BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI - 620 024

DEPARTMENT OF PHYSICAL EDUCATION

ANATOMY AND PHYSIOLOGY

Bachelor of Physical Education

(B.P.Ed.)

Lecturer By

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Guest Lecturer,

UNIT-I Introduction to Anatomy & Physiology

Meaning & Definition of Anatomy and Physiology. Need and importance of anatomy and physiology in the field of physical education - Introduction of cell and tissues - The arrangement of the skeleton – function of the skeleton – Ribs and vertebral column and the extremities - joints of the body and their types – Gender difference in the skeleton.

INTRODUCTION

Definition:

- "Cells are the fundamental unit of life."

or

- "A cell is defined as the smallest, basic unit of life that is responsible for all of life's processes."

or

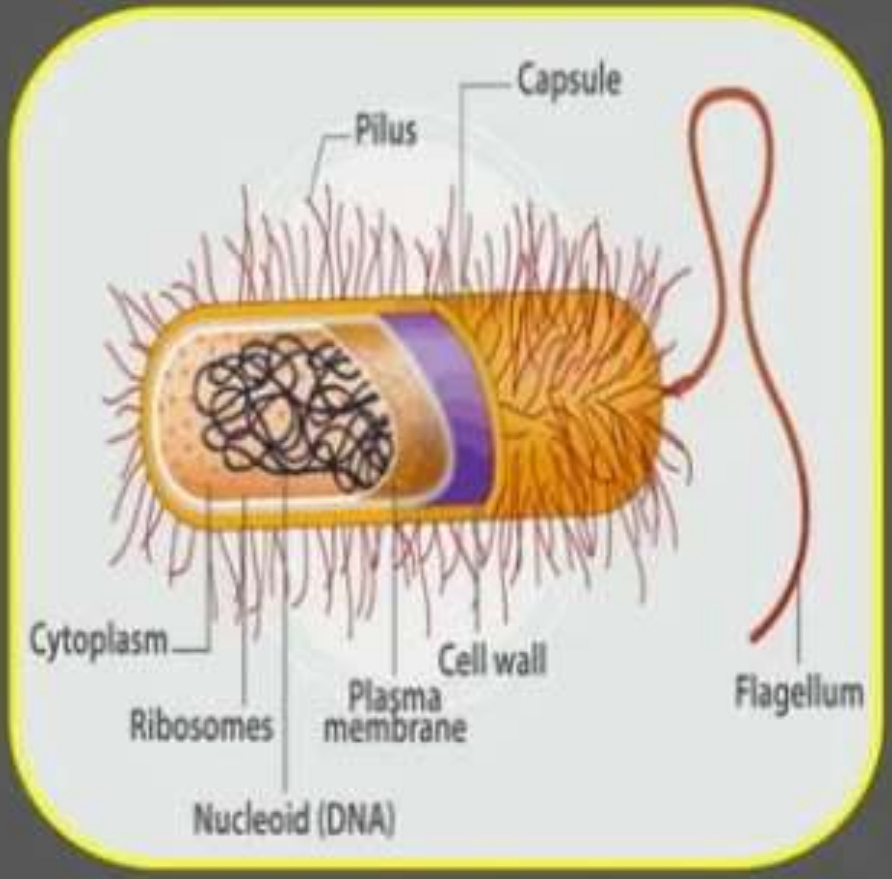
- "Cell is the structural, functional and biological unit of life."
- They are known as the building blocks of life.
- *Cell ⟶ tissue ⟶ tissue system ⟶ organ ⟶ organ system ⟶ body*

TYPES OF CELLS

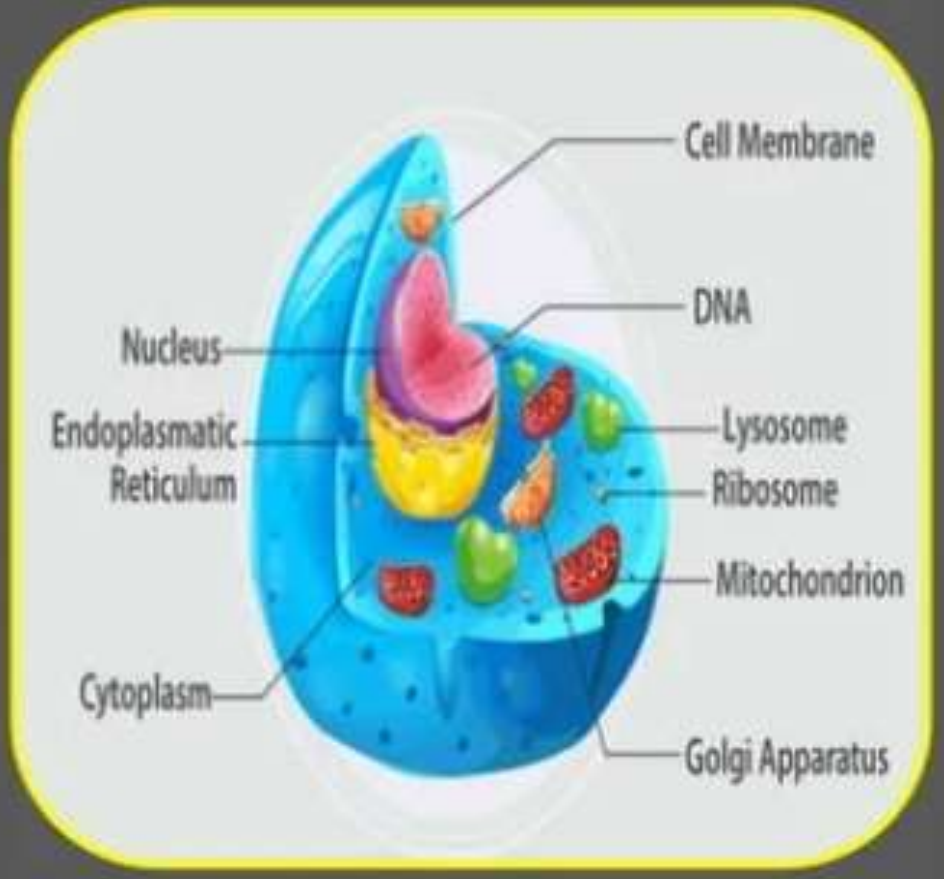
- Based on cellular structure, there are two types of cells:
- Prokaryotes: primitive nucleus

  Ex. Bacteria, Eubacteria, Archebacteria, Mycoplasma, Virus etc.
- Eukaryotes: mature nucleus
- Ex. Plants, Animals, Fungi, etc.

Structure of Prokaryote and Eukaryote Cell



Prokaryotic Cell



Eukaryotic Cell

PROKARYOTES

- Nucleoid: A central region of the cell that contains its DNA.
- Ribosome: Ribosomes are responsible for protein synthesis (70s).
- Cell wall: The cell wall provides structure and protection from the outside environment. Most bacteria have a rigid cell wall made from carbohydrates and proteins called peptidoglycans.
- Cell membrane: Every prokaryote has a cell membrane, also known as the plasma membrane, that separates the cell from the outside environment.
- Capsule: Some bacteria have a layer of carbohydrates that surrounds the cell wall called the capsule. The capsule helps the bacterium attach to surfaces.
- Fimbriae: Fimbriae are thin, hair-like structures that help with cellular attachment.
- Pili: Pili are rod-shaped structures involved in multiple roles, including attachment and DNA transfer.
- Flagella: Flagella are thin, tail-like structures that assist in movement.

EUKARYOTES

- Within a eukaryotic cell, each membrane-bound structure carries out specific cellular functions.
- Nucleus: The nucleus stores the genetic information in chromatin form.
- Plasma membrane: The plasma membrane is a phospholipid bilayer that surrounds the entire cell and encompasses the organelles within.
- Ribosomes: Ribosomes are responsible for protein synthesis (80s).
- Mitochondria: Mitochondria, also known as the powerhouses of the cell, are responsible for energy production.
- Endoplasmic reticulum: The endoplasmic reticulum is an organelle dedicated to protein maturation and transportation.
- Vesicles and vacuoles: Vesicles and vacuoles are membrane-bound sacs involved in transportation and storage.

Energy Production

- Cells require energy to carry out various chemical processes. This energy is produced by the cells through a process called photosynthesis in plants and respiration in animals.

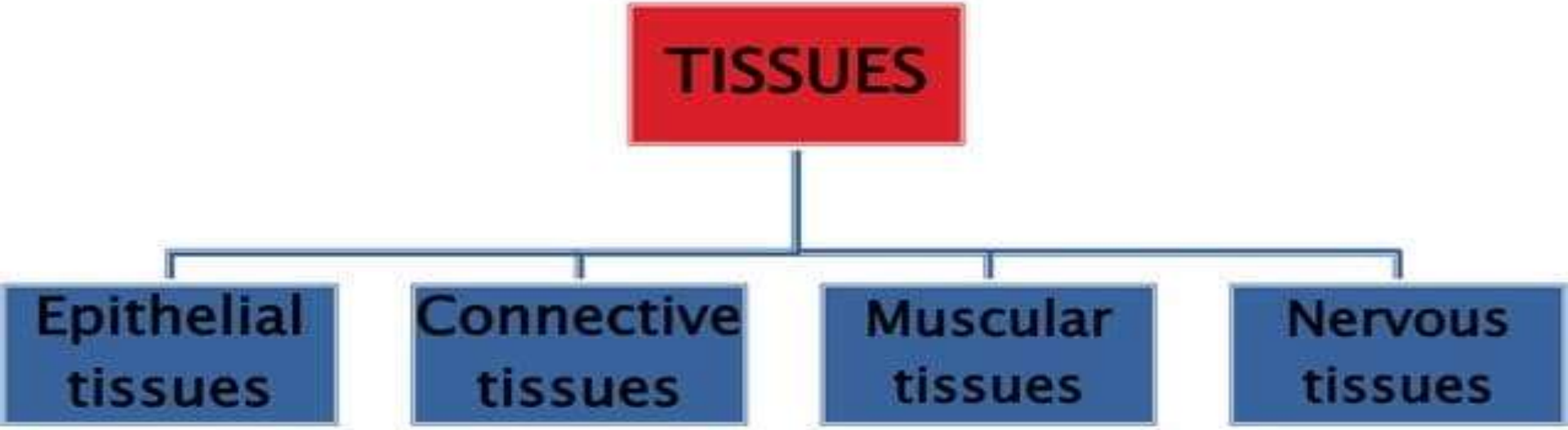
Reproduction

- A cell allow reproduction through the processes called mitosis and meiosis. Mitosis is termed as the asexual reproduction where the parent cell divides to form daughter cells. Meiosis causes the daughter cells to be genetically different from the parent cells.
- This is because they are responsible for providing structure to the organisms and performs several functions necessary for carrying out life's processes.

TISSUES

- **DEFINITION:**
- Tissue is a collection of cells which have similar structure and perform relatively common functions.

TYPES OF TISSUES

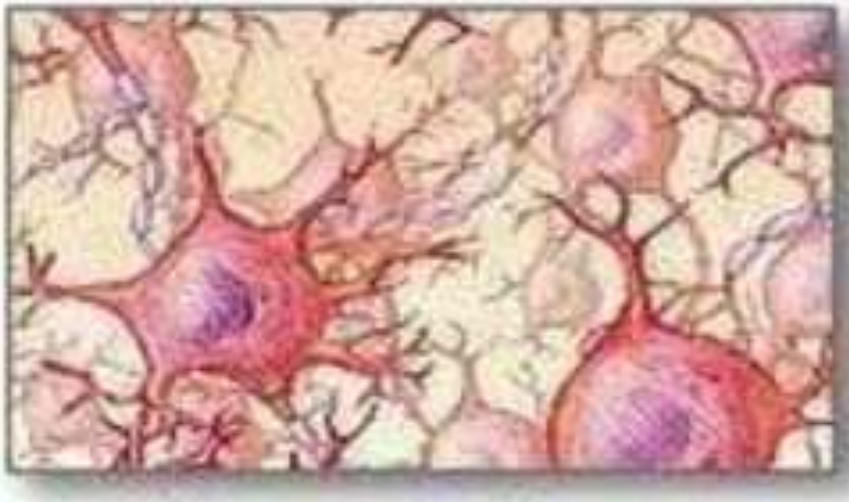


Four types of tissue

Connective tissue

Epithelial tissue

Muscle tissue



Nervous tissue

LOCATION

- Found covering the body and lining cavities and tubes. Outer and inner linning of most of the body organs such as gastrointestinal tract(GIT), urinary tract , blood vessels, heart chambers uterus.
- Found on the entire exposed surface of the body such as skin.
- Also found in glands

FUNCTIONS OF EPITHELIAL TISSUES

Role of defense and protect body organs

Secret gastric juice in stomach.

FUNCTIONS CONT....

Absorb digested food in intestine.

Removes waste as sweat in skin.

THE ARRANGEMENT OF THE SKELETON

- The human skeleton is a complex structure composed of 206 bones in adults, arranged in a way that provides support, protection, and mobility. It can be divided into two main parts: the ***axial skeleton*** and the ***appendicular skeleton***.

SKELETAL SYSTEM

- **COMPOSED OF:**

  -Bones

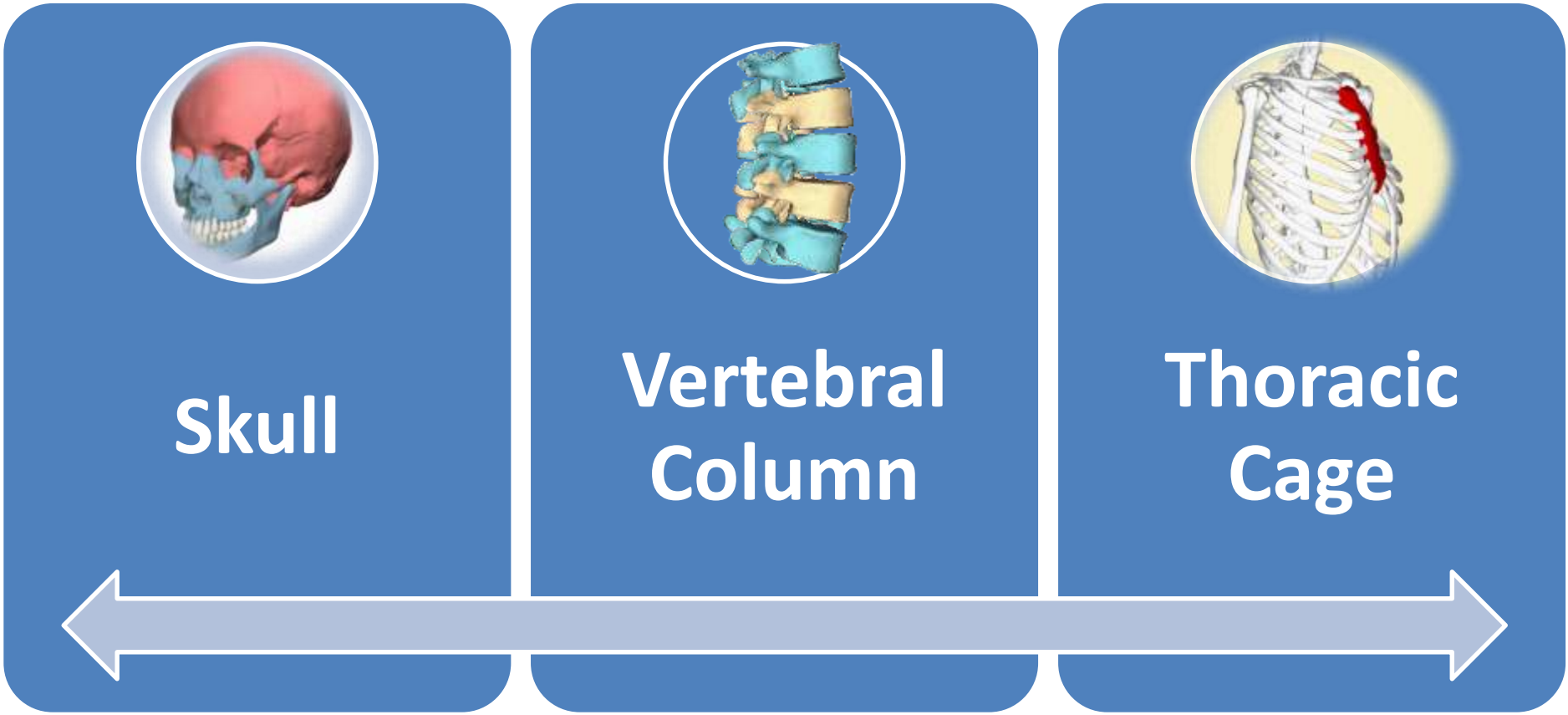
  -Cartilage

  -Joints

  -Ligaments

Axial Skeleton

- The axial skeleton consists of 80 bones and forms the central axis of the body. It includes the following:



The Appendicular Skeleton

The appendicular skeleton is composed of the:

- ***pectoral girdle***
- ***upper extremities***
- *pelvic girdle*
- *lower extremities*

FUNCTIONS OF SKELETAL SYSTEM

- **SUPPORT:** Hard framework that supports and anchors the soft organs of the body.
- **PROTECTION:** Surrounds organs such as the brain and spinal cord.
- **MOVEMENT:** Allows for muscle attachment therefore the bones are used as levers.
- **STORAGE:** Minerals and lipids are stored within bone material.
- **BLOOD CELL FORMATION:** The bone marrow is responsible for blood cell production.

CLASSIFICATION OF BONE BASED ON SHAPE

- Bones can be classified into five types based on shape:
- **Long**
- **Short**
- **Flat**
- **Irregular**
- **Sesamoid**

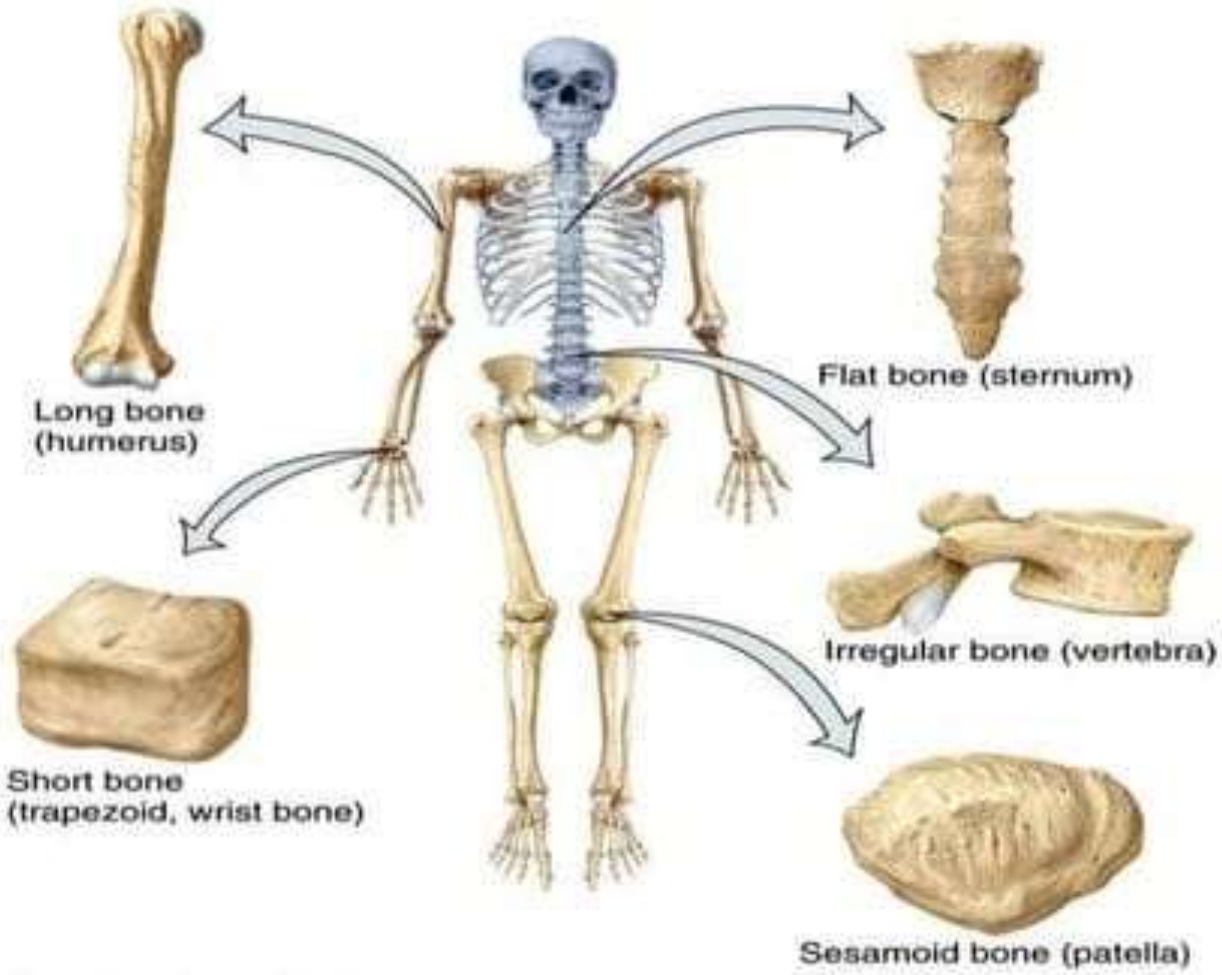


Figure 07.02 Tortora - PAP 12/e

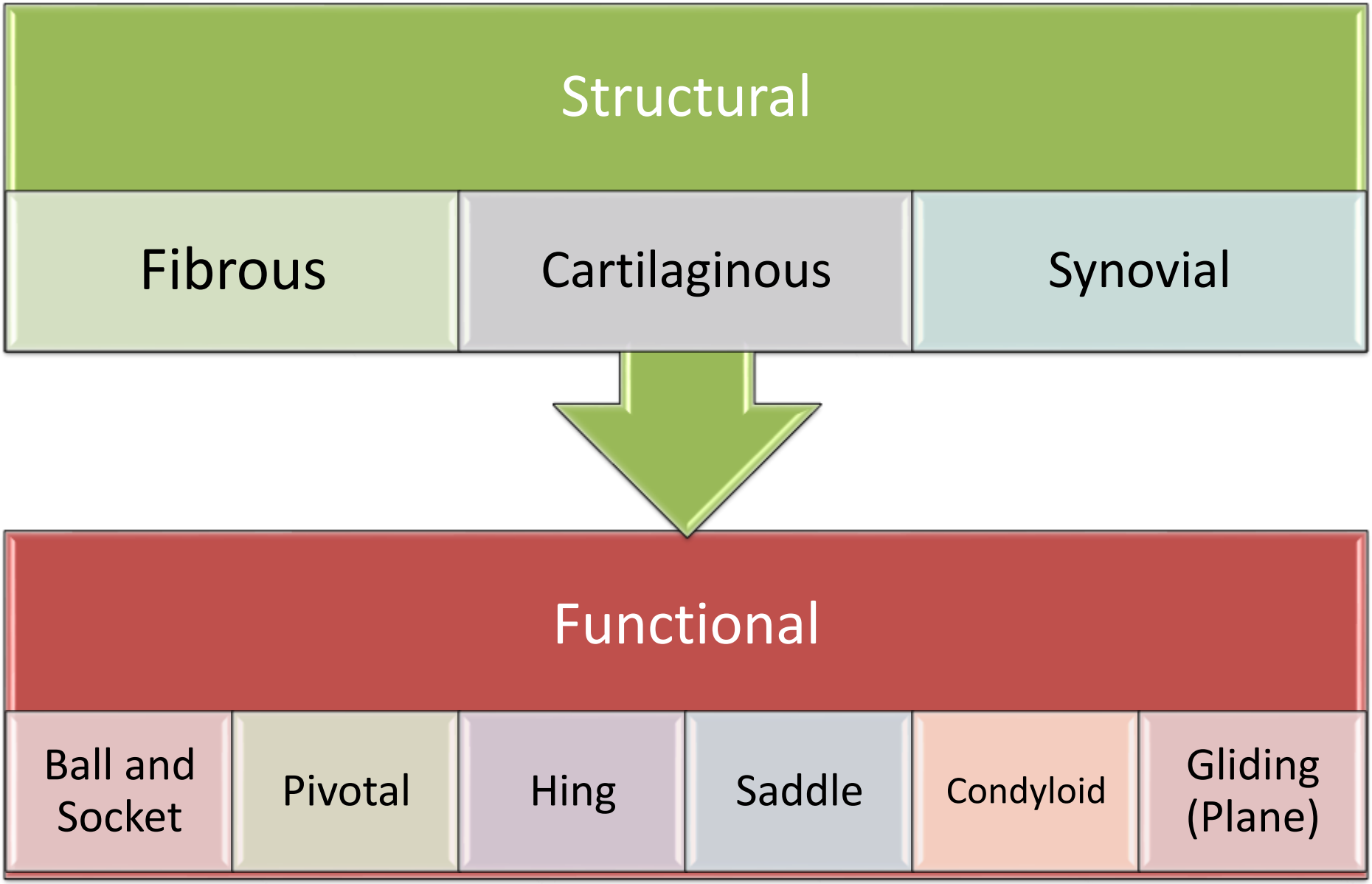
JOINTS OF THE BODY AND THEIR TYPES

- A joint, also known as an articulation or articular surface, is a connection that occurs between bones in the skeletal system.
- Joints provide the means for movement.
- The joints help us to rotate our shoulder, bend our knees and elbows, swivel our neck and more.

DEFINITION

- By, a joint is a point where two bones meet to provide a framework that permits movement. Bones are attached to one another by tissues called ligaments. Muscles are attached to bones through tendons.

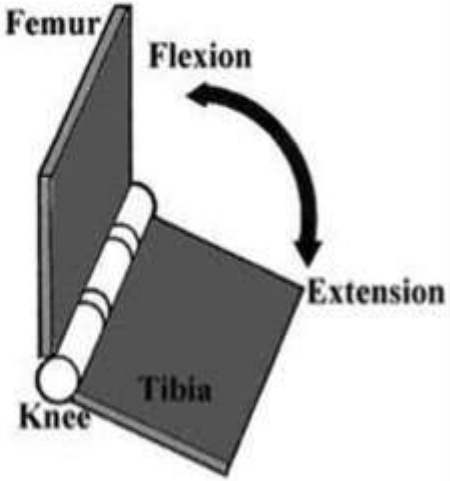
Classification of Joints



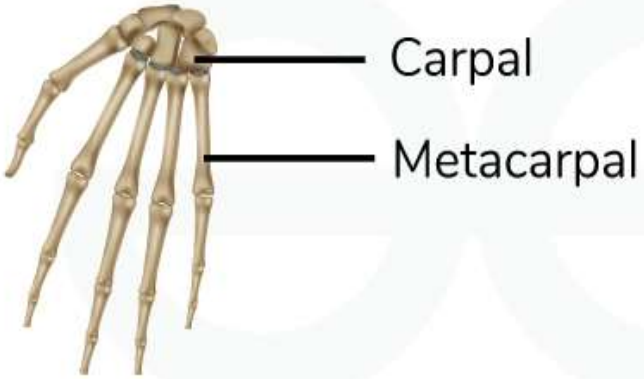
By type of tissue	By degree of movement
Fibrous – bones connected by fibrous tissue. **Cartilaginous** – bones connected by cartilage. **Synovial** – articulating surfaces enclosed within fluid-filled joint capsule.	**Synarthrosis** – immovable. **Amphiarthrosis** – slightly moveable. **Diarthrosis** – freely moveable.

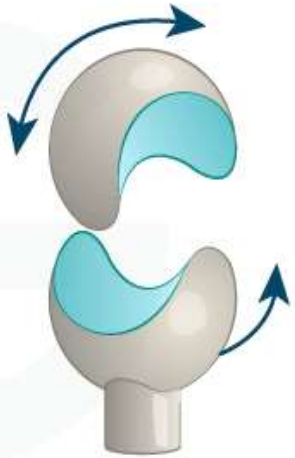
- **Hinge** – permits movement in one plane – usually flexion and extension.
  - E.g. elbow joint, ankle joint, knee joint.
- **Saddle** – named due to its resemblance to a saddle on a horse's back. It is characterised by opposing articular surfaces with a reciprocal concave-convex shape.
  - E.g. carpometacarpal joints.

HING JOINT



Saddle Joints



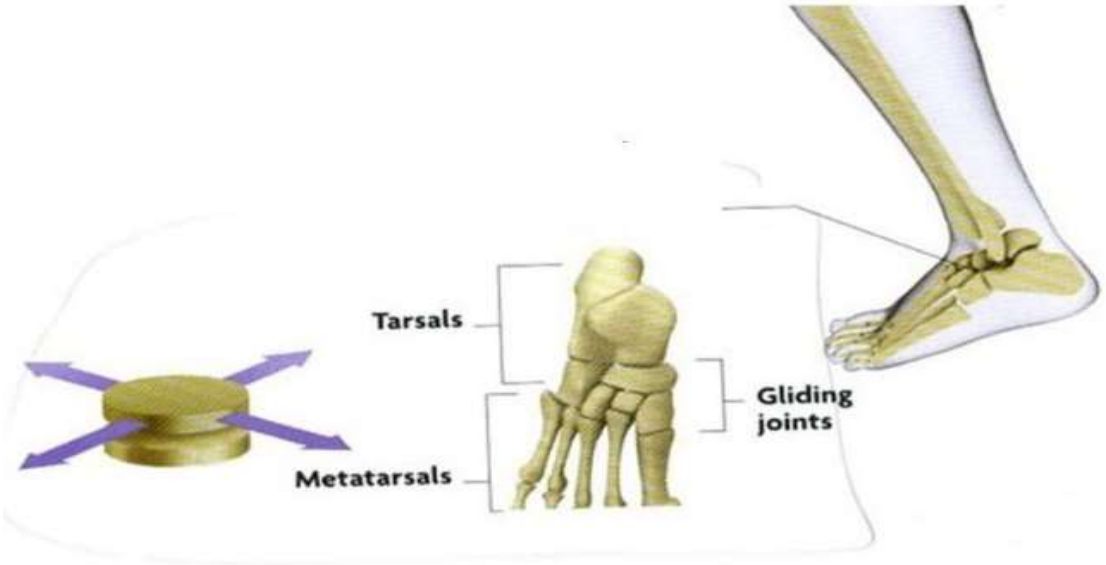


Saddle Joint

- **Plane** – the articular surfaces are relatively flat, allowing the bones to glide over one another.
  - E.g. acromioclavicular joint, subtalar joint.
- **Pivot** – allows for rotation only. It is formed by a central bony pivot, which is surrounded by a bony-ligamentous ring
  - E.g. proximal and distal radioulnar joints, atlantoaxial joint.

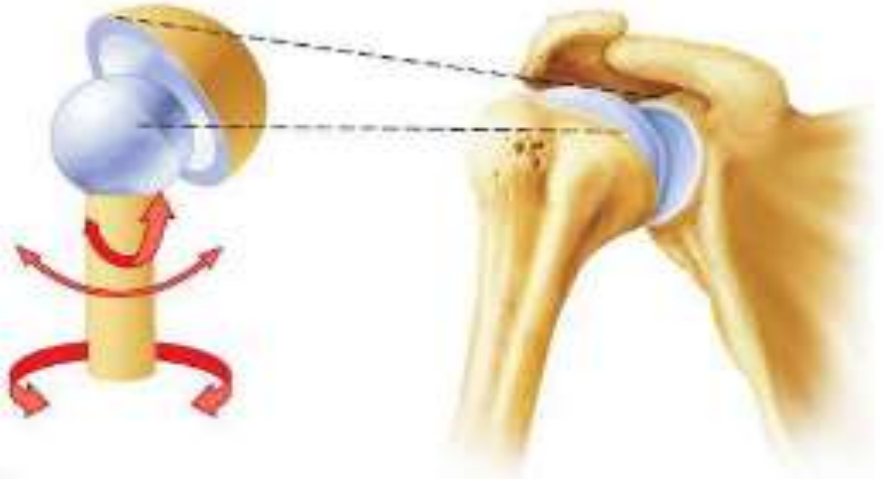
PIVOT JOINT

Gliding Joint



- **Condyloid** – contains a convex surface which articulates with a concave elliptical cavity. They are also known as ellipsoid joints.
  - E.g. wrist joint, metacarpophalangeal joint, metatarsophalangeal joint.
- **Ball and Socket** – where the ball-shaped surface of one rounded bone fits into the cup-like depression of another bone. It permits free movement in numerous axes.
  - E.g. hip joint, shoulder joint.

BALL AND SOCKET JOINT



Condyloid Joint