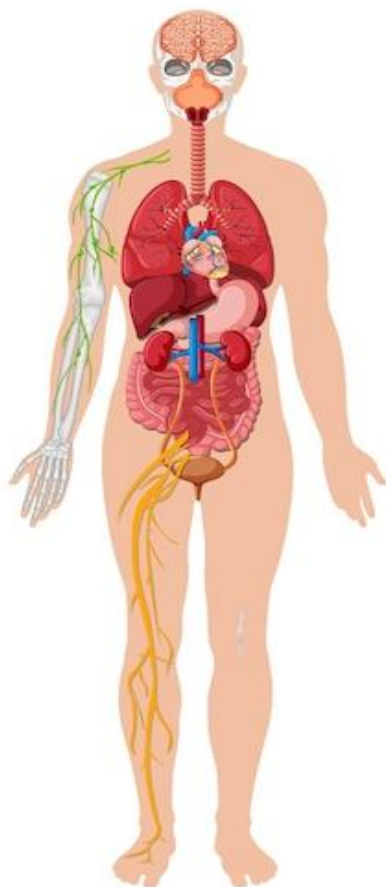


# Anatomy

FOR 3<sup>RD</sup> YEAR MEDICAL PHYSICS  
STUDENTS

LEC. NEEAN F. MAJEED

## ANATOMY OF THE HUMAN BODY



• Brain



• Lymph  
• Lymph nodes



• Skull



• Blood vessels



• Oesophagus



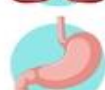
• Small intestine



• Lung



• Large intestine



• Stomach



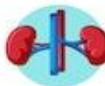
• Muscle



• Liver



• Bone  
• Joint



• Kidneys



• Nerve



• Heart



• Bladder

**Anatomy:** the word anatomy is derived from a Greek word “Anatome” meaning to cut up. It is the study of structures that make up the body and how those structures relate with each other.

Gross anatomy studies body structure without microscope.

Systemic anatomy studies functional relationships of organs within a system whereas

Regional anatomy studies body part regionally.

Both systemic and regional approaches may be used to study gross anatomy.

Microscopic anatomy (Histology) requires the use of microscope to study tissues that form the various organs of the body.

The term applies to the study of the structure of all living beings; The scope of the subject has widened very much and several subdivisions are now studied. These subdivisions include:

‰ Gross anatomy or morphological anatomy or macroscopic anatomy: Study of structures which can be seen by naked eye

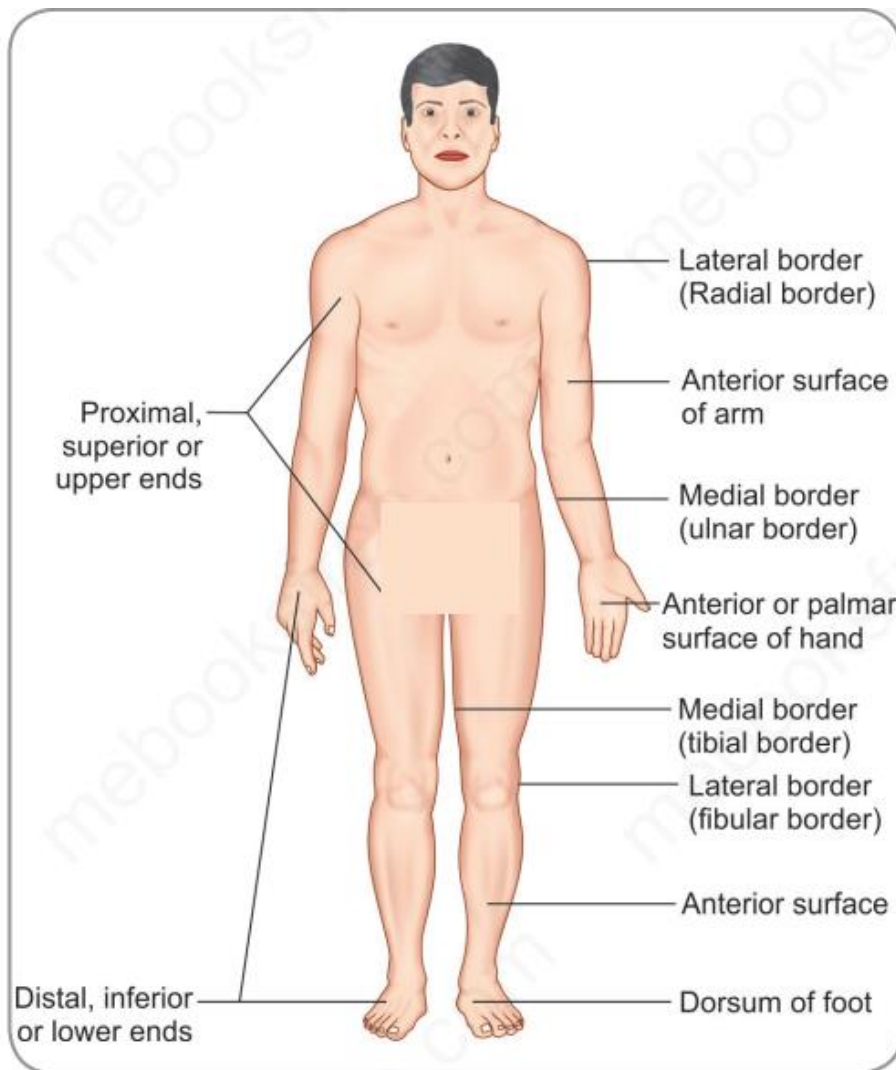
‰ Microscopic anatomy or histology: Study of structures which can be seen only on magnification, like under a microscope. Histology can also be defined as study of tissues, since tissues are microscopic.

‰ Cytology: Study of details of the structure of cells

‰ Embryology or developmental anatomy: Study of growth and development of body structures before birth

‰ Systemic anatomy: Study of the various organ systems of the body

while describing structures of the human body, it is necessary to have uniformity of terms to avoid confusion and ambiguity. Hence, all descriptions are done with reference to a standard position called the normal anatomical position (Fig. 1.1).



**Fig. 1.1: Normal anatomical position**

## Planes of the Body

As the human body is a three-dimensional (3D) structure, three perpendicular planes are described.

% The plane passing vertically through the midline of the body, so as to divide the body into right and left halves, is called the median plane. It is also called the mid sagittal plane, since it is parallel to the sagittal suture of the skull (Fig. 1.2)

% Vertical planes to the right or left of the median plane, and parallel to the latter, are called parasagittal planes (Fig. 1.2)

% The vertical plane placed at right angles to the median plane, but dividing the body into anterior and posterior parts, is called a coronal plane or a frontal plane (Fig. 1.3) It is parallel to the coronal suture of the skull

Planes passing horizontally across the body, at right angles to both the sagittal and coronal planes and dividing it into upper and lower parts, are called transverse or horizontal planes (Fig. 1.4). In the case of a limb, a transverse section is any section at right angles to the long axis of the limb. Similarly, the transverse section of an organ is at right angles to the long axis of the particular structure.

An oblique plane is at any other angle. Terms of Location and Relationship (Fig. 1.5) To describe various structures with reference to each other, several terms are required. Of these, three pairs of terms are basic and important.

These are as follows:

1. Anterior–posterior: Anything nearer or closer to the front is anterior; anything nearer or closer to the back is posterior (Fig. 1.5).
2. Superior–inferior: Anything nearer or closer to above is superior (nearer the top of head); anything nearer or closer to below is inferior (nearer the sole of feet) (Fig. 1.5).
3. Medial–lateral: Anything nearer or closer to the center or the midline of the body is medial; anything farther from the midline is lateral (Fig. 1.5).

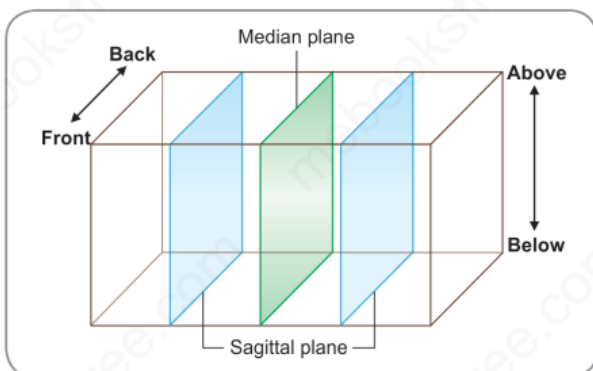


Fig. 1.2: Scheme showing median and sagittal planes

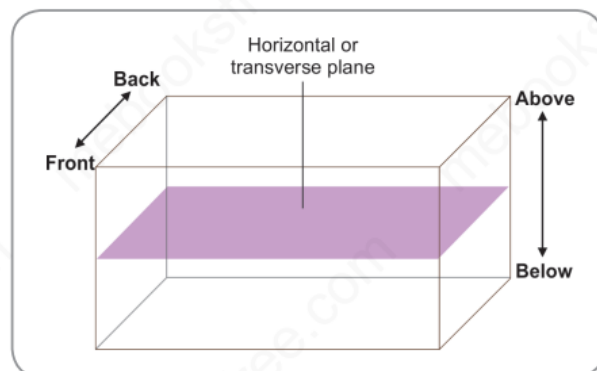


Fig. 1.4: Scheme showing a horizontal or transverse plane

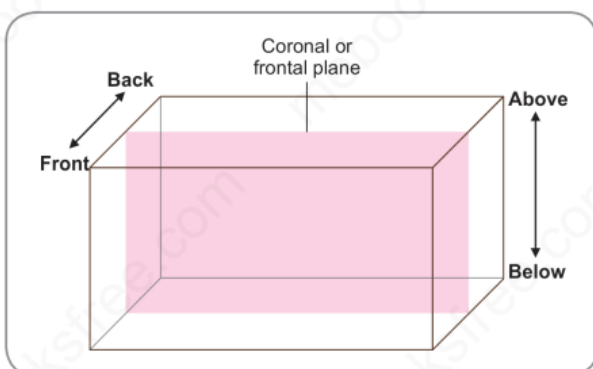


Fig. 1.3: Scheme showing a coronal or frontal plane

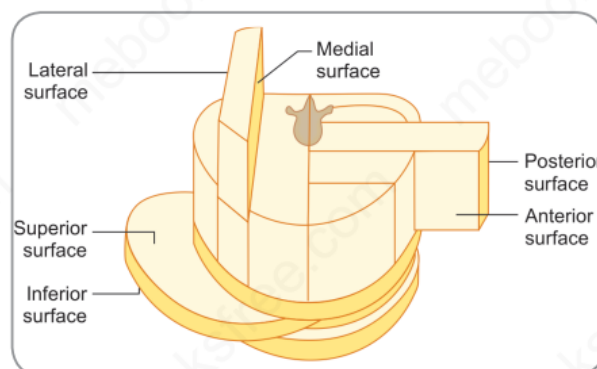
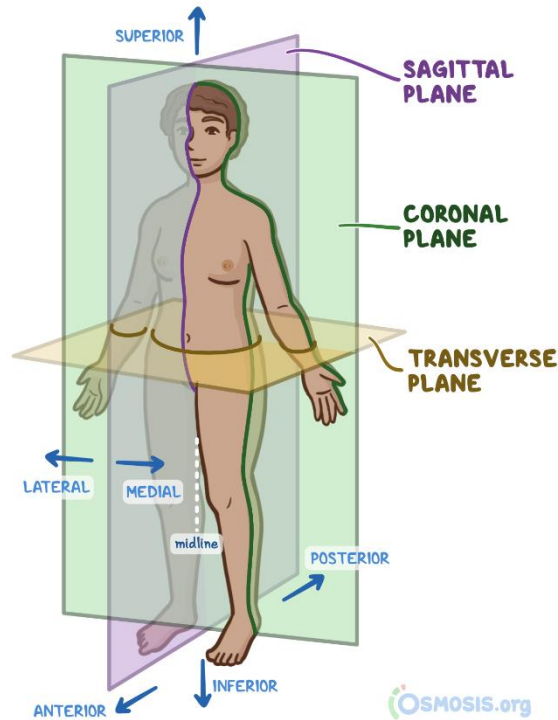


Fig. 1.5: Surfaces of body



The vertical plane passing through the midline of the body, as already been described, is the median plane (Fig. 1.2). Any structure lying in the median plane is described to be median in position. It can be clearly seen that the above mentioned three sets of terms correspond to the three fundamental perpendicular planes of the body.

**Body parts Regions** The body can generally be described to have areas of:

**Axial body part:** It is the part of the body near the axis of the body. This includes head, neck, thorax (chest), abdomen, and pelvis.

**Appendicular body part:** It is the part of the body out of the axis line. This includes the upper and lower extremities. It is customary to subdivide the abdominal area into nine regions or more easily in to four quadrants.

**Body planes and sections** Body planes are imaginary surfaces or planes lines that divide the body in to sections. This helps for further identification of specific areas

**Sagittal plane:** divides the body into right and left half.

**Frontal plane:** divides the body into asymmetrical anterior and posterior sections.

**Transverse plane:** divides the body into upper and lower body section.

**Oblique plane:** divides the body obliquely into upper and lower section.

**Atoms molecules and compounds:** - At its simplest level, the body is composed of atoms. The most common elements in living organism are carbon, hydrogen, oxygen, nitrogen phosphorus and sulfur. Atoms → Molecule → Compounds.

**Cell:** The smallest independent units of life. All life depends on the many chemical activities of cells. Some of the basic functions of cell are: growth, metabolism, irritability and reproduction.

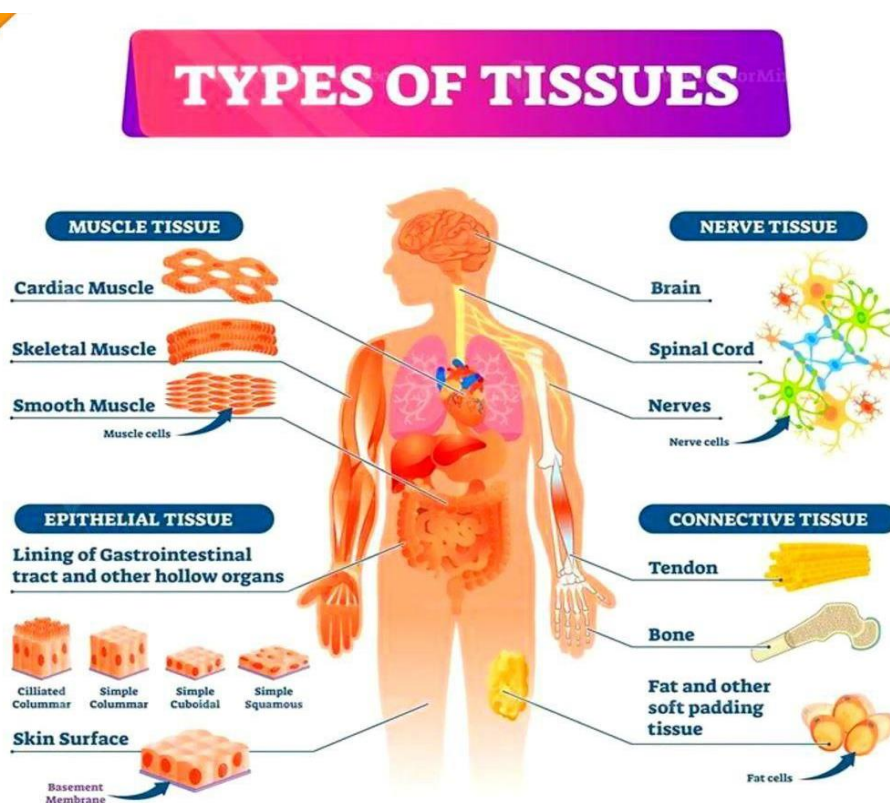
**Tissue:** tissue is made up of many similar cells that perform a specific function. The various tissues of the body are divided in to four groups. These are epithelial, connective, nervous and muscle tissue.

**Epithelial tissue:** - Found in the outer layer of skin, lining of organs, blood and lymph vessels and body cavities.

**Connective tissue:** Connects and supports most part of the body. They constitute most part of skin, bone and tendons.

**Muscle tissue:** Produces movement through its ability to contract. This constitutes skeletal, smooth and cardiac muscles.

**Nerve tissue:** Found in the brain, spinal cord and nerves. It responds to various types of stimuli and transmits nerve impulses.



**Organ:** Is an integrated collection of two or more kinds of tissue that works together to perform specific function. For example: Stomach is made of all type of tissues

**System:** Is a group of organs that work together to perform major function. For example: Respiratory system contains several organs.

**Organism level:** The various organs of the body form the entire organism

**Cell** is the basic living structural and functional unit of the body.

### **Cell Theory explains about**

- a) All living organisms are composed of cell and cell products.
- b) Cell is the basic unit of structure & function of all living organisms.
- c) All cells come from the division of preexisting cell.
- d) An organism as a whole can be understood through the collective activities & interactions of its cells.

To know more about cell, we can divide the cell in to four principal parts: -

**Plasma (cell) membrane:** it is the outer lining, limiting membrane separating the cell internal parts from extra cellular materials & external environment.

**Cytoplasm:** cytoplasm is the substance that surrounds organelles and is located between the nucleus and plasma membrane

**Plasma Membrane** is a thin outer membrane, which maintains the integrity of the cell. It keeps the cell and its contents separate and distinct from the surrounding. It is a double layered measuring about 4.5 nm and made of phospholipids, cholesterol, glyco-lipid, & carbohydrate (oligosaccharides). The bi-layer is self-sealing. If a needle is injected and pulled out, it automatically seals.

**Functions:** - 1. Separate the cytoplasm inside a cell from extra cellular fluid.

2. Separate cell from one another

3. Provide an abundant surface on which chemical reaction can occur.

4. Regulate the passage of materials in to and out of cells. It also let some things in and keeps others out. The quality selective permeability Tissue Cells are highly organized units. But in multicultural organisms, they do not function in isolation.

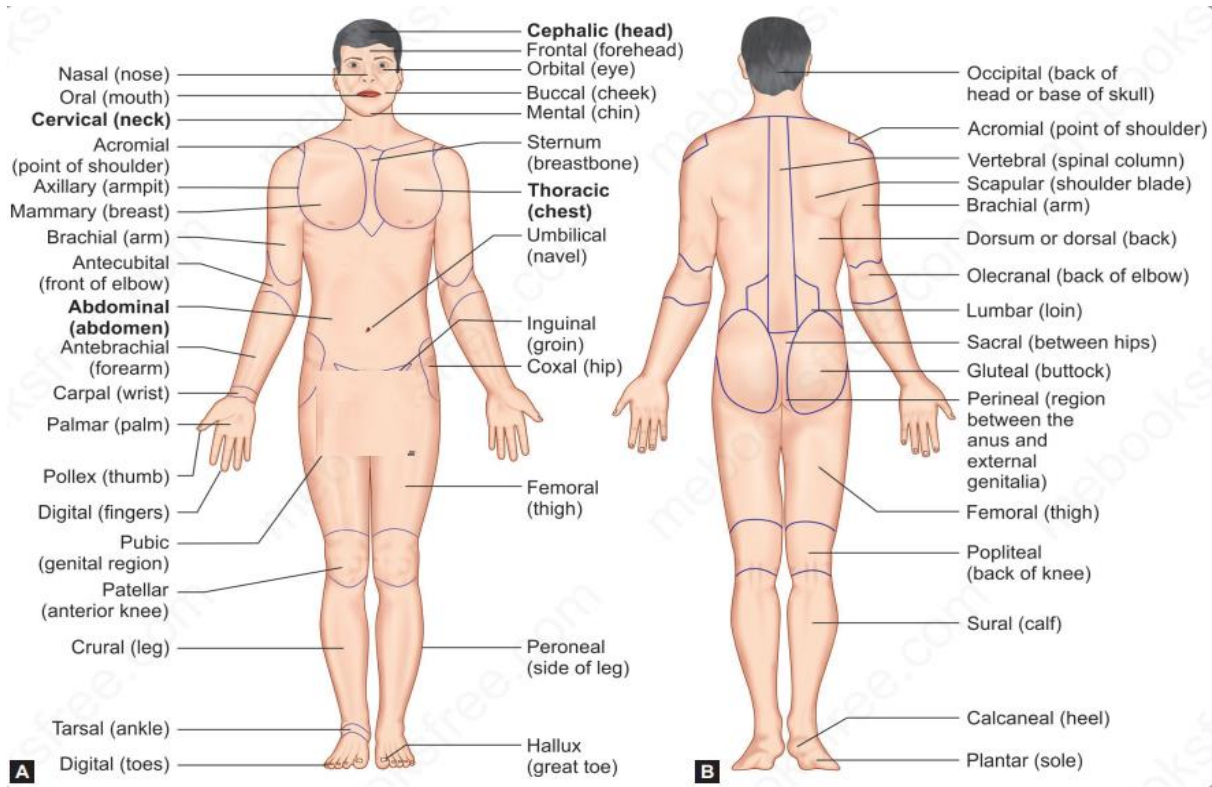
They work together in-group of similar cells called tissue. Tissue is a group of similar cell and their intercellular substance that have a similar embryological origin and

function together to perform a specialized activity. The various tissues of the body are classified into four principal parts according to their function & structure. These are epithelial, connective, muscular, and Nervous tissue.

**Main Subdivisions of the Human Body (Fig. 1.7)** For convenience of description the human body is divided into a number of major parts. These parts have specific anatomical names and it can be seen that these names (and/or terms) are repeatedly used during the study of human body. These names have also been used in describing various structures related to the concerned body parts, either in complete form or in part.

The uppermost part of the body is the head. The face is part of the head. Below the head, is the neck. In the head, the following areas can be identified: forehead, highest point, back of head and temples. Below the neck, is the region called the chest. In anatomical terminology the chest is referred to as the thorax. The thorax is in the form of a bony cage within which the heart and lungs lie. Below the thorax, is the region commonly referred to as stomach. The correct name is abdomen. The abdomen contains several organs of vital importance to the body. Traced downwards, the abdomen extends to the hips. That part of the abdomen present in the region of the hips is called the pelvis. The thorax and the abdomen together form the trunk. Back is that part of the trunk which is the posterior aspect of both the thorax and the abdomen. The lowest part of the trunk around the urinary, reproductive and anal openings is the perineum. Attached to the trunk, there are the upper and lower limbs, or the upper and lower extremities. The upper limb is divided into the arm, the forearm and the hand. The lower limb is divided into the thigh, the leg and the foot. Taking the whole body into account, we can say that the body is made of the axial and the appendicular regions. The axial region is the one that makes up the main axis of the body and consists of the head, neck and trunk. The appendicular region consists of the limbs.





Figs 1.7 A and B: Parts of human body A. Anterior view B. Posterior view

As we study various parts of the body, we notice that several different kinds of structures are present in a given organ or region or part. These structures have different physical and functional qualities. The basic framework of the body is provided by a large number of bones that collectively form the skeleton. As bones are hard they not only maintain their own shape, but also provides shape to the part of the body within which they lie. In some situations, (e.g., the nose or the ear) part of the skeleton is made up, not of bone but of, a firm but flexible tissue called cartilage. Bones meet each other at joints, many of which allow movements to be performed. At joints, bones are usually united to each other by fibrous bands called ligaments. Overlying (and usually attached to) the bones are the muscles. Muscles are what the layman refers to as flesh. In the limbs, muscles form the main bulk. Muscle tissue has the property of being able to shorten in length. In other words, muscles can contract, and by contraction they provide power for movements. Both ends are attached, usually, to bones. The attachment of a muscle to bone may be a direct one, but quite often the muscle fibers end in a cord like structure called tendon. Tendons convey the pull of the muscles to the concerned bones and are very strong structures.

Running through the intervals between muscles are the blood vessels, lymphatic vessels, and nerves. Blood vessels are tubular structures through which blood circulates. The vessels that carry blood from the heart to various tissues are called arteries. Those vessels that return this blood to the heart are called veins. Within tissues, arteries and veins are connected by plexuses of microscopic vessels called capillaries. Lymphatic vessels are delicate, thin walled tubes. They are difficult to be seen by naked eye. They often run alongside veins. Along the course of these lymphatic vessels small bean-shaped structures are present in certain situations. These are the lymph nodes. Lymphatic vessels and lymph nodes are part of a system that plays a prominent role in protecting the body. Running through tissues, often in the company of blood vessels, are also solid cord like structures called nerves. Each nerve is a bundle of a large number of nerve fibers. Each nerve fiber is a process arising from a nerve cell (or neuron). Most nerve cells are located in the brain and in the spinal cord. Nerves transmit impulses from the brain and spinal cord to various parts and tissues of the body. They also carry information from the parts and tissues to the brain. Impulses passing through nerves are responsible for contraction of various muscles and for secretions by various glands. Sensations like touch, pain, sight and hearing are all dependent on nerve impulses travelling through the nerve fibers. Bones, muscles, blood vessels are seen in all parts of the body. In addition to these, organs are seen in some parts of the body. Organs are otherwise called viscera and are usually seen in the cavities of thorax and abdomen. Some of the viscera are solid e.g., the liver or the kidney), while others are tubular (e.g., the intestines) or sac like (e.g., the stomach). The viscera are grouped together in accordance with their functions to form various organ systems. Some examples of organ systems are the respiratory system responsible for providing the body with oxygen, the alimentary or digestive system responsible for the digestion and absorption of food, the urinary system responsible for removal of waste products from the body through urine.