BIOM2020: Human anatomy

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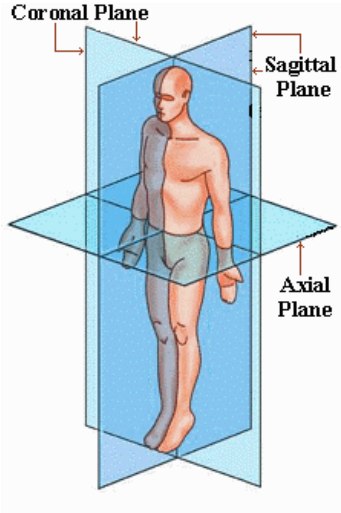
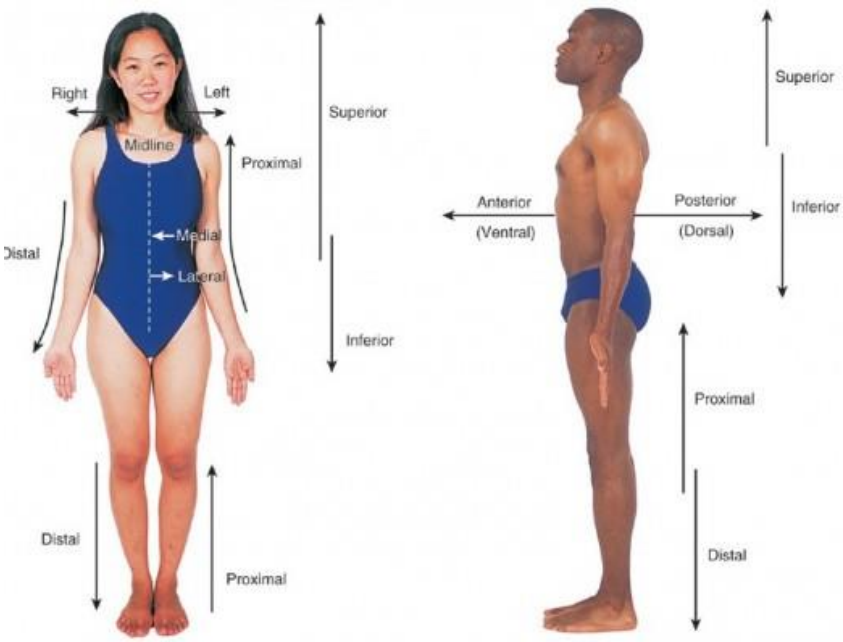
Intro to osteology & arthrology

Anatomical position:

- Standing erect
- Arms at sides
- Palms and eyes/face facing forward
- Fingers and thumbs extended
- Heels together
- Penis erect [males]



Coronal = frontal
Axial = transverse/horizontal
Sagittal can be median or paramedian (through knee joint)

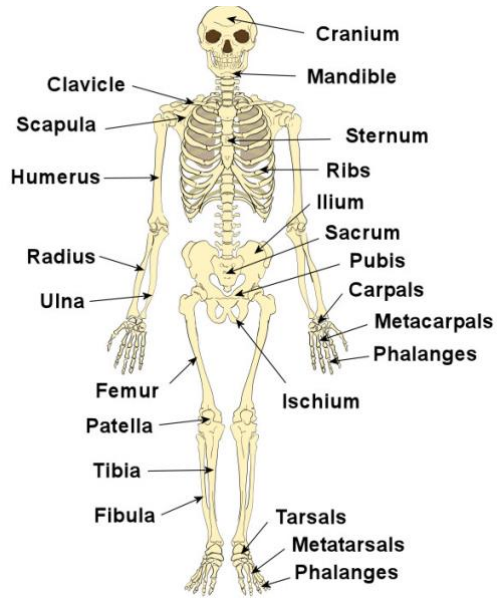


'Arm' refers to proximal segment of upper limb (forearm is separate)
'Leg' refers to distal segment of lower limb (thigh is separate)

Human skeletal system

In mature adult human body there are:

- 80 bones in the AXIAL skeleton (trunk)
- 126 bones in the APPENDICULAR skeleton (limbs)



Functions

Mechanics:

- Support
- Protection
- Movement

Metabolic:

- Nutrient store (99% of calcium, minerals, lipids)
- Blood cell formation (hematopoiesis or haemopoeisis)

Comprised of

- Organs:
  - Bones**
  - Cartilages
  - Ligaments
  - Bone marrow
- Tissues (connective tissues)
- Cells
  - Osteoblasts (create bone matrix)
  - Osteocytes (maintain bone matrix)
  - Osteoclasts (breakdown bone matrix)
- Molecules/chemicals (esp. Ca^{2+})

** BONES are organs but BONE is tissue

Dry bones are devoid of cells – only hard tissue matrix

Formation

There is only ONE type of bone tissue formation (osteogenesis)
But 2 types of bone formation:

1. Intramembranous ossification
2. Endocondral ossification

11 weeks prior to birth = 800 ossification centres
Birth = 450 ossification centres
Adult = OCs fuse to become bone = 206 bones

Classification

Long: *shaft with ends i.e. femur, phalanges*
Short: *square shaped i.e. carpals, tarsals, sesamoid bones*
Flat: *as name suggests i.e. sternum, scapula, ribs*
Irregular: *as name suggests i.e. vertebrae, os coxae, pneumatic bones*

Bone composition & structure

Bone surfaces have many tiny foramina on surface for blood supply

2 membranes (white and very thin)

- Periosteum = around outer surface
- Endosteum = around inner surface

2 marrows

- Red bone marrow = blood cell forming
- Yellow bone marrow = fat packing/storage

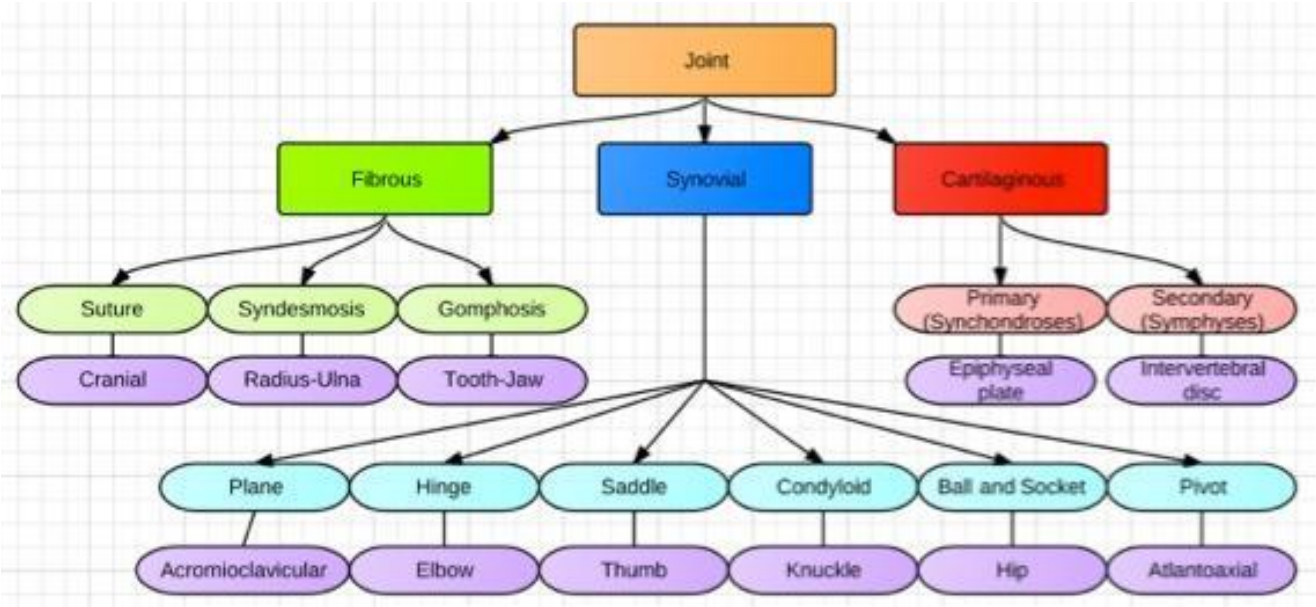
Compact bone (lamellae) = outer shell of bone; long bone shafts
Trabecular bone (spongy) = expanded heads of long bones; fills irregular bones

Diaphysis: *elongated shaft of long bone; ossifies from primary centre*
Epiphysis: *ends and tips of long bones; ossify from secondary centre*
Metaphysis: *zone of active growth between ends of diaphysis & epiphysis*

Nutrient foramen: *external opening of nutrient canal in bone*

Joints

Classified into structural and functional



Functional:

- Synarthrosis = no movement
- Amphiarthrosis = a little movement
- Diarthrosis = fully movable

Trade-off between joint stability and mobility

- i.e. shoulder more prone to dislocation than hip