

CHAPTER - 1

SCOPE OF ANATOMY AND PHYSIOLOGY DEFINITIONS OF VARIOUS TERMINOLOGIES

Points to be covered in this topic

- **1.1 Introduction**
- **1.2 Organization of human body**
 - 1.2.1 Main subdivisions of the human body
- **1.3. Body cavities**
- **1.4 Anatomy**
 - 1.4.1 Scope & Types of anatomy
 - 1.4.2 Types of basic anatomical terms
- **1.5 Anatomical terms of body planes (position)**
- **1.6 Anatomical terms of movement at joints**
- **1.7 Physiology**
 - 1.7.1 Scopes and types of physiology

1.1 INTRODUCTION

- The human body is composed of numerous smaller components or organs that function in an ordered way to keep the body functioning at all times, making humans the most complex living species.
- **Two main concepts are studied in the study of the human body**
- i. Anatomy
 - ii. Physiology

1.2 ORGANIZATION OF HUMAN BODY

- The major levels of organization in the body, from the simplest to the most complex are: **atoms, molecules, organelles, cells, tissues, organs, organ systems, and the human organism.**

Table 1.1 levels of structural organization of the human body

LEVELS	DEFINITION
Chemical level	It includes atoms; the smallest unit of matter that participates in chemical reactions. Two or more atoms join together to form molecules. Certain atoms like, carbon (C), hydrogen (H), oxygen (O), nitrogen (N), phosphorus (P), calcium (Ca) and sulfur (S) are crucial for maintaining life.
Cellular Level	There is only one cells or a loose aggregate of cells that work independently, without any coordination. e.g.- Amoeba, Paramecium.
Tissue Level	A group of cells that are structurally/ functionally similar work together to perform a common function. e.g- Nervous tissue, Epithelial tissue, Muscle cells
Organ Level	One or more tissues work together to achieve functions of the organ. e.g-Heart, Lungs, Brain
Organ system	An organ system is a collection of organs that work together to perform a similar function. e.g- Digestive system, blood pressure, renal system (kidneys), circulatory system and nervous system.
Organism Level	An organismal level, where all eleven-organ systems function in the human organism, the whole living person. e.g- Human body

1.2.1 Main subdivisions of the Human body

- i. The Head
- ii. The Trunk
- iii. The Thorax
- iv. Limbs/ Extremities
- v. The Abdomen
- vi. Arm
- vii. The Pelvis
- viii. Forearm
- ix. Thigh
- x. Leg
- xi. Great Toe

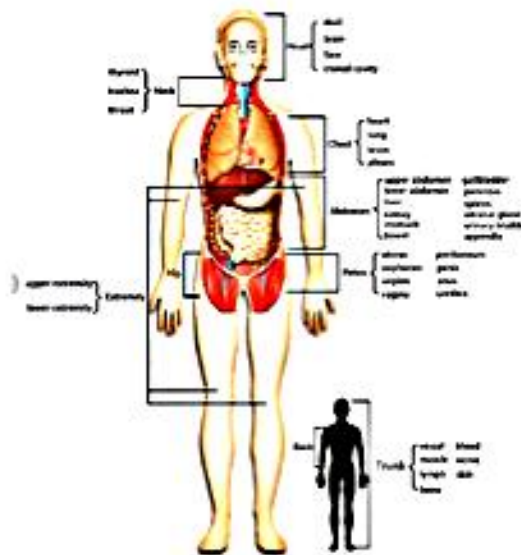


Fig.1.1: Divisions Human body

1.3. BODY CAVITIES

- Body cavities are space within the body that helps to **protect, separate and support internal organs.**

➤ Two major body cavities

1. Dorsal body cavity (Posterior)

i. Cranial cavity

- The cranial cavity contains the brain. Its boundaries are formed by **the bones of the skull.**
 - ✓ **Anteriorly** -1 frontal bone
 - ✓ **Laterally** - 2 temporal bones
 - ✓ **Posteriorly**-1 occipital bone
 - ✓ **Superiorly** - 2 parietal bones
 - ✓ **Inferiorly** - 1 sphenoid and 1 ethmoid bone and parts of the frontal, temporal and occipital bones.

ii. Vertebral cavity or Spinal cavity

- ✓ The vertebral canal, otherwise known as the **vertebral cavity or spinal cavity**, is an anatomical space formed by the vertebral column that stores an integral portion of the central nervous system.
- ✓ The spinal cord and the spinal nerve roots branching off the spinal cord bilaterally.

2. Ventral body cavity (Anterior)

i. Abdominal Cavity

- This is the largest body cavity and is oval in shape. It occupies most of the trunk and its boundaries are:
 - ✓ **Superiorly** - The diaphragm, which separates it from the thoracic cavity.
 - ✓ **Anteriorly** - The muscles forming the anterior abdominal wall.
 - ✓ **Posteriorly** - The lumbar vertebrae and muscles forming the posterior abdominal wall.
 - ✓ **Laterally** - The lower ribs and parts of the muscles of the abdominal wall.
 - ✓ **Inferiorly** - It is continuous with the pelvic cavity. The abdominal cavity is lined with a membrane called **peritoneum**.

ii. Thoracic Cavity

- This cavity is situated in the upper part of the trunk. Its boundaries are formed by the thoracic cage and supporting muscles.
 - ✓ **Anteriorly**- The sternum and costal cartilages of the ribs.
 - ✓ **Laterally** - 12 pairs of ribs and the intercostal muscles.
 - ✓ **Posteriorly** - The thoracic vertebrae.
 - ✓ **Superiorly** - The structures forming the root of the neck.
 - ✓ **Inferiorly** - The diaphragm, a dome-shaped muscle.

iii. Pelvic Cavity

- The pelvic cavity is roughly funnel-shaped and extends from the lower end of the abdominal cavity.
- The space inside the pelvic bones is called the pelvic cavity. Superiorly, the pelvic cavity is continuous with the abdominal cavity. Inferiorly, the pelvic cavity is bounded by the Pelvic floor. The pelvic cavity is divided into two parts, the greater pelvis, and the lesser pelvis. Its boundaries are:
 - ✓ **Superiorly** - It is continuous with the abdominal cavity
 - ✓ **Anteriorly** - The pubic bones
 - ✓ **Posteriorly**- The sacrum and coccyx
 - ✓ **Laterally** - The innominate (hip) bones

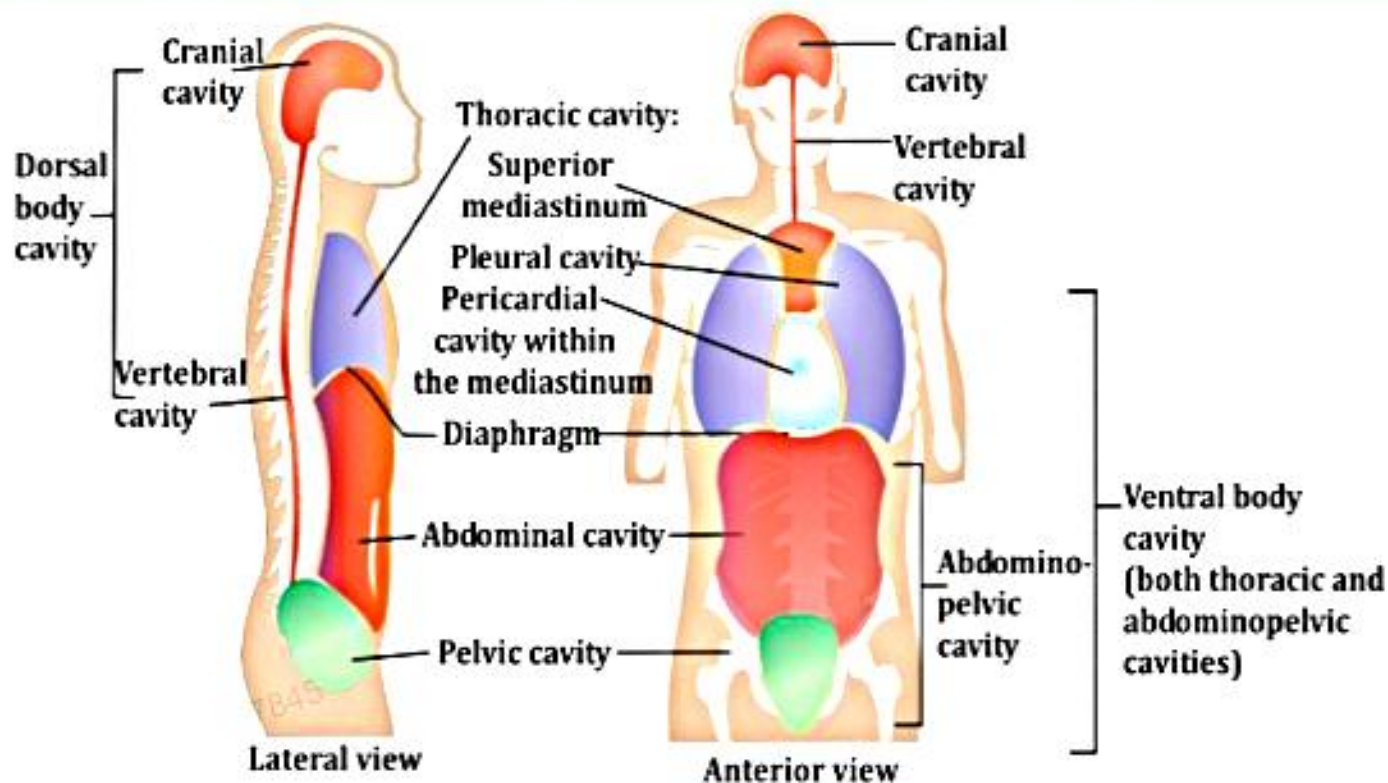


Fig.1.2: Body cavities

1.4 ANATOMY

- Anatomy is a **branch of science that dealing with the study of structure of the body** and the relationship of various parts to each other.

1.4.1 Scope & types of anatomy

1. **Gross Anatomy**-It is the study of structures that can be examined without the use of a microscope.it is also called **Macroscopic Anatomy**. There are three types of gross anatomy.

- ✓ **Surface anatomy (The external body)** - Surface anatomy (also called superficial anatomy and visual anatomy) is the study of the external features of the body of an animal.
- ✓ **Regional anatomy (Specific regions of the body)** - Body structures work together in a particular region of the human body, such as the Head or Chest, Neck, Trunk.
- ✓ **Systemic anatomy (Specific organ systems)** - Systemic Anatomy is the study of the structure of organ systems, which are groups of organs that function together in a coordinated manner. Examples include the skeletal system, composed primarily of bones; the muscular system, made up of skeletal muscles; and the cardiovascular system, consisting of the heart, blood, and vessels.

❖ Divisions of systemic anatomy

- i. **Spanchnology** - Study of organ.
 - ii. **Osteology** - Study of bones.
 - iii. **Myology** - Study of muscles.
 - iv. **Arthrology** - Study of joints.
 - v. **Neurology** - Study of the nervous system.
 - vi. **Cardiology** - Study of heart.
 - vii. **Ophthalmology** - Study of eyes.
 - viii. **Otology** - Study of ears.
 - ix. **Odontology** - Study of teeth.
 - x. **Pulmonology** - Study of lungs and respiratory system
 - xi. **Endocrinology** - Study of endocrine glands.
 - xii. **Haematology** - Blood and its disorders.
 - xiii. **Nephrology** - Study of excretory system.
 - xiv. **Gynaecology** - Study of female reproductive.
 - xv. **Embryology** - Study the development of embryo.
2. **Microscopic Anatomy**- Structures cannot be seen with the naked eye. It can be viewed only with a microscope.
- ✓ **Cytology** is the Study of **cells**.
 - ✓ **Histology** is the study of **tissues**.
3. **Clinical Anatomy** includes a number of subspecialties important in clinical practice.
- Special branches in anatomy
 - i. **Pathological anatomy**- a branch of anatomy concerned with structural changes accompanying disease.
 - ii. **Radiographic anatomy**- Study of internal structures visualized by X-Ray, CT scan, MRI.
 - iii. **Molecular biology** - Study of anatomical structures at a sub-cellular level. DNA/RNA/Protein synthesis.
4. **Development anatomy** of the human body is the process of growth to maturity. The process begins with fertilization, where an egg released from the ovary of a female is penetrated by a **sperm cell from a male**.

1.4.2 TYPES OF BASIC ANATOMICAL TERMS

1. Anatomical position

- This is the upright position of the human body with the head facing forward, the arms at the sides with palms of the hands facing forward and the feet together.
- The position with the body erects with the arms at the sides and the palms forward.
- The anatomical position is importance in anatomy because it is the position of reference for anatomical nomenclature.
- Anatomic terms such as anterior and posterior, medial and lateral, abduction and adduction, and so on apply to the body when it is in the anatomical position.

2. Anatomical Directional terms

- Directional terms are used to locate one structure, usually in relation to another structure.
- Some terms, like dorsal or ventral, are relative to the axis of the central nervous system, so the direction these terms define changes if used for brain regions versus other body regions.

Table 1.2 Anatomical directional terms and their directions

TERMS	DESCRIPTION
Anterior (or ventral)	The front or direction toward the front of the body. The toes are anterior to the foot.
Posterior (or dorsal)	The back or direction toward the back of the body. The popliteus is posterior to the patella.
Superior (or cranial)	A position above or higher than another part of the body proper. The orbits are superior to the oris.
Inferior (or caudal)	A position below or lower than another part of the body proper; near or toward the tail (in humans, the coccyx, or lowest part of the spinal column). The pelvis is inferior to the abdomen.

Lateral	The side or direction toward the side of the body. The thumb (pollex) is lateral to the digits.
Medial	The middle or direction toward the middle of the body. The hallux is the medial toe.
Proximal	A position in a limb that is nearer to the point of attachment or the trunk of the body. The brachium is proximal to the antebrachium.
Distal	A position in a limb that is farther from the point of attachment or the trunk of the body. The crus is distal to the femur.
Superficial	A position closer to the surface of the body. The skin is superficial to the bones.
Deep	A position farther from the surface of the body. The brain is deep to the skull.

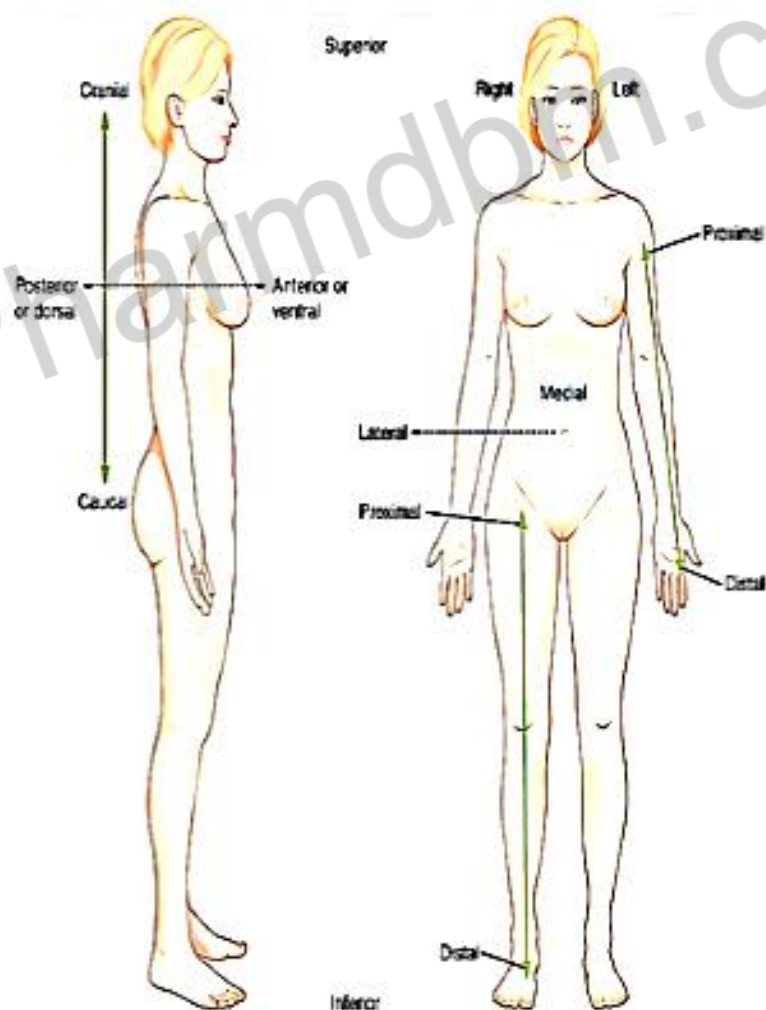


Fig.1.3: Anatomical directional Terms of the human body (a) Superior (b) Inferior

3. Anatomical Regional terms

- The study of anatomy based on regions or divisions of the body and emphasizing the relations between various structures (muscles and nerves and arteries etc).

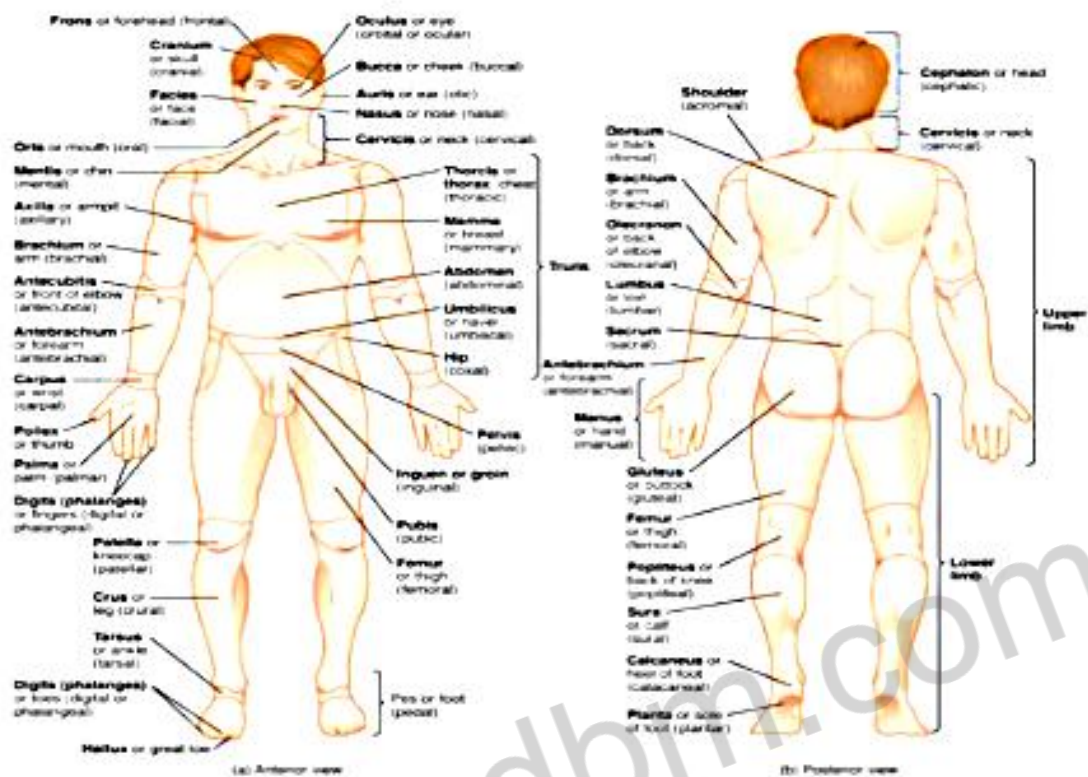


Fig.1.4: Regions of the Human Body. (a) Anterior view (b) Posterior view

1.5 ANATOMICAL TERMS OF BODY PLANES (POSITION)

- Sagittal plane (middle)** - Divides the body or an organ vertically into right and left sides.
 - If this vertical plane runs directly down the middle of the body, it is called the **mid sagittal or median plane**.
 - If it divides the body into unequal right and left sides, it is called a **parasagittal plane**.

2. Frontal plane (coronal) -Divides the body into asymmetrical anterior and posterior sections.

3. Transverse plane (horizontal) - Divides the body into upper and lower body section.

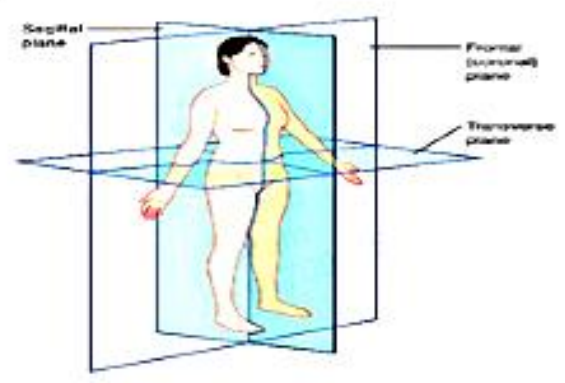


Fig.1.5: Anatomical planes

1.6 ANATOMICAL TERMS OF MOVEMENT AT JOINTS

- i. **Adduction:-** Movement towards midline of the body.
- ii. **Abduction:-** Movement away from the midline of the body 5.
Circumduction: A combination of adduction and abduction.
- iii. **Medial rotation:-** A combination of above movements, ie, adduction, abduction and circumduction.
- iv. **Lateral rotation:-** Outward movement around a long axis of the bone.
- v. **Pronation:-** Medial rotation of forearm in anatomical position, so that palm faces backward.
- vi. **Supination:-** Lateral rotation of forearm, so that palm faces forward as in normal anatomical position.
- vii. **Protraction:-** Moving of body part forward, as in jutting out lower jaw.
- viii. **Retraction:-** Moving of body part backwards, as in pulling back shoulders.
- ix. **Inversion:-** A movement that turns the sole of the foot medially.
- x. **Eversion:-** A movement that turns the sole of the foot laterally.

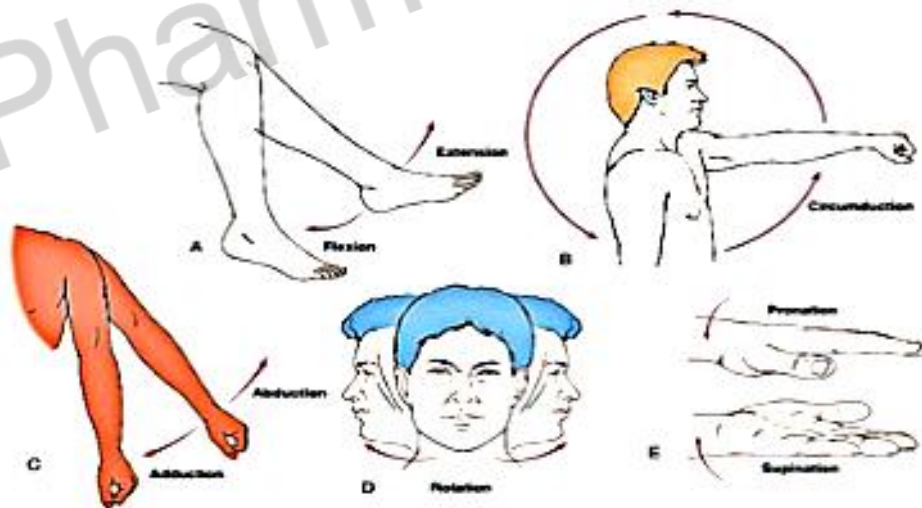


Fig.1.6: Movement at joints

1.7 PHYSIOLOGY

- Physiology is a science that deals with the study of functions of the body.

1.7.1 Scopes and Types of Physiology

- ✓ **Human physiology** is the study of the functions, or workings, of the human body. These functions are complex processes and much more difficult to examine than most anatomical structures.
- ✓ **Cell Physiology** the study of the functions of cells, is the cornerstone of human physiology. Cell physiology looks at events involving the atoms and molecules important to life. It includes both chemical processes within cells and chemical interactions among cells.
- ✓ **Organ Physiology** is the study of the function of specific organs. An example is cardiac physiology, the study of heart function how the heart works.
- ✓ **Systemic Physiology** includes all aspects of the functioning of specific organ systems. Cardiovascular physiology, respiratory physiology, and reproductive physiology are examples.
- ✓ **Pathological Physiology** the study of the effects of diseases on organ functions or system functions. Modern medicine depends on an understanding of both normal physiology and pathological physiology.

❖ Systems of the human body and their organ

- i. **Integumentary system** - Nails, sweat glands, Oil Glands.
- ii. **Skeletal system** - Joint, and their Cartilages.
- iii. **Muscular system**- Muscles.
- iv. **Endocrine system**- Hormone Producing Glands.
- v. **Cardiovascular system**- Heart, and Blood Vessels.
- vi. **Lymphatic system**- Lymphatic Fluid and Vessels.
- vii. **Respiratory system**- Pharynx, Larynx, Trachea and Bronchial Tubes.
- viii. **Digestive system**- Pharynx, Oesophagus, Stomach, Small and Large into Anus and Accessary Organs.
- ix. **Nervous system**- Spinal cord, Nerves, and Special Sense Organs.
- x. **Urinary system**- Ureters, Urinary Bladder and Urethra.
- xi. **Reproductive system**- Gonads and Associated Organs.