

# HUMAN ANATOMY AND PHYSIOLOGY

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# நோய்நாடி நோய்முதல் நாடி அதுதணிக்கும் வாய்நாடி வாய்ப்பச் செயல்.

Let the physician enquire into the (nature of the) disease, its cause and its method of cure and treat it faithfully according to (medical rule).

# C Learning Objectives

At the end of the chapter students will be able to;

- > understand the anatomy and physiology of various organs
- ▶ gain knowledge about sense organs and their function
- > understand the skeletal and muscular system
- > follow the health and hygiene of reproductive system



# Introduction

Anatomy and physiology are the branches of biology. Many of the concepts in physiology, also incorporate other basic sciences including chemistry and physics.

Anatomy is the study of the structure of living organisms. The form of an organism is the structure of its body and body parts.

Physiology is the study of the function of living organism. The function of the body and its parts determines how an organism carries out its daily activities.

# 1.1 Integumentary System

It comprises the skin and its appendages which protects the body from various kinds

of damages such as loss of water or damages from outside.

The skin is the largest organ that covers the entire body.

# The integumentary system consists of the

- Skin
- Hair
- Finger and toe nails
- Sebaceous glands
- Sweat glands



# Skin

The human skin is the outer covering of the body and is the largest organ of the integumentary system. The main functions are protection, regulation and sensation.



Cross-section of all skin layers.

The skin has the following layers from exterior to the inner layer.

- The epidermis
- The dermis
- The hypodermis (subcutaneous layer)

The epidermis is a vascular (without blood vessels); the skin contains keratin which protects and prevents the skin from becoming water logged.

The dermis, the middle layer of the skin, contains blood vessels, gives the skin its elasticity to stretch.

The hypodermis, the subcutaneous layer, stores fat that are ready for use when energy is needed. This layer of skin fat also maintains body temperature by serving as an insulator.

# Hair

Hair keeps the body warm. Hair covers the majority of the body surface; thick hair is found on the head and face and fine hair is found on other parts of the body such as the pubic area. Hair has a follicle below the skin, and a shaft above the skin. Hair contains keratin.



Schematic view of hair follicle and sebaceous gland



Eye lashes protect the eyes from foreign debris getting into the eye.

# Sebaceous Glands

Sebaceous glands are exocrine glands. It lubricate and moisturize the skin with an oily secretion which is called as sebum and maintains thermoregulation.



There are no sebaceous glands in the palms and sole of the feet.

# Nail

The finger and toe nails are made of keratin. Nails protect the tips of our fingers and toes from injury.

Three parts of the nail are:

- Nail bed
- Nail matrix
- Nail plate.

# Sweat Glands

Sweat glands are exocrine and apocrine glands that secretes sweat to the surface of

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the skin. They are found under the arms in the axillary area and perform little function in humans. Sweat glands, are exocrine glands secrete a substance that cools the body off with perspiration and eliminate wastes.



## Sweat gland

# Disease related to Integumentary system

- Acne Rash
- Athlete's foot
- SunburnAlbinism
- Skin cancer

• Pressure ulcers

- ...
- Herpes
- Impetigo Psoriasis
- Rosacea

### **Functions of Integumentary System**

- Protects the body against the external environment as the first line of defence from germs and infections.
- The skin, its thickness and sweat glands, maintain the body temperature
- Vitamin D production
- Protection against UV rays
- Perspiration.
- Dehydration
- Reception of tactile sensory messages such as heat, cold, and pain sensations.

# **1.2 The Cardiovascular System**

Heart is the master of the cardiovascular system. It pumps out blood all over the body to circulate and supply oxygen, electrolytes, nutrients and hormones. Blood circulation controls the body temperature, the PH or acid base balance of the body. Circulation fights against infection, helps in clotting of blood during injury and eliminates waste products such as carbon dioxide.

# **Position**

The heart lies in the thoracic cavity at the mediastinum [the space between the lungs]. It lies obliquely a little more to the left than the right. The apex is about 9cm to the left of the midline at the level of the 5th intercostal space and the base extends to the level of the 2nd rib.

#### Organs associated with the heart

**Inferiorly**- The apex rest on the central tendon of the diaphragm .

**Superiorly-** The great vessels in the aorta, superior venacava, pulmonary artery and pulmonary veins.

**Posteriorly-** Oesophagus ,trachea, left and right bronchus, decending aorta, inferior venacava, and thoracic vertebrae.

**Lateraly**- The left lung overlaps the left side of the heart.

**Anteriorly-** The sternum, rib, and intercostal muscles.

# Structure

The heart wall is composed of three layers of tissues. Namely

- Pericardium
- Myocardium
- Endocardium.

#### Pericardium

The pericardium is the outmost layer and is made up of two sacs. The outer sac and inner side

1. Fibrous pericardium –consists of fibrous tissue.

2. Serous pericardium- double layer of serous membrane.

The Fibrous Pericardium continues with the tunica adventitia of the great blood vessels above and is adherent to the diaphragm. It consists of two layers.

- The outer layer of the serous pericardium is the parietal pericardium
- The inner layer is visceral pericardium adherent to the heart muscles.

It secretes serous fluid called pericardial fluid. Pericardial fluid present in the space between the visceral and parietal layer, which allow smooth movement of the heart.

#### Myocardium

The myocardium is composed of specialized cardiac muscles found only in the heart. The Muscle arrangement of the myocardium enable the atria and ventricles to contract in a coordinated and efficient manner. It is also important for electrical activity of the heart.

# Endocardium

It lines chambers and valves of the heart. It is a thin, smooth membrane to ensure smooth flow of blood through the heart. It consists of flattened epithelial cells, and it is continuous with the endothelium lining of blood vessels.

The cardiovascular [cardio-heart, vascular-blood vessels] system is divided for descriptive purpose into two main parts.

- 1. The heart pumping action ensures constant circulation of the blood.
- 2. The blood vessels which form a lengthy network through which the blood flows.

The lymphatic system is closely connected by both structurally and functionally with a cardiovascular system.

The heart pumps blood in to three anatomically separate systems of blood vessels.



Heart

- The pulmonary circulation
- The systemic circulation
- The coronary circulation.

#### **Pulmonary Circulation**

The portion of the circulatory system which carries deoxygenated blood away from the right ventricle of the heart, to the lungs and returns oxygenated blood to the left atrium and ventricle of the heart.

#### Systemic Circulation

Systemic circulation carries oxygenated blood from the left ventricle, through the arteries to the capillaries in the tissues of the body. From the tissue capillaries the deoxygenated blood returns through a system of veins to the right atrium of the heart.

## **Coronary Circulation**

Coronary Circulation is the circulation of blood in the blood vessels that supplies the heart muscles.

The cardiovascular system ensures a continuous flow of blood to all body cells. Heart plays a major role in continual physiological adjustment to maintain an adequate blood supply.

#### Interior of the heart

The heart is divided into a right and left side by the septum, partition consisting

of myocardium covered by endocardium. It subdivided into 4 chambers they are

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

#### **Right Atrium**

Right atrial chamber is located in the upper portion of the right side of the heart which receives blood from all parts of the body by superior and inferior venacava. They are thin less muscular walls and smaller than ventricles.

# Left Atrium

Left atrium receives oxygenated blood from the lungs and pumps it down into the left ventricle.

The lower portion of the heart left side of is left ventricle.

# **Right Ventricle**

Deoxygenated blood flows in the right atrium, passes through the tricuspid valve and in to the right ventricle, which pumps the blood up to the lungs by pulmonary artery, through the pulmonary valve.

#### Left Ventricle

It is larger and more muscular chamber. It pumps and delivers the blood to all parts of the body by a larger artery [**aorta**] for systemic circulation.

#### Flow Of Blood Through The Heart

- The right atrium receives deoxygenated blood from all over the body by superior and inferior venacava.
- Deoxygenated blood from right atrium passes through right atrioventricular valve to right ventricle.
- Pulmonary artery collects deoxygenated blood from right ventricle to lungs through pulmonary valve or semilunarvalve.

- Pulmonary artery is divided in to left and right carries either side of the lungs.
- In lungs exchange of gases takes place.
- Oxygenated blood passes through pulmonary veins to the left atrium.
- In left atrium blood passes through left atrioventricular valve to the left ventricles carries blood from left ventricles through aortic valves.
- Arteries-Oxygenated blood passes through all parts of the body.

# Valves

These are the fibrous flaps of tissues that are present in cardiac chamber, between the arteries chambers and veins. They ensure unidirectional flow and prevent backflow of blood.

They are

# Arterioventricular Valve

It is present in every ventricle and atrium.

#### **Tricuspid Valve**

The valve lies between the right ventricle and right atrium.

#### **Mitral Valve**

It is present between left atrium and left [bicuspid valve] ventricle.

#### Semilunar Valve

It is present between arteries and ventricles.

# **Aortic Valve**

An aortic valve is present between the aorta and left ventricle.

#### **Pulmonary Valve**

Pulmonary valve exists between the pulmonary artery and right ventricle.

#### **Functions of heart**

The structure of the heart is primarily responsible for transportation of blood and

to supply nutrients to all parts of the body. This continuous activity uplifts the role of the heart as a vital organ.

Blood pumping cycle of the heart is called as cardiac cycle, which ensure that the blood is distributed throughout the body. The oxygen distribution process begins when oxygen –free blood (impure) enters in to the heart through the right atrium goes in to the right ventricle, enters the lungs for oxygenation and release of carbondi-oxide and transfers in to left atrial chambers, ready for re-distribution. About **5-6 liters** of blood circulates in the body and cardiac cycles are completed per minute.

A healthy heart beats 70 to 75 times per minute, each cardiac cycle, or heartbeat, takes about 0.8 seconds to complete the cycle.

Oxygen reloading process occur in two phase. The **systole** is a short period that occurs, when the tricuspid and mitral valve close.

The **diastole** is a relatively longer period when the aortic and pulmonary valve close. The systole –disastole relationship is the **mean** blood pressure. Other ways of physically determining the regular functioning of the heart is through examining the pulse rate.

# **Circulatory System**



**Circulatory system** 

In the fig - 1.6 shows Red color indicates oxygenated blood carried in arteries. Blue indicates deoxygenated blood carried in veins.

The relationship between the heart and different types of blood vessels.

#### Heart

- Aorta
- Arteries
- Arterioles
- Capillaries
- Venules
- Veins
- Venacava
- Heart

#### Arteries

Arteries are the blood vessels that carries oxygenated blood through out the body. Arteries consists of several layers and smooth muscles that enable them to pump blood throughout the body after it leaves the heart.

ARTERIES - It has three layers

- Tunica adventica
- Tunica media
- Tunica intima

# Arterioles

Blood valve that receives blood from the arteries. Those are present next to the arteries and before the capillaries. Arterioles also have smooth muscles.

#### Capillaries

These are the smallest structure of the circulatory system. The point at which the exchange of oxygen and corbon di-oxide occurs through the thin walls of the capillaries.

#### Venules

Blood vessels that receive blood from the capillaries and transport deoxygenated blood to the veins.

# Veins

Veins are blood vessels that carry blood towards the heart. Blood vessels receive blood from the venules and transport blood back to the heart. Like arteries, veins, have three layers.

# **Blood Components**

Blood is a body fluid that consists of:

- Plasma
- Red Blood Cells
- White Blood Cells
- Platelets

#### Plasma

Plasma in blood is over 50% of the volume of blood and over 90% of plasma is water. The main component of plasma is plasma albumin which is a protein that enables and controls the osmotic pressure of the blood.

# **Red Blood Cells (RBC)**

Red blood cells or erythrocytes are disc like in shape. RBCs are enucleated, do not contain a nucleus. The red blood cells contain iron laden haemoglobin which carries oxygen to the cells. Red blood cells also contain glycoproteins which determine the blood group of an individual. The blood types are type A, type B, type AB and type O.

# White Blood Cells

White blood cells or leukocytes are part of the immune system which fights against infections from pathogens. When the white blood cell count rises, it is a sign of infection. All leukocytes have a distinct nucleus.

# The various types of white blood cells are:

- Eosinophils
- Basophils
- Neutrophils
- Lymphocytes
- Monocytes

# Platelets

Platelets or thrombocytes(do not have a nucleus) maintain haemostasis (clotting). Haemostasis is enabled by the coagulation or thickening of blood by production of fibrin from the clotting factors found within the platelets to prevent blood loss, when a blood vessel has been broken due to injury.

# Lymphatic system

The lymphatic subsystem, a part of the circulatory system, is closely aligned with the body's immune system and removes excessive fluid from the body. The lymphatic vessels contain lymph including lymphocytes. Lymphatic system also consists of lymph nodes and lymphatic organs. These organs include the thymus gland, spleen, bone marrow and tonsils. Nodes are found throughout the lymphatic system and they serve to filter the blood as it travels throughout the body. Swollen lymph nodes are a signal of a disease or an infection. Many lymph nodes are found in the neck area, under the arms and in the groin area, although there are hundreds of them throughout the body.

#### Spleen

Spleen is an organ present in the upper left part of the abdomen and to the left side of the stomach. The spleen plays multiple supporting roles in the body. It acts as a filter for blood as part of the immune system. Old red blood cells are recycled in the spleen, platelets and white bloods are stored.

#### Diseases related to blood and blood vessels

- Phlebitis
- Deep Vein Thrombosis (DVT)
- Anaemia, including pernicious anaemia and sickle cell anaemia
- Leukaemia
- Lymphoma
- Thrombocytopenia.



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A Blood bank is a place, for carrying out all or any of the operations for collection,

aphaeresis', storage, processing and distribution of blood drawn from donors and/ or for preparation, storage and distribution of blood components. By an organization. One of the earliest blood bank was established by Frederic Durán-Jordà during the Spanish Civil War in 1936. A blood collection program was initiated in the US in 1940.

Someone needs blood every two seconds. About 1 in 7 people entering a hospital need blood. Healthy adults who are at least 17 years old, and at least 110 pounds may donate about a pint of blood—the most common form of donation—every 56 days, or every two months. Females receive 53 percent of blood transfusions; males receive 47 percent.

Dr. Karl Landsteiner first identified the major human blood groups – A, B, AB and O – in 1901. One unit of blood can be separated into several components: red blood cells, plasma, platelets and cryoprecipitate. Red blood cells live about 120 days in the circulatory system. Healthy bone marrow makes a constant supply of red cells, plasma and platelets. Donated red blood cells can be stored for 42 days.

Donated platelets can be stored for five days. Frozen plasma can be stored for one year. According to the Central Drug Standard Control Organisation (CDSCO), India has 2,760 licensed blood banks. Maharashtra (308) had the highest number of blood banks followed by Tamil Nadu (265), Uttar Pradesh (248), Karnataka (185), Kerala (166), Telangana (153), Gujarat (134), Madhya Pradesh (133), Andhra Pradesh (125), West Bengal (115) and Rajasthan (102).



# **1.3 Musculo skeletal system**

# It consists of

- Bones
- Muscles
- Cartilage
- Tendons
- Ligaments
- Joints
- Facia

# Bones

Bone tissue is a hard tissue, a type of dense connective tissue. Bone tissue is made up of different type of bone cells.

# **Bone cells**

Osteocytes are the building blocks of the bone and form the inner matrix of bone tissue that gives strength to bones.

Osteoclasts maintain the integrity and strength of the bones.

Osteoblasts build new bones by producing collagen and minerals so that the osteocyte can remain in good functioning condition.

Stem cells form in the inner surface of the bone will later transform into osteoblasts.

Lining cells protect the bones and they also release calcium into the blood when the blood calcium levels are low.

#### Types of the bones

- **1. Long bones:** Present in the arms and legs. They act as levers to move parts
- **2.** Flat bones: These includes the ribs, scapulae, sternum, and bones of the cranium
- **3. Irregular bones:** These bones are seen in face and spine bones.
- **4. Short bones:** These bones are seen in wrist and ankle bones.





# **Human Skeleton**

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- **5. Cortical bone:** the stronger bone that is needed for support and movement.
- **6. Axial bones:** Found in the skull, the ribs and the spinal column
- **7. Appendicular bones**: found in the arms, legs, shoulders and the pelvis.
- **8. Cancellous bone or spongy bone:** not as strong as cortical bone.
- **9. Seasmaoid bones:** embedded in tendons eg. Patella.

The skeleton is composed of 206 separate bones in an adult. The cartilages and ligaments helps to unite the bones at the joint

# Skull

The skull is a body structure that forms the head. It supports the structure of the face and provides a protective cavity of the face.

# **Skull bones**

The skull consists of two parts

- The cranium, which is like a box in which the brain is well protected
- The bones of the face



Skull bone

# The Cranium

The cranium (skull) is the skeletal structure of the head that supports the face and protects the brain. It is subdivided into the facial bones and the brain case, or cranial vault. The facial bones underlie the facial structures, form the nasal cavity, enclose the eyeballs, and support the teeth of the upper and lower jaws. The rounded brain cases surrounds and protects the brain and house the middle and inner ear structures.

In the adult, the skull consists of 22 individual bones, 21 of which are immobile and united into a single unit. The 22nd bone is the mandible (lower jaw), which is the only moveable bone of the skull.

The Cranium is made up of eight bones as follows:

Frontal	Two frontal bones, which
bone:	forms the forehead and helps to
	protect eyes
Parietal	One at each side of the top of
bone:	the skull joined into the middle
Temporal	One on each side below the
bone:	parietal bones. These protect
	the inner parts of the ears and
	brains
Occipital	This forms the back of the head
bone	and part of the base of the skull
One	A Butterfly or bat shaped bone,
sphenoid	which also forms part of the
	base of the skull
Ethmoid	Which forms the roof of the
	nose and in between the eyes

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The only movable joint in the skulls is mandible.

Human beings are the only living organisms which sleep on their back.

### The face has the following 14 bones

Facial Bones					
Two nasal bones	which form the				
	bridge of the nose				
Two lacrimal bones	Near the eyes it is very				
	thin and small				

Two cheek bones -	forms the check
Zypomatic bone –	
Two zygomatic bones	
Two upper jaw bones	Forms upper jaw.
Two Maxilla bones	
Two palatine bones	which join with the
	upper jaw bones
	forming the hard
	palate
Two Nasal concha	one in each side of
	wall of the nose
One Vomer bone	which rests on the
	palate and helps to
	form the nasal septum
One Mandible bone	It forms the lower
	jaw and horse shoe
	shaped
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# The vertebral column

The vertebral coloum, also known as the back bone or spine, is part of the axial skeleton. It separated by intervertebral disc.

Spine or Vertebral column is the central part of the skeleton. It supports the head and encloses the spinal cord. It consists of 33 irregular bones called "vertebrae"

The parts of the vertebral column are as follows:

- 7 Cervical vertebral column in the neck region. The first two bones called atlas and axis are important for nodding and turning the head.
- **12 dorsal or thoracic vertebrae** at the back of the chest. The ribs are joined to these vertebrae
- **5 lumbar vertebrae** in the waist region
- **5 sacral vertebrae** are fused together to form the sacrum, a triangular shaped bone with a hollow anteriorly. The sacrum helps to form the pelvis.
- **4 small vertebrae** in the tail region are fused to form a small triangular bone called

the **coccyx**. It is attached to the lower part of sacrum.

# Upper limbs.

Upper limb is divided into three regions. Its consists of,

- **Arm** located between the shoulder and elbow joint.
- Fore arm between the elbow and wrist joints
- Hand which is located distal to the wrist.

#### **Chest (thorax)**

The rib cage forms the thorax portion of the body. It consists of 12 pairs of ribs with their costal cartilage and the sternum. The ribs are anchored posteriorly to the 12 thoracic vertebrae. It protects the heart and lungs.

#### Lower limbs

Lower limb includes foot, thigh, hip and gluteal region.

#### Ear bones (MIS)

Following are the 3 ear bones

M-Malleus

I-Incus

**S**-Stapes

Together they form a short chain that crosses the middle ear and transmit vibrations caused by sound waves from the eardrum to the liquid of the inner ear.

**Throat bone (Hyoid bone):** is a horseshoe shaped bone situated in the anterior midline of the neck between the chin and the thyroid cartilage.

# 1.4 Muscular system

A brand or bundle of fibrous tissue in a human body that has the ability to contract, producing movement in or maintaining the position of parts of the body. ( )

The muscular system has three different types of muscles

- Cardiac muscle
- Skeletal muscle
- Smooth muscle

**Cardiac muscles** are striated muscles only found in the heart. Cardiac muscles works involuntarily without the control of a person.The cells found in cardiac muscle are the myocardiocytes which contract the myocardium.

**Skeletal muscle** is striated and voluntary, that enables the skeletal structures to move. These muscles are also controlled by the nervous system and the majority of skeletal muscles are attached to the bones of the body with tendons to enable body movement.

Smooth muscles are non striated and involuntary muscles. Muscles that control the movements and actions of the internal organs and systems of the body like peristalsis.

## Role of muscular system

- Voluntary movement with the skeletal muscles
- **Involuntary actions** with the smooth muscles
- **Involuntary contractions and relaxation** of the heart with the cardiac muscles

**Abduction:** Movement away from the centre of the body.

**Adduction:** Movement towards the middle of the body

Flexion: Bending movement of a joint or muscle

**Hyperflexion**: The flexion of a joint that is beyond what it normally should do, for example, can occur with a traumatic car crash when the head is forced to the chest, or flexed, beyond what it normally should do.

**Extension**: Normal straightening movement of a joint or muscle.



# The Movements of Muscles

**Hyperextension:** Extension of a joint is beyond what it normally should do, for example, can occur with a traumatic car crash when the head is forced backwards, or extended, beyond what it normally should do.

**Rotation:** Circular movement of a joint or muscle that allows the body part to move in a circular manner.

**External rotation:** Muscular and joint movement that entails both circular movement and also movement away from the center of the body.



# Rotating the arm closer to the body is internal rotation

**Internal rotation:** Muscular and joint movement that entails both circular movement and also movement towards the center of the body.

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- Circumduction: The muscular and joint movement that entails complete 360° movement
- Inversion: The turning of a joint inward
- Eversion: The turning of a joint outward
- Plantar flexion: Movement of the foot downward
- **Dorsiflexion:** Movement of the foot upward

# Cartilage

Cartilage is an important structural component of the body. It is less hard than bones and more flexible than bones and helps in articulations It protects the ends of the bone. It is found in elbows, knees and ankle.

> Cartilage does not have a blood supply, nerves and marrow.

# Tendons

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A tendon is a tough band of fibrous connective tissue that usually connects muscle to bone and is capable of withstanding tension. It is made up of collagen.

# Ligaments

A ligament is a short band of tough, flexible fibrous tissues, tissues that connects bones to bone to form a joint. It also maintain position of the organs.

#### Joints

Joint or articulation is the connection made between bones in the body which link the skeletal system into a functional whole.

# **Types of Moveable Joints**

- **Hinge joint,** e.g. interphalangeal joints fingers and toes.
- Ball and socket joint, e.g. hip and shoulder joints

- **Pivot joint**, e.g. atlantoaxial joint between the atlas and axis **neck**
- Gliding joint ("Condyloid" joint), e.g. between radius, scaphoid and lunate bones wrist.

### Structural and functional

Structural (binding tissue)

- Fibrous joint joint by connective tissue.
- Cartilage joint joint by cartilage
- Synovial joint not directly joined.
- Facet joint between two vertebrae.

# **Functional (movement)**

- **Synarthrosis** means no mobility (skull)
- Amphiarthrosis means slight mobility (vertebrae)
- **Diarthrosis** means freely movable (knee)

#### Fascia

A fascia is a band or sheet of connective tissue, primarily collagen, beneath the skin that attaches, stabilize, enclose and separates muscles and other internal organs.

#### It is classified as

- Superficial fascia
- Deep fascial fascia
- Visceral fascia
- Parietal fascia.

## Diseases related to the bone

- Arthritis
- Rheumatoid arthritis
- Osteoporosis
- Osteoarthritis
- Osteomyelitis
- Fractures

#### Functions of musculo skeletal system

The human skeleton and the skeletal system perform several functions.

1. The protection of the vital organs of the body

- 2. The support of the human body which gives it its form and stability
- 3. Body movement
- Control of metabolic functions like the calcium and calcium storage as well as iron metabolism and iron storage in the bone marrow
- 5. Hematopoiesis, the production of red blood cells in the bone marrow of bones.

# 1.5 Nervous System

The nervous system is the most complex of all the systems which coordinates controls and enables all body functions like movement, thinking, autonomic, or automatic, reflexes and sensory perception. The nervous system sends messages to all parts of the body and receives it. For example, when a person touches fire, the message is sent to the brain which interprets and sends a message to the person's finger to suddenly remove it.

#### The Parts of the Nervous System

- The central nervous system
- The peripheral nervous system



**Nervous System** 

# The parts of the central nervous system are the

- Brain
- Spinal cord

# The Brain

The brain is placed inside a skull or cranium which protects it. The brain consists of three major parts, two hemispheres (right and left hemisphere) and meninges, the protective membrane.

The meninges have three layers (PAD)

P-Pia mater (inner)

A-Arachnoid (middle)

**D**-Dura mater (outer).

The spinal cord is covered with meninges. The subarachnoid space (space between the arachnoid layer and the pia mater) contains the cerebrospinal fluid.

# Cerebrospinal fluid (CSF)

CSF fluid is a clear, colorless body fluid found in the brain and spinal cord. It is about 125ml of CSF at any one time and about 500ml is generated everyday.

CSF acts as a cushion or buffer for the brain, providing basic mechanical and immunological protection to the brain inside the skull.

Note: Both the brain and the spinal cord are comprised of gray matter and white matter. Gray matter plays a higher role in the central nervous system's functioning than the white matter. The white matter consists of lesser cells than the gray matter.

# The brain is also divided into three major areas

- Cerebrum
- Cerebellum
- Brain stem



# Cerebrum

The cerebrum is the largest part of the brain and its lobes coordinate and enable body movement, sensory perception, learning, olfactory sense, gustatory sense, optic sense, auditory sense, memory, thinking, judgment and communication abilities.



# Cerebrum

The cerebrum has four major lobes which, as shown in the picture above, are:

- The frontal lobe
- The temporal lobe
- The parietal lobe
- The occipital lobe

The frontal lobe is responsible for thinking, movement, judging and writing.

The temporal lobe plays a role in terms of memory and hearing.

The parietal lobe helps in sensory perception.

The occipital lobe facilitates understanding written language and vision.

## Cerebellum

The cerebellum, referred as the little brain or hind brain is much smaller than the cerebrum and lies behind the other parts of the brain. The cerebellum controls motor nerves, balance, equilibrium, fine motor coordination and gross motor coordination.



# Cerebellum

# **Brain stem**

The brain stem lies at the base of the skull and between the right and left hemispheres of the brain.

#### The brain stem has three sections

- Midbrain
- Pons
- Medulla oblongata

The midbrain controls messages sent from other higher areas of the brain to the pons and medulla below it and it also controls posture.

The pons connects the midbrain and the medulla. The pons controls the rhythm of respirations.

The medulla oblongata connects the pons and the spinal cord through a hole in the base of the skull called the **foramen magnum**. The medulla is the center of control for breathing and cardiac functioning and manages swallowing, vomiting, cough, and sneeze reflexes.

#### **The Spinal Cord**

The spinal cord connects the brain to the peripheral nervous system throughout the body. The spinal cord is protected with the meninges and the spinal column.

The spinal cord is divided into different parts, which are:

- Cervical region
- Thoracic region
- Lumbar region

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- Sacral region
- Coccyx, or tail bone, region





## **Spinal Cord C.S**

The spinal cord has 31 nerve clusters which sends and receives motor and sensory messages to and from the rest of the body and it coordinates reflex action.

# The Peripheral Nervous System

# The Parts of the Peripheral Nervous System

Peripheral nervous system consists of all the parts of the nervous system other than the brain and the spinal cord. The peripheral nervous system is not protected with bones. The peripheral nervous system is divided into two:

- Autonomic nervous system
- Somatic nervous system

# Autonomic nervous system

The autonomic nervous system controls automatic and involuntary physiological functions of the body that are out of our control like the movements of smooth, involuntary muscles. For example, the constriction of the eye's pupil when it is exposed to bright light.

The autonomic nervous system's functions can be further divided into:

#### Sympathetic nervous system

Sympathetic nervous system is responsible for the fight and flight syndrome that results from stress. These responses include an increased heart rate, pupil dilation and decreased peristalsis.

#### Parasympathetic nervous system

The parasympathetic nervous system manages the functions related to rest. For example, the parasympathetic nervous system manages involuntary control of tears, digestion and the production of saliva.

#### Somatic nervous system

The somatic nervous system controls voluntary muscular movement with the skeletal muscles of the body. The somatic nervous system has efferent and afferent nerves which send and receive motor function related nerve signals.

## Reflexes

A reflex is a muscle reaction that automatically occurs in response to a stimulus.

#### There are two types of reflexes.

#### Infant reflexes

Reflexes present at the time of birth, but disappear shortly thereafter.

⊕

# Other reflexes

Reflexes present at the time of birth and remain active throughout life time. For example, the pupil reflex, sneeze reflex, blinking reflex, cough reflex and yawn reflex.

# **Twelve Cranial Nerves**

Remember the mnemonic: One Old Owl Turned Top, A Fat Aunt Go Viewed Some Hop

- Olfactory: smell
- Optic: vision
- Oculomotor: eye movements.
- Trochlear: eye movements.
- Trigeminal: chewing and sensory to face
- Abducens: eye abduction.
- **Facial**: facial expressions, the tongue and the salivary glands.
- Acoustic/Auditory: hearing
- **Glossopharyngeal**: taste impulses and the secretion of saliva from the parotid gland.
- **Vagus**: respiratory and the digestive systems such as the pharynx and swallowing.
- Spinal accessory: movement of shoulder.
- Hypoglossal: Tongue movement.

#### **Functional Units of Nervous System**

The nervous system is comprised of millions of neurons and glial cells.

# **Types of nerves**

- Sensory or afferent nerves
- Motor or efferent nerves
- Mixed nerves

# Neuron



Neuron

The neuron is the primary type of nerve cell in the nervous system. Glial cells forms myelin sheath over the neuron for protection.

Neurons communicate with other neurons by sending impulses at the synapse, a point of junction between any two neurons. There are two types of neurons which are sensory neurons and motor neurons. Sensory neurons sense and transmit information such as taste, touch and sight. Motor neurons send and transmit messages that involve muscle movement.

# **Glial Cells**

Glial cells are non-neuronal cell that provide support and nutrition, maintain homeostasis, form myelin and patricipate in signal transmission in the nervous system.

### **Types of nerves**

**Sensory or afferent nerves**When action potentials are generated by sensory receptors on the dendrites of these neurons, they are transmitted to the spinal cord by the sensory nerve fibres. The impulses may then pass to the brain or to connector neurons of reflex arcs in the spinal cord motor or efferent nerves.

Motor nerves originate in the brain, spinal cord and autonomic ganglia. They transmit impulses to the effectors organs muscles and gland. There are two types:

**Somatic Nerves** – involved in voluntary and reflex skeletal muscle contraction.

Autonomic Nerves (sympathetic and parasympathetic) – involved in cardiac and smooth muscle contraction and glandular secretion.

**Mixed Nerves:** In the spinal cord, sensory and motor nerves are arranged in separate groups or tracks. Outside the spinal cord, when sensory and motor nerves are enclosed with the same sheath of connective tissue they are called mixed nerves.

# Disease related to nervous system

- Seizures
- Stroke
- Epilepsy
- Meningitis
- Paralysis
- Multiple sclerosis
- Parkinson's diseases
- Alzheimer's disease
- Bell's palsy.

# 1.6 Gastro Intestinal System

#### Introduction

The alimentary canal, is a continuous hollow tube from the mouth to the rectum. The alimentary canal along with the associated organs like the salivary glands, liver, pancreas and the gallbladder is called the digestive or gastrointestinal system. The primary role of the digestive system is to supply blood stream with nutrients that can be used by the body for its fuel, energy and fluid needs.



# Parts of digestive system

The organs that contribute to digestion are the tongue, salivary glands, the liver, the gallbladder, and the pancreas. The gallbladder and the pancreas secrete and deposit bile and digestive enzymes, respectively through the common bile duct to the duodenum of the small intestine.

# Mouth

The cheeks,tongue and palate frame the mouth, which is also called oral cavity .its boundaries are defined by the lips, cheeks, soft palate and epiglottis. It is divided in to two sections.

They are

- The vestibule- the area between the cheeks and the teeth.
- The oral cavity- filled by the tongue

The mouth is the opening through which the person ingests food and fluids. Incisors, canines, premolar and molars are the types of teeth helps in mastication

#### Tongue

Tongue is one among the five sensory organ. It is a muscular structure used for moving food in the mouth and to swallow fluid and food. Taste buds are found on the upper surface of the tongue and the salivary glands.

#### Salivary glands

Salivary glands produce saliva which contains the digestive enzyme amylase. Amylase digests and breaks down starch into glucose and maltose.

#### Pharynx

The pharynx receives air from the nares or the mouth and it also receives food from the mouth. When people say that their food has gone down the wrong pipe, they are experiencing an abnormal small amount of food moving from the pharynx to the trachea.

# **Epiglottis**

The epiglottis is the flap like projection in the back of the mouth attached to the

larynx. It goes up during breathing to allow the air to enter into the trachea and it moves down during the swallowing of food and drinking fluids to allow the food to enter the oesophagus.

# Oesophagus

The oesophagus is a long straight hollow structure that starts at the pharynx and ends at the stomach. The upper portion of the oesophagus has skeletal muscles and the lower portion has smooth muscles. Oesophagus has a sphincter at the top of pharynx end and it has a sphincter at the bottom of the stomach which prevent food from flowing back into the pharynx from oesophagus and backing up from the stomach into the oesophagus. The primary role of the oesophagus is peristalsis, wave like movements that move and propel food and fluids along the digestive tract with the help of muscles.

# Stomach

The stomach is a hollow organ on the left side of the abdomen that collects and processes food and fluids. The stomach has the fundus, body and antrum. The stomach secretes digestive enzymes, such as pepsin, hydrochloric acid and gastric acid to facilitate the digestive process. As the food and fluids are processed in the stomach, a partially digested chyme is formed. Pepsin digests proteins; and hydrochloric acid provides the pH of acidity that is necessary for digestion. Minimal absorption of water soluble vitamins and some medications such as aspirin takes places at stomach.

# Liver

The liver is an abdominal organ and gland on the right side of the abdominal cavity and near the center of the body. The liver produces bile which is then transported to the gallbladder through the common bile duct and then to the small intestine. Bile is used for the breakdown and digestion of fats.

#### **Small Intestine**

The chyme from the stomach is mostly absorbed in the small intestine as usable minerals and nutrients. The small intestine also receives bile and the pancreatic enzymes from the bile ducts. These pancreatic enzymes break down carbohydrates, fats and proteins for absorption. The small intestine is also a hollow abdominal tube that connects to the stomach at its upper end and to the large intestine at its lower end which sphincter prevents back flow.

The three parts of the small intestine are the duodenum, jejunum and ileum

Iron is absorbed in the duodenum, jejunum absorbs all of the products of digestion and the ileum absorbs any remaining nutrients that has left behind.

# Large Intestine

The large intestine is involved in the absorption of water and the removal of by products of digestion through defecation. The two major parts of the large intestine are the cecum and sigmoid colon.

The caecum is connected to the appendix which has an unknown role and the colon absorbs water and propels waste to the rectum.

#### Rectum

The rectum is a part of the lower gastro intestinal tract. It is a continuation of a sigmoid colon and connects to the anus. The key role of the rectum is to act as a storehouse for feces.

# Anus

The anus is the last part of the digestive tract. The lining of the upper anus is specialized to detect rectal contents. It knows whether the contents are liquid, gas or solid.

# The stages of digestion are:

# Mastication

Digestion of the food starts by the action of mastication(chewing) aided by teeth, a form of mechanical digestion.

Saliva secreted by the salivary glands which contains the following:

Salivary Amylase - Starts the digestion of starch

Mucus - Lubricates the food

Hydrogen carbonate - Maintains the ideal condition of PH (Alkaline) for Amylase to work

## Digestion

Digestion is the breakdown of large insoluble food molecules into small watersoluble food molecules. So that they can be absorbed into the watery blood plasma. Digestion is a form of catabolism that is divided into mechanical and chemical digestion. The term mechanical digestion refers to the stepwise physical breakdown of large pieces of food into smaller pieces. In chemical digestion, enzymes break down food into the small molecules the body can use.

#### Absorption

95% of absorption of nutrients occurs in the small intestine. Water and minerals are reabsorbed by the colon .

#### Diseases related to digestive system

- Poisonings
- Diarrhea
- Constipation
- Diverticulitis
- Gastric Eosophageal Reflux Disorder
   (GERD)
- Peptic ulcers
- Cholelithiasis
- Cirrhosis of liver
- Hepatitis

- Colitis
- Irritable Bowel Syndrome (IBS)
- Cancer

# **1.7 Urinary system**

#### Introduction

Urinary system also known as the renal system consist of the kidneys, ureters, bladder, and urethra. The purpose of the urinary system is to eliminate the excess water from the body, regulate blood volume and blood pressure, control and regulate the level of electrolytes and blood PH.

# The parts of the urinary system

- Kidneys
   Ureters
- Bladder Urethra

#### Kidneys

The kidneys are bean shaped bilateral urinary organs that lie in the upper abdominal area in close proximity to the stomach and liver. The two main layers of the kidney are the medulla and the renal cortex. The medulla is the inside portion of the kidney and the cortex is the outer layer of the kidney. The kidneys are made up of millions of **nephrons**, the primary functional unit of the kidney.



# Kidney

#### Ureters

The bilateral ureters connect the pelvis of each kidney to the bladder. The ureters consist

of smooth involuntary muscle which serves as the conduit of urine from the kidneys into the bladder.



#### Bladder

The bladder is the muscular organ that serves as the collection and retention vessel which temporarily holds and retains urine prior to urination. A normal urinary bladder can hold up to 800 milliliters of urine.

#### Urethra

Urethra transports urine from the bladder to the outside of the body. This image shows (a) a female urethra and (b) a male urethra.

The urethra is the opening through which the urine passes out.

The male gender has two urethral sphincters to control both the passage of urine and sperm and the female gender has only one urethral sphincter to control the flow of urine only.

# Physiology Of Urinary System

The functional unit of the urinary system is the nephron. The actual filters are tiny structures called nephron and each kidney is made up of one million nephrons. A nephron is made up of two parts, a cluster of capillaries called glomerulus, and a long fine tube. The nephrons are doing the following functions.



#### Urinary System

# Filtration

Filtration occurs when the circulating blood passes through the kidney where the removal of proteins and other cellular particles. The ultra filtrate becomes urine after reabsorption and secretion.

#### **Re absorption**

Reabsorption occurs after filtration, entails the re-entry of some particles and molecules from the ultrafiltrate back into the blood for future use.

NOTE: Anti Diuretic Hormone controls the amount of water in the body and the blood. Excessive water in the blood causes high blood pressure and fluid overload, and a low amount of water in the blood causes low blood pressure and dehydration. Anti diuretic hormone also decreases the amount of aldosterone in the body.

#### Secretion

Secretion is the opposite of reabsorption which entails the movement of wastes and

other molecules into the urine from the blood after it is processed by the kidney.

# The process of urine production

The entry of blood into the kidneys  $\rightarrow$  filtration of blood  $\rightarrow$  ultra filtration  $\rightarrow$  Re absorption  $\rightarrow$  Secretion  $\rightarrow$  Excretion of urine

Kidney physiologically prompts the secretion of Antidiuretic hormone and Aldosterone and production of enzymes like Renin and Angiotensin II

NOTE: A normal adult human void from 800 to 2,000 ml of urine per day. Urinary output less than 800 mLs per day and less than 30 mLs per hour are considered oliguria; urinary output in excess of 2,000 ml per day is considered polyuria; and the absence of all urine production is referred to as anuria.

# Functions of the urinary system

- Eliminates wastes from the body
- Manages and controls the homeostasis of the body in terms of its pH or acid-base balance
- Manages and controls the homeostasis of the body in terms of its electrolytes and electrolyte balance
- Manages and controls the blood pressure
- Stores urine until voiding is prompted
- Enables the process of urination
- Remove wastes like urea and ammonia from the blood
- Manage and control the fluids and fluid balance in the body by holding or retaining water and releasing and removing water from the blood stream
- Serve with endocrine functions such as the production of erythropoietin and calcitriol which are needed for the production of red blood cells and the reabsorption of calcium, respectively.

#### Disease related to urinary system

- Urinary tract infection
- Urolithiasis
- Nephrolithiasis
- Renal failure
- Renal cysts
- Glomerulonephritis
- Cancers of the urinary tract
- Dialysis

# 1.8 Respiratory system

#### Introduction

Respiratory system provides the body with oxygen required to sustain life and to eliminate carbon dioxide. The respiratory system works in association with the heart and lungs.

Air is breathed in through the nose or the mouth. In nasal cavity, a layer of mucus membrane acts as a filter and traps pollutants and other harmful substances found in the air. Next air moves in to the pharynx, a passage that contains the intersection between the oesophagus and the larynx. The opening of the larynx has a special flap of cortilage the epiglottis that opens to allow air to pass through but closes to prevent food from moving in to the airway.



**Respiratory System** 

From the **larynx** air moves in to the **trachea** and down to the intersection that branches to form the **right** and **left primary bronchi**, each of these bronchi, branch in to **secondary bronchi** that branch into **tertiary bronchi** that branch in to smaller airways called **bronchioles** that eventually connect with tiny specialized structure called **alveoli** that function in gas exchange.

The respiratory system is divided into the upper and lower respiratory system.

Upper Respiratory Tract	Lower Respiratory Tract
Nostril	Trachea
Pharynx	Bronchi
Larynx	Bronchioles
Epiglottis	Alveoli

# Nostrils

A nostril is one of the two channels of the nose from the point where they bifurcate to the external opening.

#### Pharynx

Pharynx is the part of the throat. It is situated at behind the nasal cavity, besides the larynx, and above the oesophagus. It has three part, they are nasopharynx, oropharynx and laryngopharynx.

# **Epiglotis**

Epiglotis is a flap in the throat. It is present between the pharynx and larynx. It helps to prevent the food from entering the windpipe [trachea] and the lungs. It is made up of elastic cartilage covered with a mucus membrane attached to the entrance of the larynx.

# Larynx

Adam's apple or the voice box. Larynx connects the lower part of the pharynx and

trachea. It received inspired air from the pharynx and passes it to the trachea.

## Trachea



# Trachea

Trachea called as windpipe, is a cartilaginous tube that connects the pharynx and larynx to the lungs allowing the passage of air.

# Lungs

The lungs are the primary organs of the respiratory system. Human lungs are conical in shape and spongy organ. Right and left lung are situated in the thoracic cavity, either side of the heart, and above the diapharam.

The lungs are protected by ribcage and the spine. The right lung is larger than left lung. The left lung has two lobes, upper and lower lobes. The right lung has three lobes upper, middle and the lower lobe.

# Bronchus

The bronchus is passage of airway in the respiratory system. They conducts air in to the lungs. It is divided in to primary, secondary, and tertiary bronchi.

# **Bronchioles**

They are bronchus of the bronchi. The bronchioles further divided in to smaller terminal bronchioles.

# Alveoli

The alveoli are located in the respiratory zone of the lungs. It is the smallest units in the respiratory tract. Human lungs contain about 480 million alveoli.



### Alveoli

Each alveolus is surrounded by numerous capillaries and is the site of gas exchange by diffusion.

# NOTE: Diaphragm is the major breathing muscle of the body.

# Respiratory cycle

The respiratory cycle includes two phases, inspiration or inhaltion of oxygen and expiration or exhalation of carbon dioxide.

NOTE: Each inspiration plus one expiration is one breath. Normally, adults breathe 16 to 20 times per minute or 960 to 1,200 times per hour.

The lungs expand with inspiration and deflate and relax during expiration. Both the expansion and contraction of the lungs are aided by the muscular diaphragm and the intercostal muscles.

#### Disease of the respiratory tract

- Pneumonia
- Emphysema
- Bronchitis
- Asthma
- Chronic Obstructive Pulmonary Disease (COPD)
- Influenza or the "flu"
- Tuberculosis
- Laryngitis
- Pharyngitis
- Lung Cancers
- Dyspnea
- Respiratory arrest

# 1.9 Endocrine System

The endocrine system provides the body with the hormones that are needed to sustain life and create life. Hypo and hyper secretion of the endocrine glands leads to physiological problems.

NOTE: Endocrine glands are different from exocrine glands. Endocrine glands secrete hormones to an internal part of the body; and exocrine glands secrete substances to the exterior or near the surface of the body. Salivary glands secrete saliva into the mouth and sebaceous glands secrete an oily substance on the skin.

# Physiology

Endocrine system is a control system of ductless glands that secrete hormones within specific organs. Hormones acts as



"messengers" and are carried by the blood stream to different cells in the body, which interpret these messages and act on them. It provides an electrochemical connection

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from the hypothalamus of the brain to all the organs that control the body metabolism, growth and development, reproduction and also maintain homeostasis.

The endocrine system regulates its hormones through negative feedback. Increases in hormones activity decrease the production of that hormone

# The endocrine system consists of these glands

Pituitary gland

• Adrenal glands

Thyroid

Ovaries

- Hypothalamus
- Pineal gland
- Parathyroid
- Pancreas
- Testes

NOTE: The Thymus is the only endocrine gland that does not secrete any hormones

The Thymus is considered as an endocrine gland because it plays a role in the immune system of the body.



**Endocrine System** 

# Hypothalamus

The hypothalamus lies within the cranium which regulates the homeostasis. The hypothalamus regulates the release or slow down and stop the release of hormones from other endocrine glands based on the blood levels of these hormones.

# **Pituitary Gland**

Located at the base of the brain, is the **master gland** which controls the secretion of

several other glands included in the endocrine system.

#### **Pineal Gland**

The pineal gland is a small endocrine gland that lies close to the hypothalamus, performs the coordination of **circadian rhythm (sleep - wake cycle)**.

# **Thyroid Gland**

The Thyroid gland shaped like angel wings on each side of the throat just above the trachea, are connected to each other with a thin connecting area called the Isthmus.

The Thyroid gland regulates the body's metabolism, basal metabolic rate, cardiac system's function, physical growth and sexual functioning.



**Thyroid System** 

**Parathyroid Glands** ("para" means around and "thyroid" is thyroid gland).

The parathyroid glands are two pairs of glands found bilaterally on both sides of the neck just behind the Thyroid gland. The body has four parathyroid glands which is unique when compared to the other glands of the endocrine system. The role of the glands is to control the circulating amount of two electrolytes, calcium and phosphorous with the secretion of parathyroid hormone.

# **Adrenal Glands**

The adrenal glands, which are in the abdominal area, are located bilaterally just above each kidney and the diaphragm. The adrenal glands consist of two layers, the cortex (outer layer) and the medulla (inner core).

# The cortex secretes:

- Androgen male hormone
- Aldosterone controls blood pressure and fluid balance
- Cortisol regulates and coordinates metabolism

# The medulla secretes stress reaction hormones such as:

- Adrenaline
   Noradrenaline
- Catecholamine

# The Pancreas

The pancreas is located behind the stomach. The islets of Langerhans secrete glucagon, insulin, pancreatic polypeptide and somatostatin. The pancreas produces and releases digestive enzymes and juices that break down foods as they enter the small intestine.

NOTE: Pancreas is called as a mixed gland since it serves both as an endocrine gland and as a digestive organ and exocrine body.

# Testes and Ovaries

Ovaries and Testes are the endocrine glands and gonads, which is called as a sex and reproduction glandular structure.

The ovaries produce progesterone, estrogen, inhibin and androstenedione. Progesterone regulates menstrual cycle and the preparation of the uterus for the implantation of the egg. Estrogen regulates the development of breasts. Inhibin inhibits Follicle Stimulating Hormone (FSH) in females and in males it inhibits the development of sperm and androstenedione (androgen that is weaker than testosterone).

The testes produce androgens, testosterone and sperms.



**Testes and Ovaries** 

# Diseases related to endocrine system

- Diabetes insipidus
- Acromegaly
- Gigantism
- Syndrome of Inappropriate Antidiuretic Hormone Secretion (SIADH)
- Hyperthyroidism
- Hypothyroidism
- Cushing's syndrome
- Addison's disease

# 1.10 Reproductive System

The role of the male and female reproductive system is to procreate and to provide sexual gratification to the person.



#### Female Reproductive System

# Female reproductive system

The female reproductive system is made up of the internal and external sex organs that function in reproduction of new offspring. The female reproductive system is immature at birth and develops to maturity at puberty and able to produce gametes, and to carry a foetus to full term.

#### Parts of Female Reproductive System.

External Organs	Internal Organs		
• Vulva	• Vagina		
Mons pubis	• Cervix		
• labia majora	• Uterus		
Labia minora	• Fallopian tubes		
• clitoris	• Ovaries		
• Vestibule			

# External Organs

The vulva is the external part of the female genitalia. It protects the woman's sexual organs urethra, vestibule, and vagina.

#### **Mons Pubis**

The mons pubis is a pad of fat lying in front of the symphysis pubis where pubic hair develops with puberty.

#### Labia majora

The labia majora are two thick folds which form the sides of the vulva.

#### Labia minora

The labia minora lies just inside the labia majora and surround the openings to the vagina and urethra.

# **The Clitoris**

The clitoris lies above the vagina is covered with a protective cover or hood.

#### Vestibule

It is a small space or cavity at the beginning of a vaginal canal.

# Internal Organs

#### Vagina

The Vagina is an elastic, muscular canal that extends from the vulva to the cervix. The vaginal canal travels upwards and backwards between the urethra at the front and the rectum at the back.

The outer vaginal opening is normally partly covered by a membrane called the hymen. It joins the internal and external female reproductive organs and protects against infection by a moist secretion.

# Cervix

The cervix is the lower part of the uterus. The lower narrow portion where it joins with the upper part of the vagina. The cervix is usually 2-3 cm long and roughly cylindrical in shape which changes during pregnancy. As labour progresses, the cervix becomes softer and shorter, beings to dilate and facilitate normal labour.

#### Uterus

The uterus is a pear shaped muscular organ and the major female reproductive organ. It provides mechanical protection, nutritional support, and removal of the waste for developing embryo and fetus.

• It has three layers, they are perimetrium, myometrium and endometrium.

Major functions are to accept a fertilized ovum which becomes implanted into the endometrium, and menstruation.

# The fallopian tube

The fallopian tubes are two tubes leading from the ovaries in to the uterus. They enable the passage of ovum from the ovaries to the uterus. Different segments are interstitial, isthmus, ampulla, infundibulum and fimbriae. Fertilization takes place in the ampulla of the fallopian tube.

# **Ovaries**

The ovaries are considered as the female gonade. Each ovary is whitish in colour and located alongside the lateral wall of the uterus. It secretes estrogen, testosterone, Inhibin and progesterone. These hormones are responsible to maintain menstrual cycle, pregnancy and development of breast.

# Functions of the female reproductive system

- To produce ovum.
- To protect and nourish fertilized egg until it is fully developed.
- To give birth.
- Menstruation.
- To have sexual intercourse.

#### Diseases related female reproductive system

- Breast cancer
- Cervical cancer
- Ovarian cancer
- Poly cystic ovarian disorder
- Menorrhagia
- Fibroids

# Male Reproductive System

The male reproductive system consists of internal and external organs.

#### The external organs

- Penis
- Scrotum

# **The Penis**

The tip of the penis is protected with foreskin. The penis enlarges and becomes erect with sexual excitation because there is a rich supply of blood.

# **The Scrotum**

The scrotum lies bilaterally behind the penis. The scrotal sac holds and protects the testes.

NOTE: The scrotum moves upward and downward when it is exposed to cold and warm environmental temperatures, respectively.

# The internal organs are the

- Testes
- Epididymis
- Vas deferens

Prostate gland

Seminal vesicles

•

- Ejaculatory ducts
- Urethra

# **Testes**

The testicles, or testes, lie bilaterally to the penis in the scrotum. The testes are endocrine glands and gonads.

![](_page_27_Picture_39.jpeg)

Male Reproductive System

![](_page_27_Picture_41.jpeg)

# Epididymis

The epididymis is the connecting tube between the testes and the vas deferens which stores, transports and matures the sperm from the testes. The epididymis has three parts such as, the head, body and tail.

# Vas Deferens

The vas deferens moves the mature sperm from the epididymis to the ejaculatory ducts and then to the urethra for ejaculation.

# **Seminal Vesicles**

The seminal vesicles are the pair of glands which attach to the vas deferens near and under the bladder. It produces a fructose substance that provides the sperm with the energy it needs to locomote and move through the male reproductive tract.

#### Prostate

The prostate is an exocrine gland which secretes an alkaline fluid that preserves the life of the sperm when it hits the acidic female vagina.

#### **Ejaculatory Ducts**

The pair of ejaculatory ducts forms the union of the vas deferens and the seminal vesicles. Sperm enters the ejaculatory ducts from the vas deferens.

# Urethra

The urethra is an organ common for both reproductive system and urinary system.

#### The primary male reproductive hormones are

Follicle stimulating hormone which produces sperm (spermatogenesis).

Luteinizing hormone which produces testosterone.

Testosterone which leads to the development of primary and secondary sexual characteristics during puberty.

#### Disease related to reproductive system

- Prostate cancer
- Testicular cancerErectile dysfunction

• Hydrocele.

- Gynecomastia
- Varicocele

### Sensory system

It is an organ of the body which response to external stimuli by conveying impulses through the sensory neuron to the appropriate places within the sensory nervous system.

There are five sense organs in the human body. It includes,

- Skin Eye Ear
- Tongue Nose

# Skin

The human skin is the outer covering of the body and is the largest organ of the integumentary system. The main functions are protection, regulation and sensation.

# Anatomy of the Eye

The eye is a sensory organ. It absorbs light rays from our environment and transforms them in such a way that the information in the brain can be processeced further.

![](_page_28_Figure_31.jpeg)

# Anatomy of Eye

- The eye has many parts work together to produce clear vision.
- The **sclera** or white part of the eye protects the eyeball.

- The **pupil** or black dot at the center of the eye is a hole through which light can enter the eye.
- The **iris** or coloured part, surrounding the pupil. It controls how much light enters the eye by changing the size of the pupil.
- The **cornea**, a clear window at the front of the eye covers the iris and pupil.
- A clear **lens**, located behind the pupil, acts like a camera lens by focusing light in to the retina at the back of the eye.
- The **retina** is a light sensitive inner lining at the back of the eye. Ten different layers of cells work together in the retina to detect light and turn it into electrical impulses.
- The retina has special cells called **cones** and **rods** are located in the retina. These all are known as photoreceptors and help absorb light.
- Cones cone cells help us see **colour** and detail.
- Rods rod cells allow us to see in poor lighting and give us our **night vision**.

# Functions [Physiology] of the Eye

- 1. Light reflects of the object we are looking at
- 2. Light rays enter the eye through the cornea at the front of the eye.
- 3. The light passes through a watery fluid and enters the pupil to reach the lens.
- 4. The lens can change in thickness to bend the light, which will focus it on to the retina at the back of the eye.
- 5. On the way to the retina, light passes through a thick, clear fluid called a vitreous humour. The vitreous humor fills the eyeball and helps maintain its round shape.
- 6. The light then reaches the back of the eyes and hits the retina. The retina translates the light into electrical impulses which are then carried to the brain by the optic nerve.

Finally, the visual cortex of the brain interprets these impulses at what we see.

![](_page_29_Picture_17.jpeg)

# **ABOUT EYE BANK**

In India, we have an estimated 4.6 million people

with corneal blindness that is curable through corneal transplantation made possible by eye donation. The cornea is the transparent outer portion of the eyeball that transmits light to the retina. It is a 1/2-inch wide film of tissue that forms a protective covering on the front of the eye. Corneal blindness can be cured in many cases through the transplant of a donated cornea. In 1905 Eduard Konrad Zirm, MD, performed the first successful corneal transplant. In 1944 Paton established the world's first eye bank, the Eye-Bank for Sight Restoration, in New York. Certified Eye Bank Technicians are re-certified every 3 years. Anyone can be an eye donor! Cornea donation is not dependent on age, eye colour, blood type or even eye sight quality. The eyes have to be removed within six hours of death. Cornea transplant is usually performed within 4 days after donation, depending upon the method of cornea preservation. Eye donation gives sight to two blind persons. One blind person is given one eye. Almost anyone between the ages of 2 and 75 can be an eye donor, regardless of poor vision, diabetes, or cancer. In fact, only under the following conditions can eye donation definitely not occur: HIV or AIDS, Active Hepatitis, Active Syphilis, Rabies, Viral Encephalitis, Leukemia, Active Lymphoma, or Active Meningitis. It is illegal to buy and sell human eyes, organs and tissues. Any cost associated with eye procurement are absorbed by the eye bank.

# MAKE EYE DONATION A FAMILY TRADITION

Your eyes after death need not perish. Help blinds to see, donate eyes after death.

![](_page_30_Figure_1.jpeg)

The ear is the organ for hearing. It is divided into three parts.

- Outer ear-pinna /auricle, auditory canal
- Middle ear-ear drum, ossicles, Eustachian tube
- Inner ear- cochlea, vestibule and semicircular canal.

#### The outer ear

Pinna: receives sound waves that travel the auditory canal or ear canal.

The curved formation on the outside [the pinna] helps funnel sound down the ear canal to the ear drum.

#### Auditory canal

Acts as a funnel and leads to the ear drum. which protects the eardrum from shock and intrusion by external objects.

#### Ear drum

- It is a cone shaped piece of skin.
- It is very sensitive, even the slightest pressure variation will cause it to vibrate.
- It is also separates the outer ear from the middle ear.

#### The middle ear

It transfer the energy of a sound wave by vibrating the three bones found there.

Ossicles:- smallest bone of the body. Ear bones are malleus, incus and stapes.

# **Eustacian tube**

A tube that connects the middle ear to the back of the nose. It equalizes the pressure between the middle ear and the air outside.

#### The inner ear

It has two main parts.

#### Cochlea

This is a spiral that is covered in a stiff membrane. It contains thousands of hair cells attached to the end of the organ of the auditory nerve called organ of corti. These tiny hairs bend because of the vibrations caused by the sound waves.

#### The auditory nerve

The vibration from the hairs stimulated tiny nerve cells. The nerve cells then send signals along the auditory nerve to the brain.

# Functions of Ear

Any source of sound sends vibrations or sound waves in to the air. These funnel through the ear opening, down the ear canal and strike eardrum acquiring in to vibrate. The vibrations become nerve impulses and transported to the brain, which interprets the impulses sound [music, voice, etc.]

# Tongue

Tongue is a muscular organ situated in the floor of the mouth. It is associated with the function of taste, speech, mastication, degurition.

### Parts of the tongue

- Root
- Tip
- Body it consists of two
- Dorsum oral part
- Pharyngeal part
- Posterior part
- Inferior inferior surface.

![](_page_30_Picture_38.jpeg)

![](_page_31_Figure_1.jpeg)

# Tongue

There are two groups of muscles of the tongue.

- 1. Four intrinsic alter the shape of the tongue and not attached to the bone.
- 2. Four paired extrinsic muscles- change the position of the tongue and are anchored to the bone.

The tongue upper surface is covered by taste buds housed in numerous lingual papillae. It is responsible for taste.

## Nose

The organ of smell is located in the middle of the face. The internal part of the nose lies above the roof of the mouth.

The nose consists of external nose and nasal cavity both are divided by the septum into right and left.

# Functions of the nose

- Respiration
- Olfaction
- 1. Nose is the first part of the upper respiratory tract.
- 2. Warming and moistening of the inhaled air.
- 3. Filter the air by removing particulates.

![](_page_31_Figure_16.jpeg)

![](_page_31_Figure_17.jpeg)

#### Olfaction

It has olfactory receptor neuron and it is responsible for sense of smell.

#### Speech

The normal speech is produced with pressure from the lungs, this can be modified using airflow through the nose in a process called nasalization.

#### SUMMARY

- Integumentary system comprises the skin. Appendages protect the body from various kinds of damage. Such as loss of water or damages from outside.
- \* It consists of the skin, hair, finger nails, toe nails and other structures including glands.
- Heart is the master of cardiovascular system. It pumps out blood to supply oxygen, electrolytes, nutrients and hormones through out the body.
- Blood circulation controls the body temperature, the PH or acid base balance of the body.
- Blood pumping cycle of the heart is called cardiac cycle. The heart consists of four chambers, valve, and three layers of covering.
- Heart has three types of circulation like coronary, systemic and pulmonary circulation. It is considered as a one of the vital organ of the body.

![](_page_31_Picture_29.jpeg)

SUMMARY (CONTD)
The musculo skeletal system is made up of the body's bones, muscles, cartilage, tendons, ligaments, joints, and other connective tissue that supports and bind tissues and organs together.
The primary functions of the system is forming and supporting the body, allowing motion, and protecting vital organs.

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- The nervous system is the most complex of all the systems which coordinates controls and enables all body functions like movement, thinking, autonomic, or automatic, reflexes and sensory perception.
- The nervous system sends messages to all parts of the body and receives it.
- The alimentary canal, with the other organs of digestion, is a continuous hollow tube from the mouth to the rectum.
- The alimentary canal along with the associated organs like the salivary glands, liver, pancreas and the gallbladder is called the digestive or gastrointestinal system.
- ◆ The stages of digestion are mastication, digestion, and the absorption.
- Urinary system also known as the renal system, consist of kidneys, ureters, bladder, and the urethra.
- The purpose of the urinary system is to eliminate the excess water from the body, regulate blood volume and blood pressure, control and regulate the level of electrolytes and blood PH.
- ◆ The physiology of urinary system are filtration, reabsorption and secretion.
- Respiratory system provides required oxygen to the body, to sustain life and to eliminate carbon dioxide. The respiratory systems' work is associated with the heart and lungs. It is divided into upper and lower respiratory tract.
- Air is breathed in through the nose or the mouth. Alveoli plays major role in process of diffusion.
- The endocrine system provides the body with the hormones that are needed to sustain life and create life. Hypo and hyper secretion of the endocrine glands leads to physiological problems.
- The purpose of reproductive system is to procreate, and to provide sexual gratification to the person.
- Sensory organ responses to external stimuli by conveying impulses through the sensory neuron to the appropriate places within the sensory nervous system.
- The skin is the outer covering of the body and is the largest organ of the integumentary system. The main functions are protection, regulation and sensation.
- The eye is a sensory organ. It absorbs light rays from our environment and transforms them in such a way that the information in the brain can be processed further.
- The ear is the organ for hearing. The ear can be divided into outer and inner ear. Inner ear plays major role in conduction of sound waves.
- Tongue is a muscular organ situated in the floor of the mouth. It is associated with the function of taste, speech, mastication, and deglutination.
- Nose is the organ of smell located in middle of the face. The internal part of the nose lies above the roof of the mouth.

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# GLOSSARY A-Z

Bradycardia	-	A pulse rate of less than 60 per minute		
Tachycardia	-	A pulse rate of more than 100 per minute		
Systole	-	The phase of the cardiac cycle when the heart gets contract		
Diastole	-	The phase of the cardiac cycle when the heart is at rest		
Pericardium	-	The sac that encloses the heart; the heart's outermost layer		
Purkinje fibers	-	Bundles of nerve tissues that allows the heart to conduct nerve		
		impulses		
Pulse	-	The rate of the heart this is documented as the number of heart		
		beats per minute		
Sinoatrial (SA) node	-	The natural heart pacemaker that controls the rate of the heart		
Atrioventricular	-	This node sends an electrical impulse to the bundle of His		
(AV)node				
Bundle of His	-	sends electrical impulse to Purkinje fibers		
Cardiac arrhythmia,	-	Abnormal and irregular heart beats		
or dysrhythmia				
Electrocardiogram	-	ECG, records the electrical activity of the heart and the heart's		
		rhythm		
Hypertension	-	High blood pressure		
Hypotension	-	Low blood pressure		
Angina or angina	-	Chest pain that results from the lack of adequate oxygen to the		
pectoris		heart muscle. The lack of oxygen to the heart muscle is referred to		
		as ischemia.		
Myocardial	-	Heart attack		
infarction				
Mastication	-	Chewing		
Digestion	-	The breaking down of food particles into smaller particles and		
		molecules		
Taste buds	-	Taste sensors found on the upper surface of tongue		
Parotid salivary	-	One of the salivary glands		
giand				
Amylase	-	The digestive enzyme that is produced by the salivary glands in		
Destate				
Peristalsis	-	wave like involuntary muscular movements that move and proper		
Chuma		Dertially directed food in the store sh		
Diarrhaa	-	Lease and often difficult to control feed are written		
Constinution	-	The lask of a bound movement or d freedow with a		
Constipation	-	The lack of a bower movement and recal evacuation		
Fecal Impaction	-	The drying of stool in the intestines that cannot be evacuated		

![](_page_33_Picture_3.jpeg)

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Diverticulitis	-	The inflammation or infection of the intestine affected with diverticulosis		
Gastric acid reflux	-	The movement of acids and contents from the duodenum of the small intestine back into the esophagus		
Cholelithiasis	-	Gall bladder stones		
Cholecystitis	-	An inflammation or infection of the gall bladder		
Cirrhosis	-	Damage to the liver and its hepatic tissues		
Hepatitis	-	A type of liver infection by hepatitis virus		
Colitis	-	An acute or chronic inflammation of the colon		
Crohn's disease	-	inflammation of the gastrointestinal tract		
Irritable bowel syndrome	-	A disorder of the large intestine that can lead to abdominal pain, diarrhea and other gastrointestinal system disorders		
Hemorrhoids	-	Enlarged veins in the lower rectum and/or anus		
Hormones	-	Chemical substances that control manage and coordinate several body functions		
Gland	-	An organ that secretes and releases a substance.		
Circadian rhythm	-	The normal human being's 24 hour cycle of sleep and wakefulness.		
Diurnal beings	-	Day time active and nighttime sleep beings		
Nocturnal beings	-	Nighttime active and daytime sleep beings		
Progesterone	-	The hormone secreted by the ovaries and plays a role in the		
		menstrual cycle and the preparation of the uterus for the		
		implantation of the fertilized egg or ovum		
The testes	-	The endocrine system gland that produces testosterone		
Diabetes insipidus	-	A pituitary gland disorder, lack of insulin production		
Acromegaly	-	A pituitary gland disorder, swelling or overgrowth of extremities including head		
Gigantism	-	A pituitary gland disorder, over growth of the entire body including tallness		
Hyperthyroidism	-	An overactive thyroid gland		
Hypothyroidism	-	An underactive thyroid gland		
Cushing's syndrome	-	Over production of cortisol by the adrenal glands		
Addison's disease	-	Under production of cortisol by the adrenal glands		
Skin	-	The largest organ of the body that covers the entire body		
Thermoregulation	-	The regulation of the bodily temperature		
Tactile sense	-	sense of touch		
Lunula	-	The half-moon (luna) white area at the base of the nail.		
Acne	-	Clogging of skin pores with dead skin and skin oils		
Rash	-	An often itchy irregular reddened area on the skin that can occur		

from a number of different causes

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Athlete's foot	-	Also referred to as tinea pedis (foot), it is a fungal infection of the feet
Sunburn	-	Burning of the skin as the result of exposure to the sun
Albinism	-	Defective melanin that causes an abnormal coloration of the skin and hair
Herpes	-	A viral infection
Impetigo	-	A contagious skin condition that appears as a rash on the skin
Psoriasis	-	Thick skin surface as the result of an abnormal buildup of cells on the skin surface
Rosacea	-	A skin disorder that causes redness and skin break outs
Ligaments	-	Connective tissue with collagen at the point of articulation
Tendons	-	Connective tissue with collagen that allow joint movement
Fascia	-	Connective tissue that connects muscles to other muscles
Fractures	-	The breakage of a bone
Greenstick fracture	-	A fracture that occurs when only one side of the bone is fractured
Dislocation	-	The joints are completely separated and are no longer articulated and connected with each other
Arthritis	-	One of the many types of skeletal disorders that is characterized
		with the inflammation of one or more skeletal joints in the body
Rheumatoid arthritis	-	A type of arthritis that affects the younger population, auto immune disorder
Osteomyelitis	-	An infection of bone tissue
Glial cells	-	A type of nervous system cell, other than a neuron, that forms myelin which is the covering or sheath over parts of the neuron
Synapse	-	The point at which neurons gently touch each other to send or receive a nerve impulse or message.
Meninges	-	The protective membrane that covers the brain and the spinal cord
Brain	-	The major organ of the body that controls and manages virtually all physiological and emotion bodily responses
Pons	-	The mid-section of the part of brain stem that connects to the midbrain above and the medulla below and the part that controls the rhythm of respirations
Reflex	-	A muscle reaction that automatically occurs in response to a certain type of stimulus, or stimulation
Seizures	-	Abnormal nervous system nerve activity in the brain that can lead to a wide variety of signs and symptoms including uncontrolled body movement and jerking or a short lapse of consciousness
Stroke	-	An episode of bleeding or a clot in the brain that causes symptoms and damage to the brain and its functioning
Epilepsy	-	A group of disorders that lead to seizures

![](_page_35_Figure_2.jpeg)

Paralysis	-	The neurological loss of function to one or more parts of the body	
Parkinson's disease	-	A chronic and progressive disorder of the nervous system that	
		can lead to disability	
Alzheimer's disease	-	A progressive degenerative form of dementia	
Bell's palsy	-	A disorder of the facial nerve that adversely affects the face and	
		the muscular movements of the face	
Neuralgia	-	Pain originating from a nerve or group of nerves	
Procreate	-	To give life to a new person	
Salpinges	-	An alternative name for the fallopian tubes	
Fimbria	-	The hair like fringes of the fallopian tubes nearest to the ovaries	
Vaginitis	-	Infection of the vagina and vaginal vault	
Cystocele	-	The collapse of the urinary bladder into the vagina	
Rectocele	-	The pushing of the rectum and part of the large intestine against	
		the vaginal wall	
Nares	-	The nostrils of the nose	
Pneumonia	-	An inflammation and infection of the lungs	
Emphysema	-	A disorder characterized with an inability to expel air from the alveoli	
Bronchitis	-	An inflammation and infection of the bronchi	
Asthma	-	A lung inflammation that makes the work of breathing more difficult	
Chronic obstructive	-	A chronic lung disorder that consists of chronic bronchitis and/or	
pulmonary disease		emphysema	
(COPD)			
Influenza or the "flu"	-	An acute inflammation and infection that can adversely affect the	
		lungs and respiratory functioning	
Tuberculosis	-	A serious lung infection that is contracted with a bacillus	
		pathogen	
Laryngitis	-	An inflammation and infection of the larynx	
Pharyngitis	-	An inflammation and infection of the pharynx	
Dyspnea	-	Difficulty breathing	
Erythropoietin	-	The substance that is needed for the production of red blood cells	
Vasopressin	-	An alternative name for antidiuretic hormone	
Micturition	-	The synonym for urination or voiding	
Urolithiasis	-	A kidney stone or calculi	
Renal cysts	-	Infections in the kidney	
Glomerulonephritis	-	Inflammation of the glomeruli of the kidneys	

The point at which the and carbon dioxide of a. lungs c. veins The red colour of presence of a. hemoglobin c. xanthophyll Thymus gland is a partice of a. muscles c. skin 90% of plasma consista. protein c. water Red blood Cells contata. a prominent nucle	he exchange of oxygen occurs b. arteries d. capillaries blood is due to the b. erythrocin d. rhodopsin art of b. lymphatic system d. inner ear sts of b. sugar d. salt
c. veins The red colour of presence of a. hemoglobin c. xanthophyll Thymus gland is a pa a. muscles c. skin 90% of plasma consis a. protein c. water Red blood Cells cont a. a prominent nucle	d. capillaries d. capillaries blood is due to the b. erythrocin d. rhodopsin art of b. lymphatic system d. inner ear sts of b. sugar d. salt tains
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a. protein c. water Red blood Cells cont a. a prominent nucle	b. sugar d. salt tains
Red blood Cells cont a. a prominent nucle	tains
a. a prominent nucle	110
In the second second second second second	
b. a dormant nucleus	5
d. no nucleus	
Hemostasis is aided l	by
a. thrombocytes c. erythrocytes	b. leucocytes d. granulocytes
Adult human has	
a. 206 bones	b. 216 bones
c. 226 bones	d. 236 bones
Malleus Incus and St	tapes are
c. tarsus	d. carpals
Sternum is a	
a. leg bone	b. hand bone
c. breast bone	d. hip bone
The building blocks	of bones are called
a. osteocytes	
c. thrombocytes	
	Adult human has a. 206 bones c. 226 bones Malleus Incus and St a. bones c. tarsus Sternum is a a. leg bone c. breast bone The building blocks a. osteocytes b. melanocytes c. thrombocytes d. leucocytes

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19.	Haematopoiesis is		29.	Spinal cord has	nerve clusters
	a. production of V	VBCs		a. 11	b. 21
	b. production of R	BCs		c. 31	d. 41
	c. production of h	aemoglobin	30.	Abducens is a	
	d. production of insulin			a. muscle tissue	b. cranial nerve
20.	20. Cartilage does not have			c. exocrine gland	d. protein derivative
	a. blood supply	b. nerves	31.	Digestion starts from	n
	c. marrow	d. all of the above		a. small intestine	b. large intestine
21.	Ligaments are conne	ective tissue made up of		c. tongue	d. stomach
	a. chitin	b. carbohydrates	32.	The salivary amylase	e is called
	c. collagen	d. fatty acids		a. ptyalin	b. pepsin
22.	Rheumatoid arthriti	is is		c. insulin	d. renin
	a. dystrophy		33.	Bile is produced in	
	b. Alzheimer's dise	ease		a. lungs	b. liver
	c. auto immune di	sorder		c. stomach	d. kidney
	d. anemia		34.	Stomach secretes	
23.	The basic units of n	erves are called		a, oxalic acid	b. citric acid
	a. neurons	b. nephrons		c. nitric acid	d.hydrochloric acid
	c. transposons	d. exons	35.	The point of fertiliza	ation is
24.	A point of juncti	on between any two		a, fallopian tube	h vagina
	neurons is called	1		c. uterus	d. endometrium
	a. collapse	b. synapse	36	The male hormone i	is called
	c. protapse	c. relapse	50.	a estrogen	h Androgen
25.	The brain is protected	ed by the		c. thyroid	d progesterone
	a. pericardium	b. diaphragm	27	The sugar present in	
	c. cranium	d. osphradium	57.	ine sugar present in	h galactosa
26.	CNS consists of			a. glucose	d mannose
	a. heart and skin		•		d. mannose
	b. liver and bones		38.	is the i	master gland
	c. skin and nails	1		a. thyroid	b. adrenal
	d. brain and spina	l cord		c. prostate	d. pituitary
27.	is the lar	gest part of brain	39.	Diabetes is caused	l due to the lack of
	a. cerebrum			production of	
	b. cerebellum	-0		a. glucagon	b. insulin
	d spinal cord	d		c. thrombin	d. keratin
20				The major breathing	g muscle is
28.	28. The respiratory rhythm is controlled by			a. trachea	b. bronchus
	a. gyri	b. sulci		c. diaphragm	d. meniscus
	c. pons	a. ghai cells			

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Unit\_1\_Human\_physiology\_Gen\_Nur.indd 39

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- 41. Larynx in males are also called as
  - a. Eve's apple
  - b. Guyton's apple
  - c. Newton's apple
  - d. Adam's apple
- 42. Alveoli are the

a. air sacs	b. water sacs
c. water bags	d. hairs in lungs

43. Adults breathe \_\_\_\_\_ times in a minute

a. 20-24	b. 16-20
c. 12-16	d. 18-22

- 44. COLD is expanded as
  - a. child of limited dystrophy
  - b. city old lantern dialling
  - c. chronic obstructive lung disease
  - d. children of lifetime diseases
- 45. Human urine majorly consists of
  - a. uric acidb. ammoniac. nitrogend. urea
- 46. Kidneys are \_\_\_\_\_ shaped

a. pearl	b. bean		
c. triangle	d. spherical		

47. The inner layer of kidney is called the

a. lamella	b. cortex
c. medulla	d. glabella

48. \_\_\_\_\_ is performed in case of kidney failure

a. paralysis	b. haemolysis
c. plamolysis	d. dialysis

49. Antidiuretic hormone controls the amount of water in

a.	blood	b.	urine
c.	sweat	d.	tears

- 50. Polyuria is
  - a. frequent urination
  - b. excess urination
  - c. less urination
  - d. blood in urine

## **Answer The Following Questions**

- 1. Illustrate the structure of sebaceous glands and label the parts
- 2. Briefly write about the layers present in the skin
- 3. Write short notes on lymphatic system
- 4. What are the types of leucocytes?
- 5. What are the functions of platelets?
- 6. Briefly write about the structure of bone
- 7. Other than bones, what are the other tissues and structure of musculo skeletal system?
- 8. Illustrate and briefly write about the structure of a neuron
- 9. Write about peripheral nervous system
- 10. What are the functions of small intestine?
- 11. What are the internal organs of male reproductive system?
- 12. Substantiate kidney as an organ
- 13. Illustrate the structure of larynx
- 14. What is respiratory cycle?
- 15. Draw and explain the structure of nephron

## Write In Detail

- 1. Explain the arrangement of integumentary system and in its functions
- 2. Illustrate and explain the structure and function of human heart
- 3. Classify human bones
- 4. Illustrate and explain the structure of human brain
- 5. What are the different stages of digestion?
- 6. Illustrate and explain the structure of human ovaries
- 7. List down the endocrine glands and the corresponding hormones secreted by it.
- 8. Explain the structure and function of Thyroid gland
- 9. Illustrate and explain the structure of human lungs
- 10. Explain the structure and function of kidneys

![](_page_40_Picture_1.jpeg)

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- https://www.youtube.com/ watch?v=vii3YLGouv0
- https://www.youtube.com/ watch?v=dYYHaPkKqIA
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![](_page_40_Figure_11.jpeg)