potentially fatal blood clots.

Chambers of the Heart

Vertebrate hearts can be classified based on the number of chambers present. For instance, most fish have 2 chambers, reptiles and amphibians have 3 chambers. Avian and mammalian hearts consists of 4 chambers. Humans are mammals so we obviously have 4 chambers, namely:

- Left atrium
- Right atrium
- Left ventricle
- Right ventricle

Atria are thin, less muscular walls and smaller than ventricles. These are the blood-receiving chambers that are fed by the large veins.

Ventricles are larger and more muscular chambers responsible for pumping and pushing blood out to the circulation. These are connected to larger arteries that deliver blood for circulation.

The right ventricle and right atrium are smaller than left chambers. Their walls consist of fewer muscles compared to the left portion and the size difference is based on their functions. The blood from the right side flows through the pulmonary circulation while blood from the left chambers is pumped throughout the body.

Blood Vessels

In organisms with closed circulatory systems, the blood flows within vessels of varying sizes. All vertebrates, including humans, possess this type of circulation. The blood vessels typically comprise of the following:

- **Veins** supply deoxygenated blood to the heart via inferior and superior vena cava, and it eventually drains into the right atrium.
- **Capillaries** are very small, tube-like vessels which form a network between the arteries to veins.
- **Arteries** are muscular-walled tubes mainly involved in supplying oxygenated blood away from the heart to all other parts of the body. Aorta is the largest of the arteries and it branches off into various smaller arteries throughout the body.

Valves

These are the fibrous flaps of tissues that are present in cardiac chambers between the veins. They ensure unidirectional flow and prevent backflow of blood. There are two types of valves.

- **Atrioventricular valves** are present in every ventricle and atrium. The valve between the ventricle and right atrium is the tricuspid valve, and the one which is found between the left ventricle and atrium is known as the mitral valve.
- **Semilunar valves** are present in the large arteries and ventricles. An aortic valve is present between the aorta and left ventricle, and a pulmonary valve exists between the pulmonary artery and right ventricle.

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A53. The cerebrum is the largest part of the brain. It is responsible for memory, speech, the senses, and emotional response. It is divided into four sections called lobes: the frontal, temporal, parietal, and occipital. Each handles a specific segment of the cerebrum's jobs.

The diencephalon is inside the cerebrum above the brain stem. Its tasks include sensory function, food intake control, and the body's sleep cycle. As with the other parts of the brain, it is divided into sections. These include the thalamus, hypothalamus, and epitheliums.

The brain is protected from damage by several layers of defenses. Outermost are the bones of the skull. Beneath the skull are the meninges, a series of sturdy membranes that surround the brain and spinal cord. Inside the meninges, the brain is cushioned by fluid.

A54. The skin is one of the largest organs in the body in surface area and weight. The skin consists of two layers: the epidermis and the dermis. Beneath the dermis lies the hypodermis or subcutaneous fatty tissue. The skin has three main functions: protection, regulation and sensation. Wounding affects all the functions of the skin.

The skin is an organ of protection

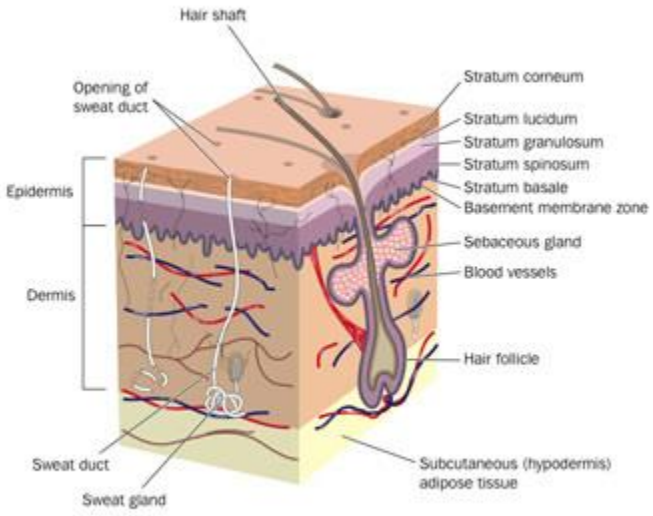
The primary function of the skin is to act as a barrier. The skin provides protection from: mechanical impacts and pressure, variations in temperature, micro-organisms, radiation and chemicals.

The skin is an organ of regulation

The skin regulates several aspects of physiology, including: body temperature via sweat and hair, and changes in peripheral circulation and fluid balance via sweat. It also acts as a reservoir for the synthesis of Vitamin D.

The skin is an organ of sensation

The skin contains an extensive network of nerve cells that detect and relay changes in the environment. There are separate receptors for heat, cold, touch, and pain. Damage to these nerve cells is known as neuropathy, which results in a loss of sensation in the affected areas. Patients with neuropathy may not feel pain when they suffer injury, increasing the risk of severe wounding or the worsening of an existing wound.



A55. Pancreas produces chemicals to digest the food we eat. The exocrine tissues secrete a clear, watery, alkaline juice that contains several enzymes. These break down food into small molecules that can be absorbed by the intestines

The enzymes secreted by the pancreas include:

- trypsin and chymotrypsin to digest proteins
- amylase to break down carbohydrates
- lipase, to break down fats into fatty acids and cholesterol

The endocrine portion, or islets of Langerhans, secrete insulin and other hormones.

Pancreatic beta cells release insulin when blood sugar levels rise.

Insulin:

- moves glucose from the blood into muscles and other tissues, for use as energy
- helps the liver absorb glucose, storing it as glycogen in case the body needs energy during stress or exercise

When blood sugar falls, pancreatic alpha cells release the hormone glucagon.

Glucagon causes glycogen to be broken down into glucose in the liver.

The glucose then enters the bloodstream, restoring blood sugar levels to normal.

Answers no. 56 to 65 (8 marks each)

A56. Blood pressure is measured using two numbers. **systolic** and The second number, called **diastolic** blood pressure, measures the pressure in your blood vessels when your heart rests between beats. If the measurement reads 120 **systolic** and 80 **diastolic**, you would write "120/80 mmHg. Blood pressure is measured with an instrument called a sphygmomanometer. First, a cuff is placed around your arm and inflated with a pump until the circulation is cut off. A small valve slowly deflates the cuff, and the doctor measuring blood pressure uses a stethoscope, placed over your arm, to listen for the sound of blood pulsing through the arteries. That first sound of rushing blood refers to the systolic blood pressure; once the sound fades, the second number indicates the diastolic pressure, the blood pressure of your heart at rest.Blood pressure is measured in millimeters of mercury (mm Hg) and recorded with the systolic number first, followed by the diastolic number. For example, a normal blood pressure would be recorded as something under 120/80 mm Hg.

Blood pressure readings can be affected by factors like:

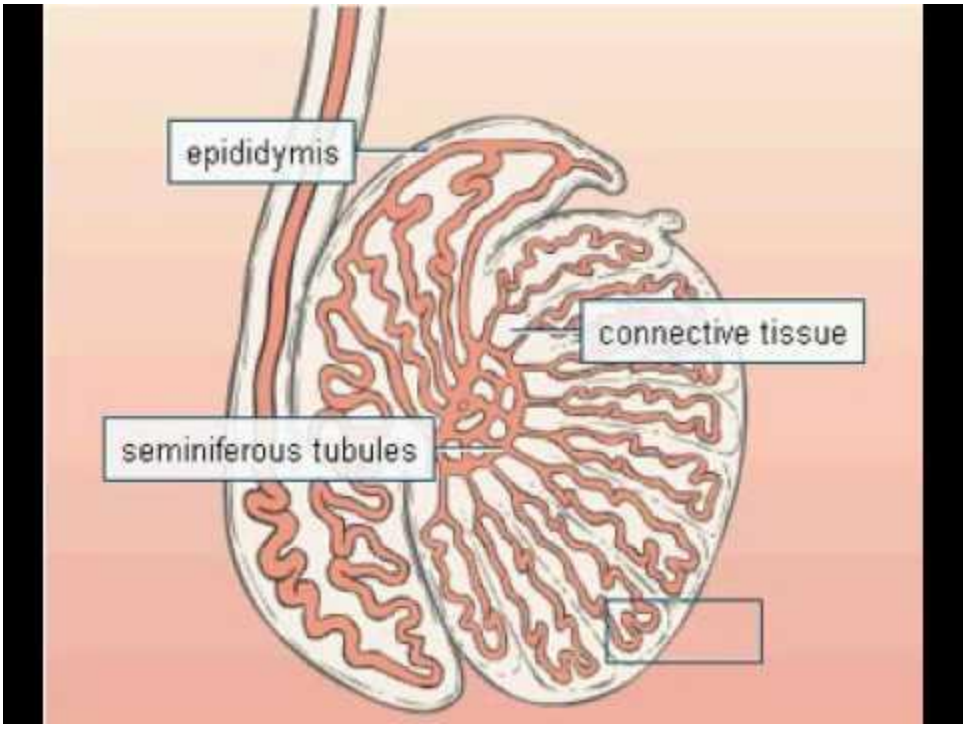
- Smoking
- Coffee or other caffeinated drinks
- A full bladder

- Recent physical activity

Blood pressure is also affected by your emotional state and the time of day. Since so many factors can affect blood pressure readings, you should have your blood pressure taken several times to get an accurate measurement

A57. The testes — also called testicles — are two oval-shaped organs in the male reproductive system. They're contained in a sac of skin called the scrotum. The scrotum hangs outside the body in the front of the pelvic region near the upper thighs.Structures within the testes are important for the production and storage of sperm until they're mature enough for ejaculation. The testes also produce a hormone called testosterone. This hormone is responsible for sex drive, fertility, and the development of muscle and bone mass. The testicles are housed in the **scrotum** just behind the penis. The testicles are the male gonads — the primary male reproductive organs. They have two, very important functions that are very important to the male reproductive system: they produce gametes, or sperm, and they secrete **hormones**, primarily testosterone.

STRUCTURE OF TESTES



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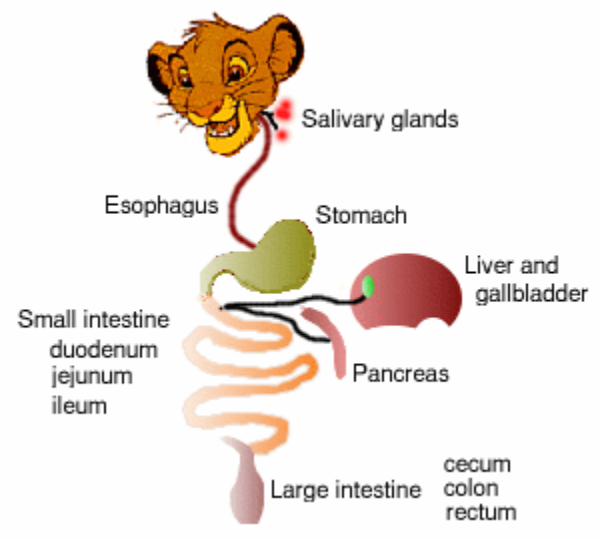
A58. **The digestive system is composed of the digestive or alimentary tube and accessory digestive organs**. The basic terminology used to describe parts of the digestive system is shown below and more detailed description of each is presented in later sections.



The digestive system depicted above - a carnivore - is the simplist among mammals. Other species, even humans, have a more or very much more extensive large intestine, and ruminants like cattle and sheep have a large set of forestomachs through which food passes before it reaches the stomach.

Each of the organs shown above contributes to the digestive process in several unique ways. If you were to describe their most important or predominant function, and summarize shamelessly, the list would look something like this:

- **Mouth**: Foodstuffs are broken down mechanically by chewing and saliva is added as a lubricant. In some species, saliva contains amylase, an enzyme that digests starch.
- **Esophagus**: A simple conduit between the mouth and stomach - clearly important but only marginally interesting compared to other regions of the tube.
- **Stomach**: Where the real action begins - enzymatic digestion of proteins initiated and foodstuffs reduced to liquid form.
- **Liver**: The center of metabolic activity in the body - its major role in the digestive process is to provide bile salts to the small intestine, which are critical for digestion and absorption of fats.
- **Pancreas**: Important roles as both an endocrine and exocrine organ - provides a potent mixture of digestive enzymes to the small intestine which are critical for digestion of fats, carbohydrates and protein.
- **Small Intestine**: The most exciting place to be in the entire digestive system - this is where the final stages of chemical enzymatic digestion occur and where almost almost all nutrients are absorbed.
- **Large Intestine**: Major differences among species in extent and importance - in all animals water is absorbed, bacterial fermentation takes place and feces are formed. In carnivores, that's about the extent of it, but in herbivores like the horse, the large intestine is huge and of critical importance for utilization of cellulose

A59. **Thyroid Stimulating Hormone** (TSH) causes the thyroid gland to produce and release thyroid hormones. Thyroid hormone controls the basal metabolic rate and plays an important role in growth and maturation. Thyroid hormones affect almost every organ in the body.

Growth Hormone (GH) regulates growth and metabolism.

Adrenocorticotropic Hormone (ACTH) triggers the adrenals to release the hormone cortisol, which regulates carbohydrate, fat, and protein metabolism and blood pressure. The adrenal glands sit above the kidneys and are also responsible for the body's fight or flight response.

Luteinizing Hormone (LH) and Follicle Stimulating Hormone (FSH) control the production of sex hormones (estrogen and testosterone) and sperm and egg maturation and release.

Melanocyte-Stimulating Hormone (MSH) regulates the production of melanin, a dark pigment, by melanocytes in the skin. Increased melanin production produces pigmentation or tanning of the skin; in certain conditions excessive production of melanocyte-stimulating hormone can cause darkening of the skin.

Prolactin (PRL) stimulates production of breast milk and is necessary for normal milk production during breast feeding.

A60.The liver is a roughly triangular organ that extends across the entire abdominal cavity just inferior to the diaphragm. Most of the liver's mass is located on the right side of the body where it descends inferiorly toward the right kidney. The liver is made of very soft, pinkish-brown tissues encapsulated by a connective tissue capsule. This capsule is further covered and reinforced by the peritoneum of the abdominal cavity, which protects the liver and holds it in place within the abdomen.

The peritoneum connects the liver in 4 locations: the coronary ligament, the left and right triangular ligaments, and the falciform ligament. These connections are not true ligaments in the anatomical sense; rather, they are condensed regions of peritoneal membrane that support the liver.

- The wide *coronary ligament* connects the central superior portion of the liver to the diaphragm.
- Located on the lateral borders of the left and right lobes, respectively, the *left* and *right triangular ligaments* connect the superior ends of the liver to the diaphragm.
- The *falciform ligament* runs inferiorly from the diaphragm across the anterior edge of the liver to its inferior border. At the inferior end of the liver, the falciform ligament forms the round ligament (ligamentum teres) of the liver and connects the liver to the umbilicus. The round ligament is a remnant of the umbilical vein that carries blood into the body during fetal development.The liver consists of 4 distinct lobes — the left, right, caudate, and quadrate lobes.

- The left and right lobes are the largest lobes and are separated by the falciform ligament. The right lobe is about 5 to 6 times larger than the tapered left lobe.
- The small caudate lobe extends from the posterior side of the right lobe and wraps around the inferior vena cava.
- The small quadrate lobe is inferior to the caudate lobe and extends from the posterior side of the right lobe and wraps around the gallbladder.

Functions of liver: The liver has a wide range of functions, including detoxification and the production of bile to help with **digestion**. It also plays a large role in metabolism. The pancreas serves two roles. As an **endocrine** gland, it produces several important **hormones**, including insulin and glucagon

A61. **Physiology of Eye:** The overall function of the eye is to act like a biological camera—it absorbs light and translates images into nerve signals to conduct to the brain. Light entering the eye first passes through the cornea, where it is refracted to begin the process of focusing. It next passes through the pupil, where the contraction of muscles in the iris controls the size of the pupil and the amount of light entering the eye. Light passes through the lens, where it is further refracted to focus on the retina. Contractions of the ciliary muscles pull on the zonular fibers and the lens, allowing the lens to accommodate vision at varying differences. To view objects that are close to the eye, the ciliary muscles relax and permit the lens to assume a wide shape. The wide shape of the lens allows it to refract the light to a high degree to focus on the retina. For distant objects, the ciliary muscles pull on the lens to flatten it, reducing the amount of refraction and focusing distant light on the retina.

Once light has passed through the lens, it continues through the vitreous humor and passes through the retina. Photoreceptor cells in the retina are specialized to detect light and produce nerve signals in response to light. Rods are the more numerous and sensitive of the photoreceptors and are specialized for seeing in low-light situations. They produce grayscale images in low light, but are overwhelmed by light during the day or in a normally lit room at night. Cones, on the other hand, are specialized for detecting light in brighter conditions and are able to differentiate colors. The three types of cone cells — red, green, and blue — are able to detect specific colors, or wavelengths, of light. The combination of the three types of cone cells produces all of the colors that the human eye can detect. Once the photoreceptors have detected light, the cells produce an action potential that is conducted to bipolar cells and ganglion cells in the retina. These cells transmit the signal into the optic nerve, where it travels to the brain to be processed.After light has passed through the retina, it is absorbed by the choroid. The choroid prevents excess light from remaining within the eye and forming afterimages. High intensity lights can overcome the absorptive effects of the choroid, resulting in the “red eye” seen in pictures.

A62. **Kidney disorders:** Kidney disease is broadly classified into acute kidney injury and chronic kidney disease.

Acute kidney injury

Acute kidney injury is sudden damage to the kidneys. In many cases it will be short term but in some people it may lead to long-term chronic kidney disease.

The main causes are:

- damage to the actual kidney tissue caused by a drug, severe infection or radioactive dye

- obstruction to urine leaving the kidney (for example because of kidney stones or an enlarged prostate).

People who have chronic kidney disease are also at increased risk of acute kidney injury.

Chronic kidney disease

More often, kidney function worsens over a number of years. This is known as chronic kidney disease. Sometimes it can progress to end stage kidney disease (also known as kidney failure), which requires dialysis or a kidney transplant to keep you alive.

There are different causes of chronic kidney disease, the key ones being:

- damaged blood vessels to the kidneys due to high blood pressure and diabetes
- attacks on the kidney tissue by disease or the immune system (glomerulonephritis)
- the growth of cysts on the kidneys (polycystic kidney disease)
- damage due to backward flow of urine into the kidneys (reflux nephropathy)
- congenital abnormalities of the kidney or urinary tract.

There are many other causes of kidney disease, and sometimes the cause is not known. Regardless of the cause of the disease, some parts of the treatment are common to all. However, your doctor will always attempt to find the cause of your kidney disease as it may have important implications.

If the cause of your kidney disease is genetic or unknown, your doctor may recommend your relatives also be checked.

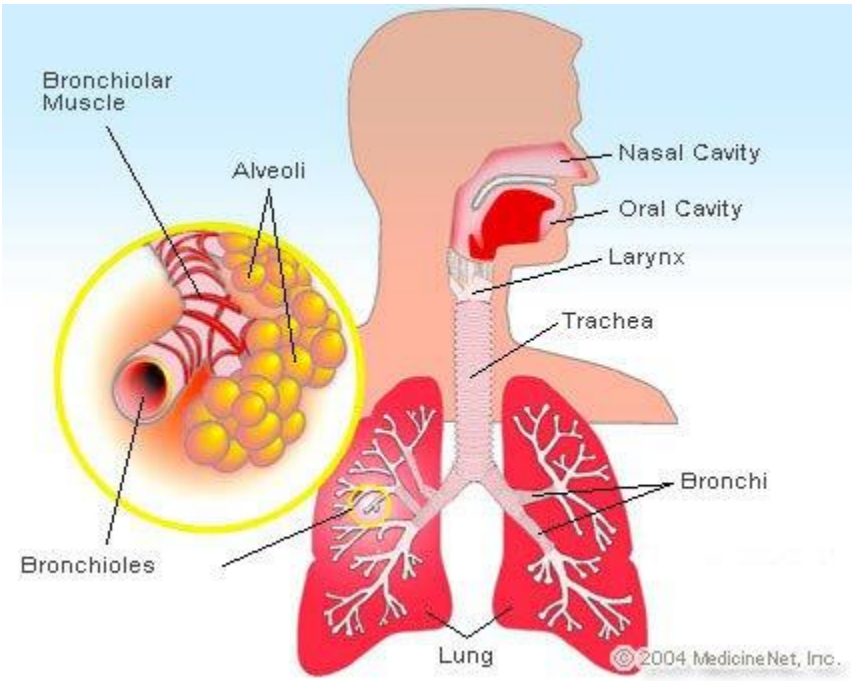
A63. **Lungs**: The lungs are a pair of spongy, air-filled organs located on either side of the chest (thorax). The trachea (windpipe) conducts inhaled air into the lungs through its tubular branches, called bronchi. The bronchi then divide into smaller and smaller branches (bronchioles), finally becoming microscopic.

The bronchioles eventually end in clusters of microscopic air sacs called alveoli. In the alveoli, oxygen from the air is absorbed into the blood. Carbon dioxide, a waste product of metabolism, travels from the blood to the alveoli, where it can be exhaled. Between the alveoli is a thin layer of cells called the interstitium, which contains blood vessels and cells that help support the alveoli.

The lungs are covered by a thin tissue layer called the pleura. The same kind of thin tissue lines the inside of the chest cavity -- also called pleura. A thin layer of fluid acts as a lubricant allowing the lungs to slip smoothly as they expand and contract with each breath.

Functions of Lungs: The lungs are a pair of organs in the chest that are primarily responsible for the exchange of oxygen and carbon dioxide between the air we breathe and the blood. The main function of the lungs is the process of gas exchange called respiration (or

breathing). In respiration, oxygen from incoming air enters the blood, and carbon dioxide, a waste gas from the metabolism, **leaves** the blood. A reduced lung function means that the ability of lungs to exchange gases is reduced. The heart and lungs work together to make sure the **body** has the oxygen-rich blood it needs to function properly. The Pulmonary Loop The right side of the heart picks up the oxygen-poor blood from the **body** and moves it to the lungs for cleaning and re-oxygenating.



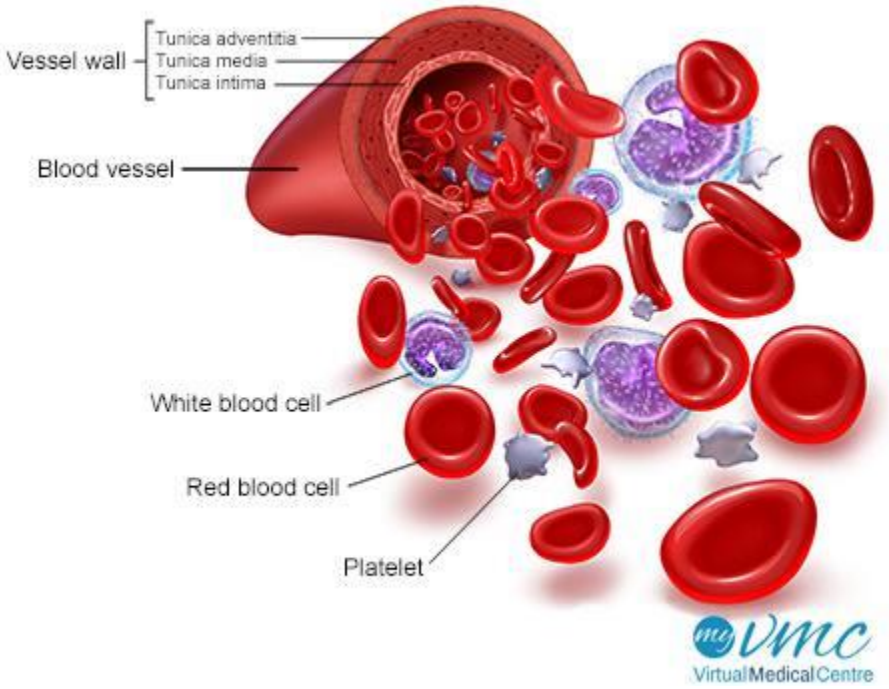
A64. **Compostion of Blood:**

Blood is classified as a connective tissue and consists of two main components:

1. Plasma, which is a clear extracellular fluid
2. Formed elements, which are made up of the blood cells and platelets
   The formed elements are so named because they are enclosed in a plasma membrane and have a definite structure and shape. All formed elements are cells except for the platelets, which are tiny fragments of bone marrow cells.

Formed elements are:

- Erythrocytes, also known as red blood cells (RBCs)
- Leukocytes, also known as white blood cells (WBCs)
- Platelets



Leukocytes are further classified into two subcategories called granulocytes which consist of neutrophils, eosinophils and basophils; and agranulocytes which consist of lymphocytes and monocytes.

The formed elements can be separated from plasma by centrifuge, where a blood sample is spun for a few minutes in a tube to separate its components according to their densities. RBCs are denser than plasma, and so become packed into the bottom of the tube to make up 45% of total volume. This volume is known as the haematocrit. WBCs and platelets form a narrow cream-coloured coat known as the buffy coat immediately above the RBCs. Finally, the plasma makes up the top of the tube, which is a pale yellow colour and contains just under 55% of the total volume.

Functions of Blood: Blood has three main functions: transport, protection and regulation.

Transport: Blood transports the following substances:

- Gases, namely oxygen (O_2) and carbon dioxide (CO_2), between the lungs and rest of the body
- Nutrients from the digestive tract and storage sites to the rest of the body
- Waste products to be detoxified or removed by the liver and kidneys
- Hormones from the glands in which they are produced to their target cells
- Heat to the skin so as to help regulate body temperature

Protection: Blood has several roles in inflammation:

- Leukocytes, or white blood cells, destroy invading microorganisms and cancer cells
- Antibodies and other proteins destroy pathogenic substances
- Platelet factors initiate blood clotting and help minimise blood loss

Regulation: Blood helps regulate:

- pH by interacting with acids and bases
- Water balance by transferring water to and from tissues

A65.**Joint Disorders:** A joint is where two or more bones come together, like the knee, hip, elbow, or shoulder. Joints can be damaged by many types of injuries or diseases, including

- **Arthritis** - inflammation of a joint. It causes pain, stiffness, and swelling. Over time, the joint can become severely damaged.
- **Bursitis** - inflammation of a fluid-filled sac that cushions the joint
- **Dislocations** - injuries that force the ends of the bones out of position

Treatment of joint problems depends on the cause. If you have a sports injury, treatment often begins with the RICE (Rest, Ice, Compression, and Elevation) method to relieve pain, reduce swelling, and speed healing. Other possible treatments include pain relievers, keeping the injured area from moving, rehabilitation, and sometimes surgery. For arthritis, injuries, or other diseases, you may need joint replacement surgery to remove the damaged joint and put in a new one.