



SKELETAL SYSTEM

Notes # 1

Functions and main structures of the skeletal system

STRUCTURES:

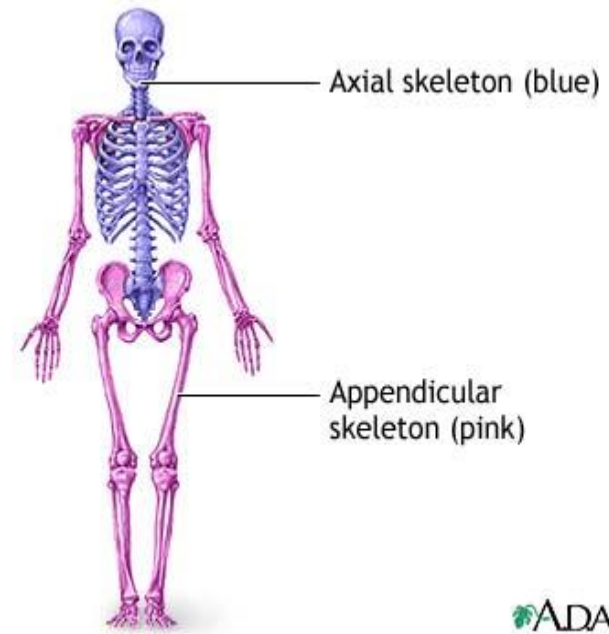
- BONES!!!
- LIGAMENTS
- JOINTS



MAIN FUNCTIONS OF SKELETAL SYSTEM

1. Support

- stand upright



2. Protection

- Soft organs
 - Skull – brain
 - Thorax – heart
 - Pelvis/hips – reproductive organs



FUNCTIONS CONTINUED

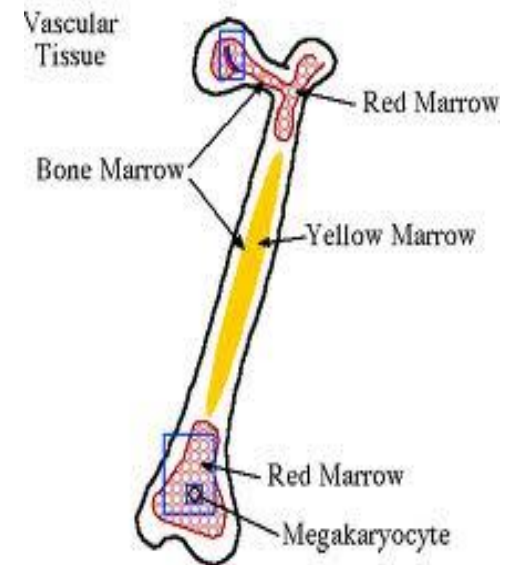
3. Movement

4. Blood cell formation

- Red marrow – red and white blood cells

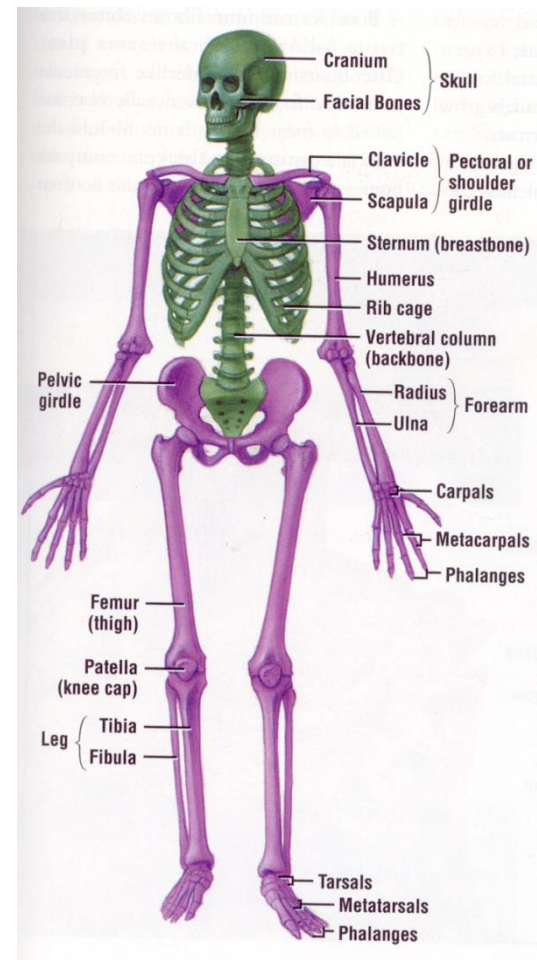
5. Storage

- Yellow marrow – fat and ion storage

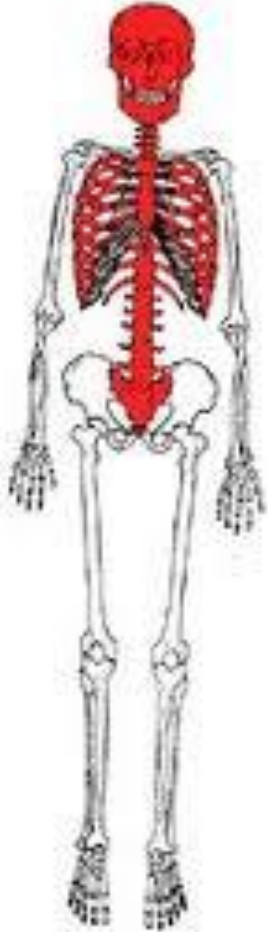


SKELETAL SYSTEM

- Two parts
 - Axial skeleton
 - Protection
 - Appendicular skeleton
 - Support/movement
- 206 bones in your body



AXIAL SKELETON



VERY PROTECTIVE

3 MAIN PARTS

Skull

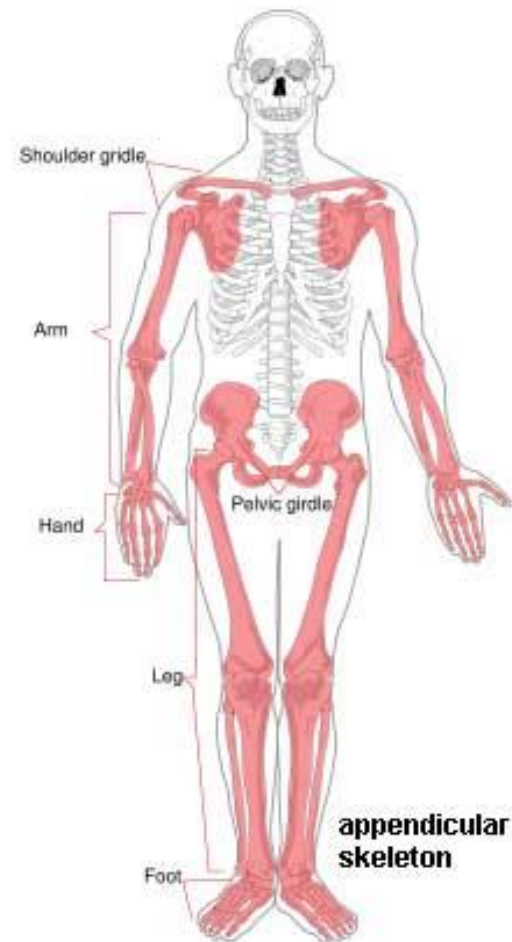
Vertebral column

Thorax



APPENDICULAR SKELETON

- MORE INVOLVED IN MOVEMENT/support
- Girdles
 - Shoulder
 - Pelvic
- Limbs
 - Arms
 - Legs
 - Hands
 - Feet



WHAT ARE THE TWO MAIN COMPONENTS OF BONE?

○ MINERALS

- Calcium and phosphorous
- Provide strength

○ ORGANIC MATERIAL

- Made from Carbon!
- Main protein – collagen
- Provides flexibility

○ MATRIX

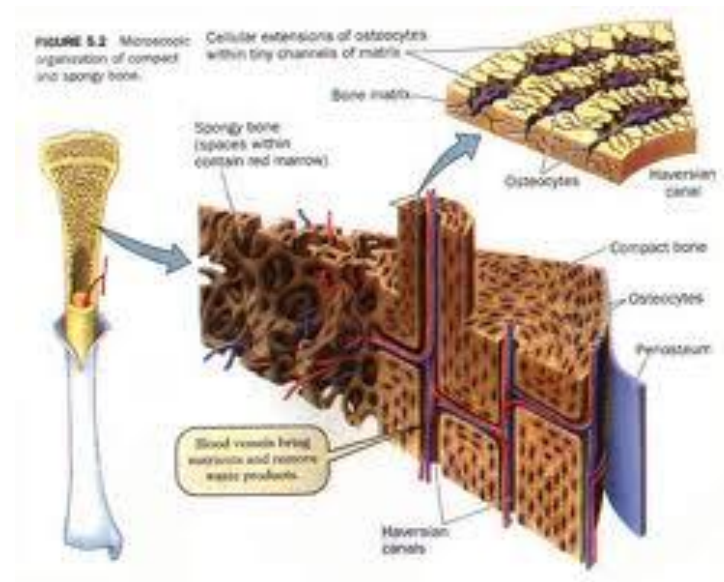
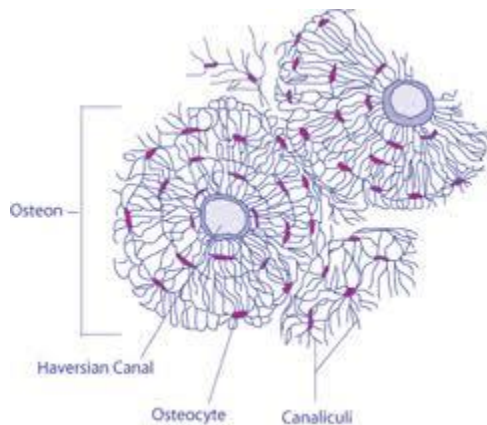
- The minerals and organic material together



HOW DOES MATRIX FORM BONES?

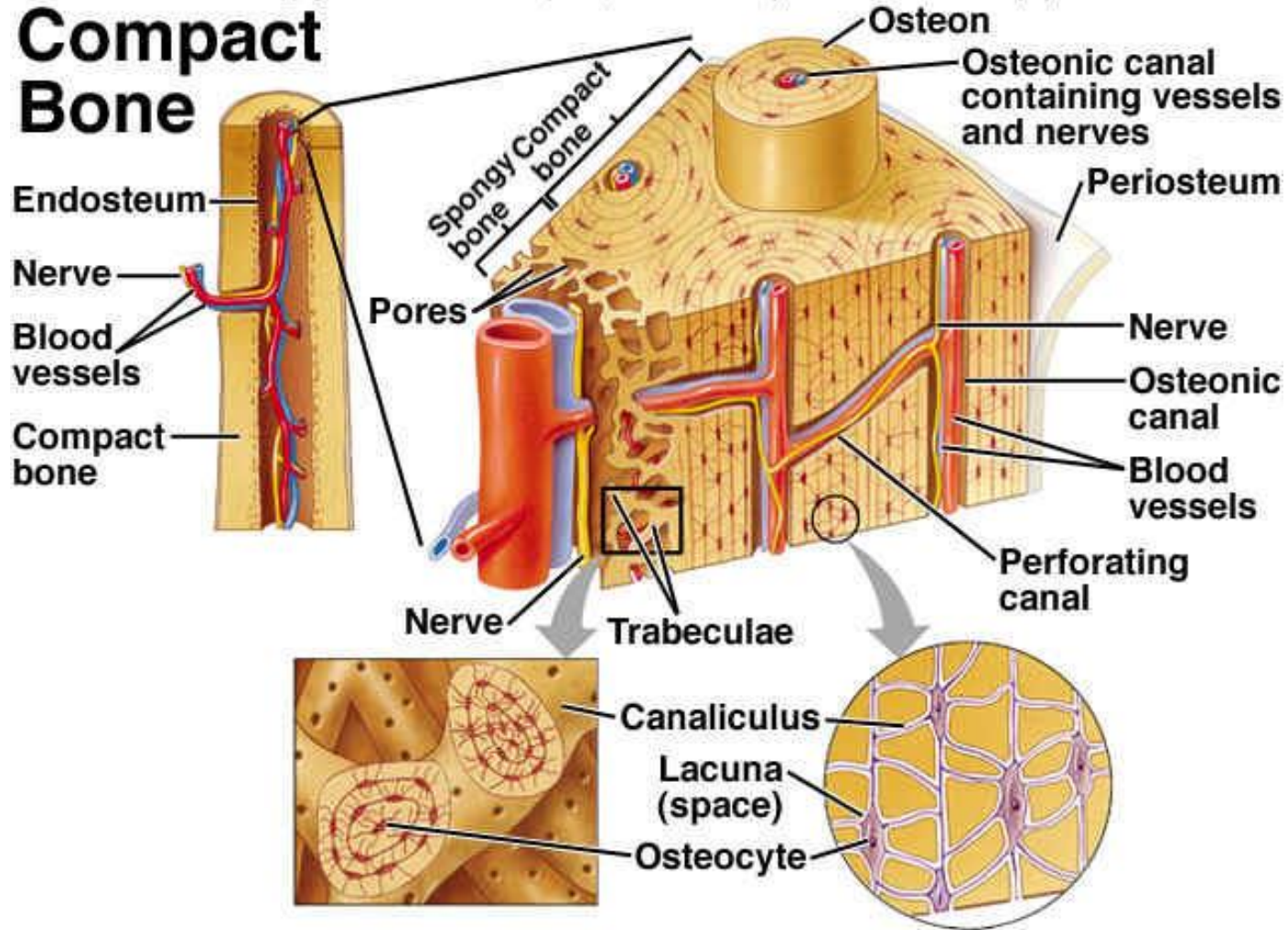


- Central (Haversian) Canals
 - Matrix on the outside
 - Hole with blood vessels in the middle



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Compact Bone



NOTES 2

WHAT
EXACTLY IS
HAPPENING
INSIDE
YOUR
BONES?



BONES BY SHAPE



+ long bone



short bone



irregular bone



flat bone

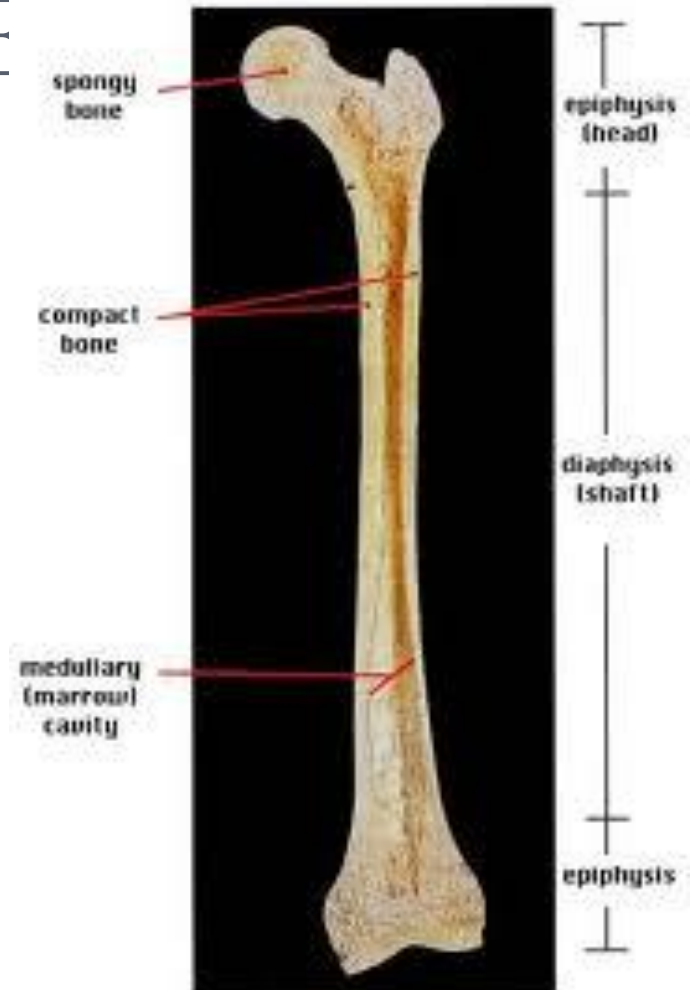
www.visualdictionaryonline.com



BONES BY SHAPE

○ Long Bones

- Exterior compact bone for strength
- Spongy bones at head
- Open space in middle for marrow (Yellow Marrow)
- “classic” bone shape



BONES BY SHAPE

○ Short Bones

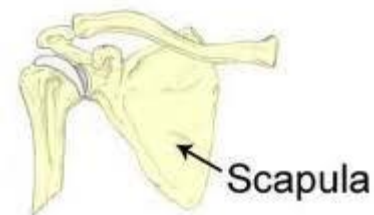
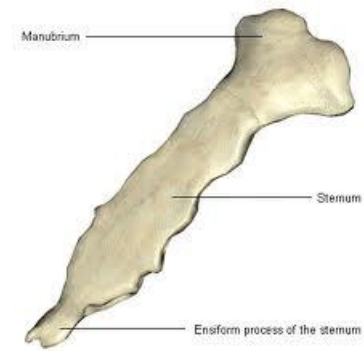
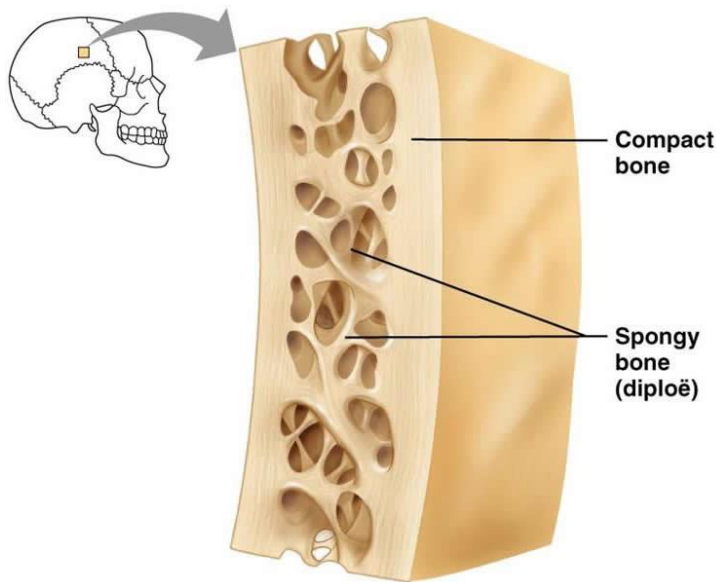
- Mostly spongy bone
- Thin wall of compact bone



BONES BY SHAPE

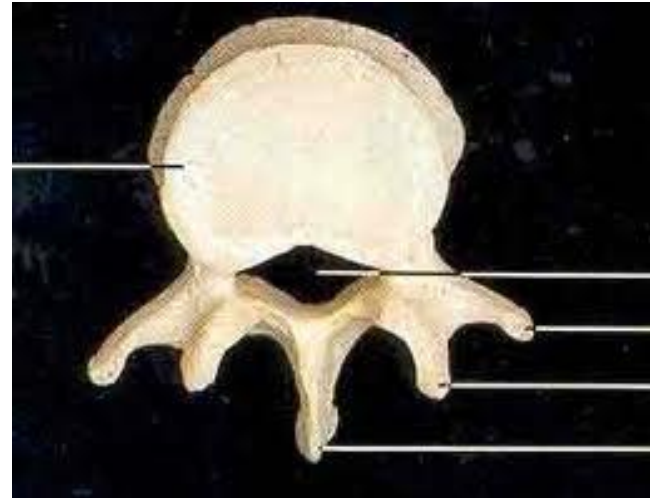
○ Flat Bones

- Sandwich of compact and spongy and spongy



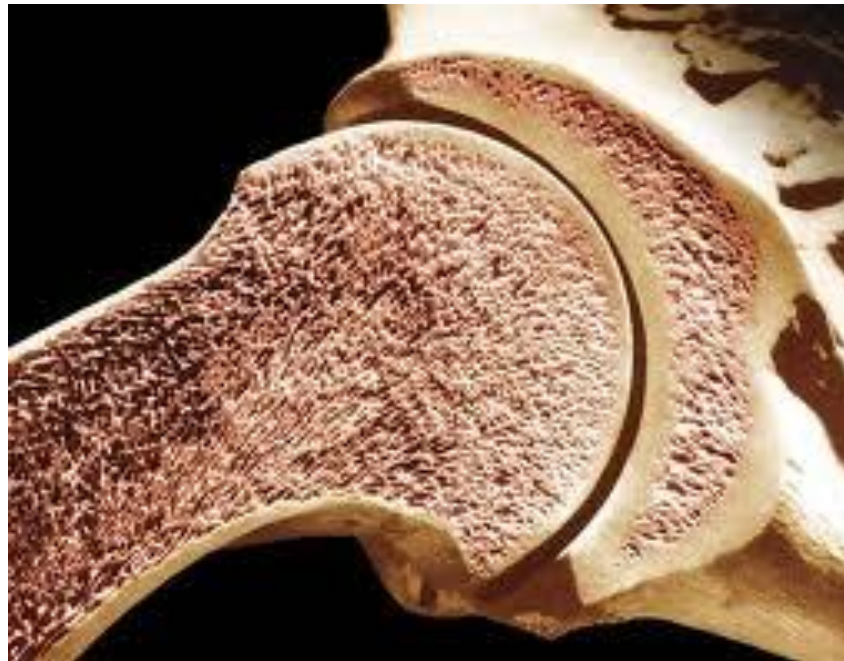
BONES BY SHAPE

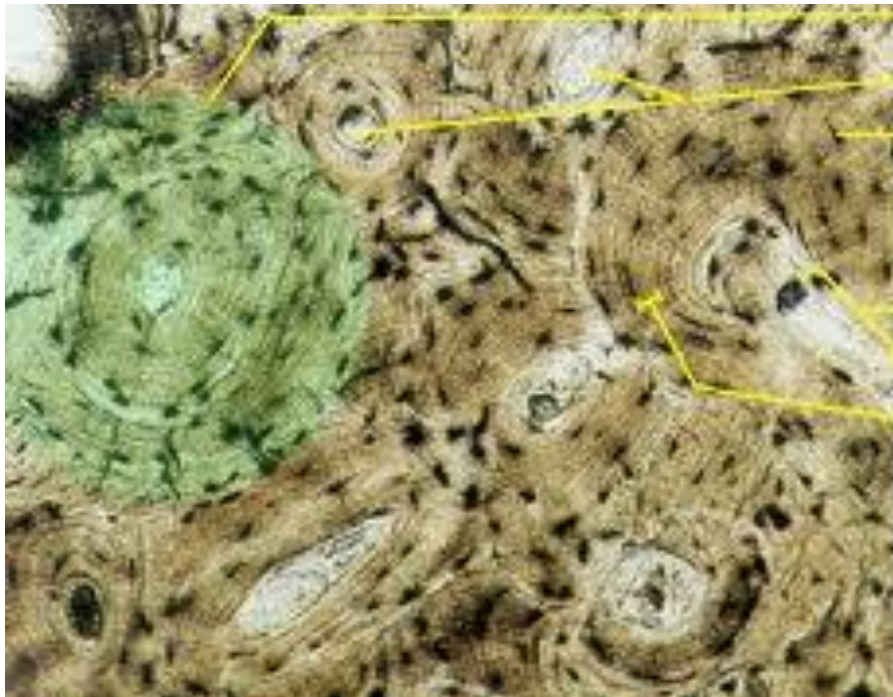
- Irregular Bones
 - Depends...



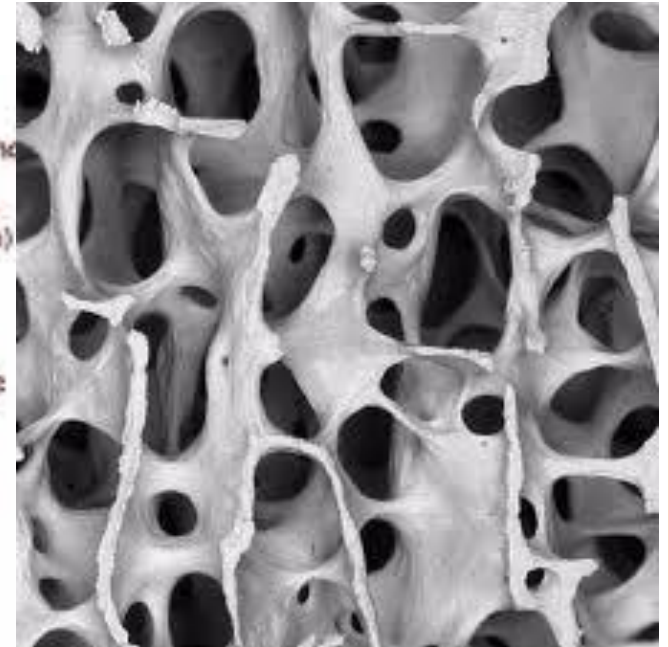
BONE TISSUE

- Compact and spongy bone
 - Compact bone is dense and smooth looking
 - Spongy has holes and internal open space





- Osteon
- Central canal
- Osteocyte (within lacuna)
- Transverse canal
- Lamella



MORE ON MARROW

○ RED MARROW

- Birth place of blood cells
 - RBC born & mature here
 - WBC start here, mature elsewhere
- Located in flat bones, short bones, and ends of long bones

○ YELLOW MARROW

- Fat storage/reserve
- Deposit of Ca^{2+} , Mg^{2+} and PO_4^-
- Only in long bones



A FEW OTHER STRUCTURAL FEATURES

○ Ligament

- Connective tissue
- Connects bone to bone

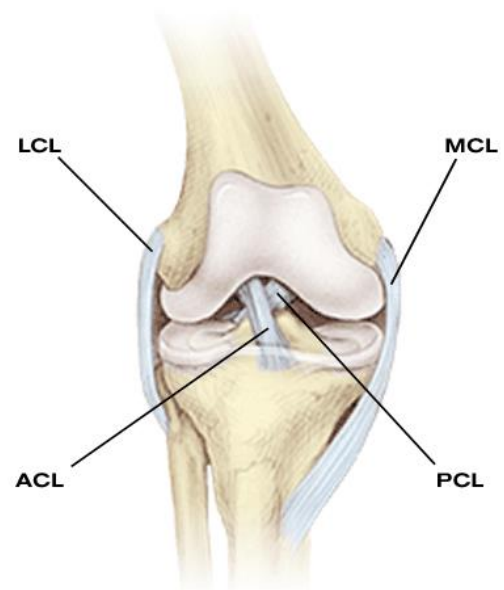
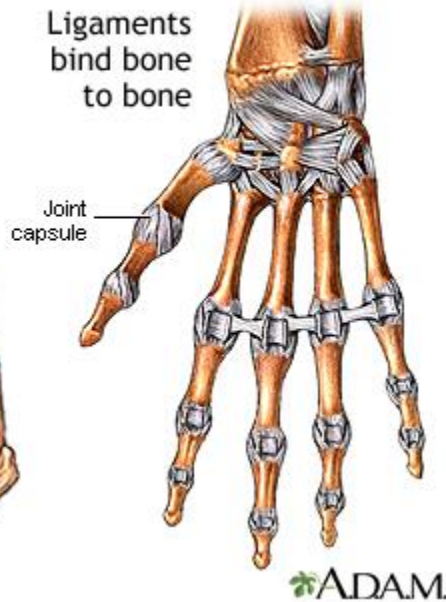
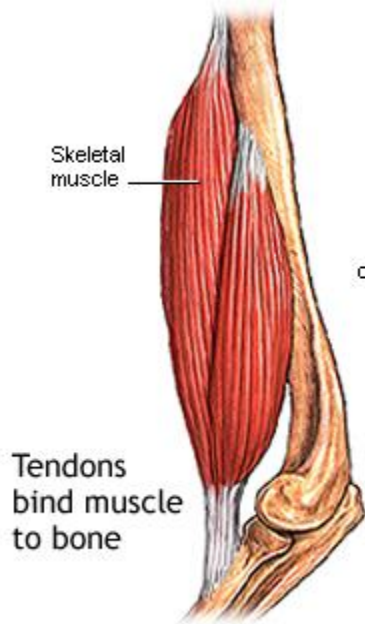
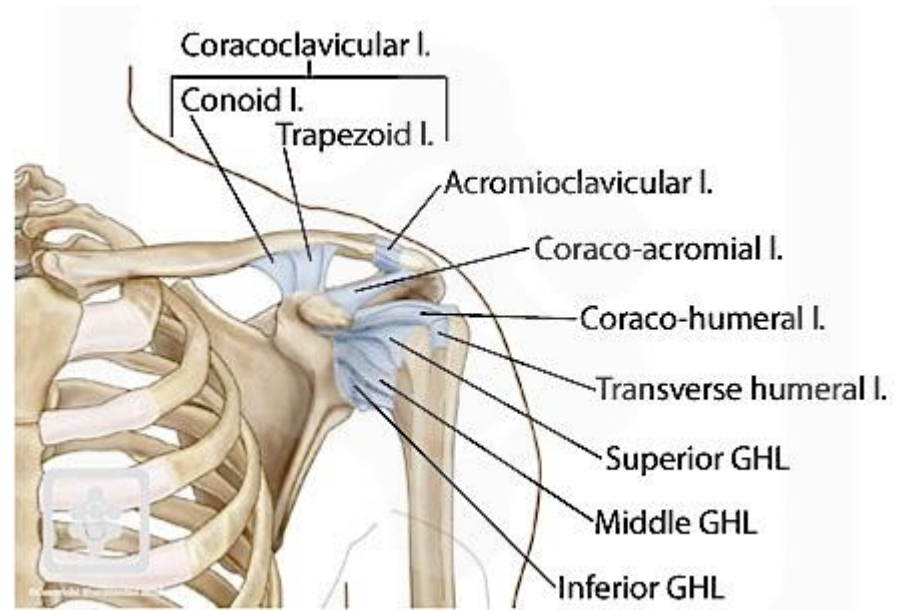
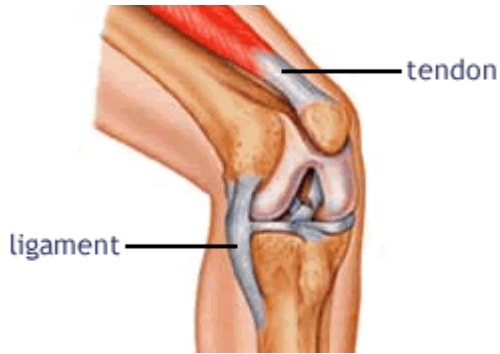
○ Tendon

- Connective tissue
- Connects Muscle to bone

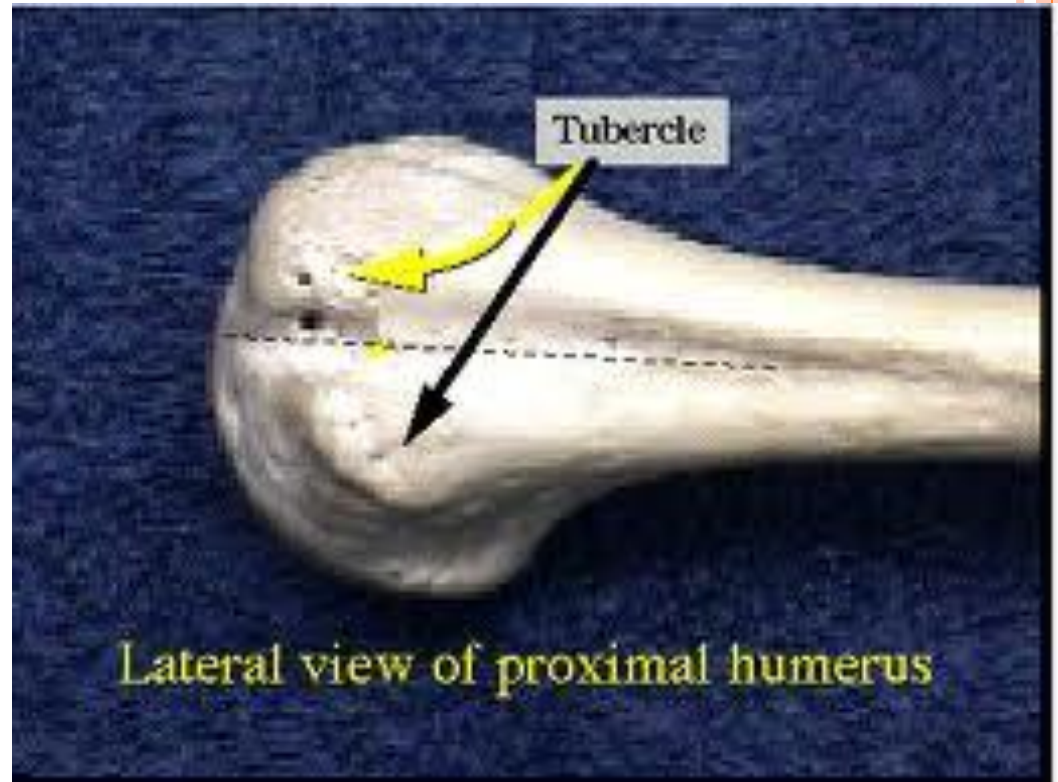
○ Tubercles or tuberosity

- Where the muscle/tendon connects to the bone





Achilles Tendon



LONG BONE ACTIVITY

- Go to a long bone
 - Sketch it
 - Label the following in your sketch
1. Epiphysis
 2. Shaft
 3. Arterial hole
 4. Spongy bone
 5. Compact bone
 6. Tubercle
 7. Where the red marrow is
 8. Where the yellow marrow is



DAY 3

- Joints and ligaments
 - Connecting one bone to another



BODY JOINTS

Hip Joint

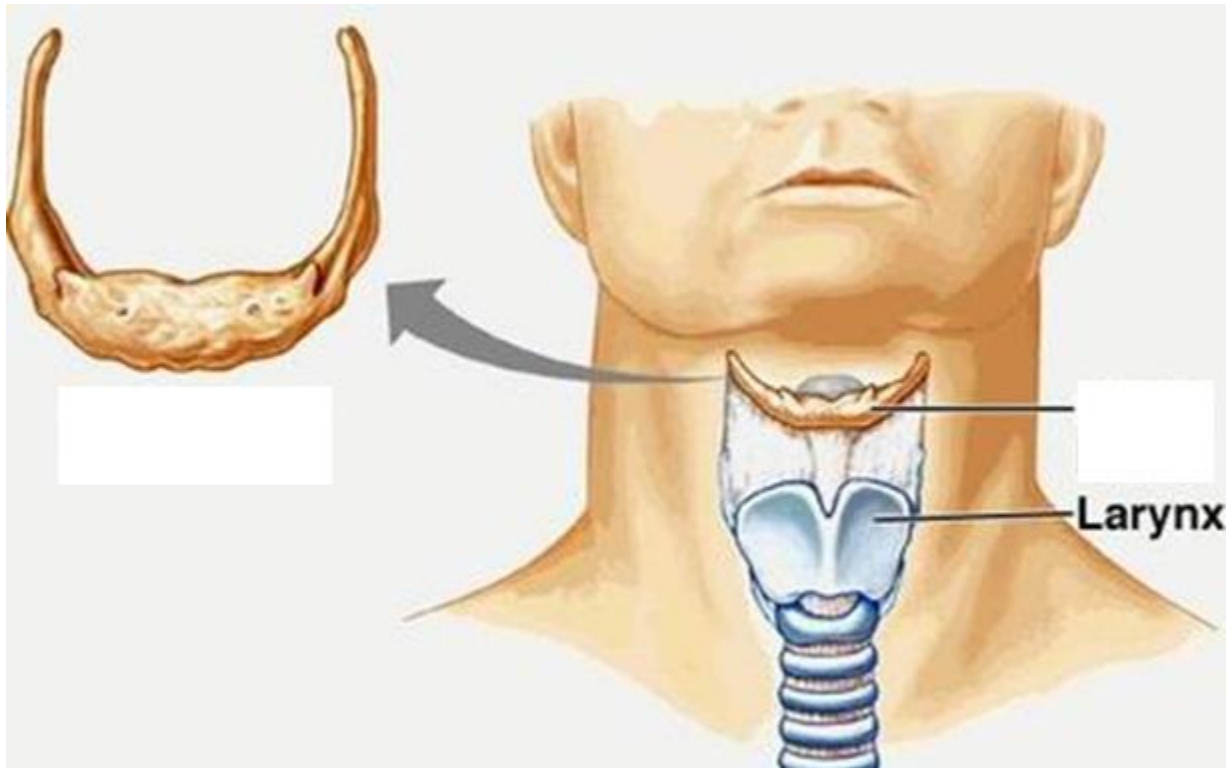


BODY JOINTS

- Body joint – where 2 bones come together
- All bones (except the hyoid bone) form at least one joint
- **FUNCTION:**
 - To bring two bones together



HYOID BONE



TYPE AND STRUCTURE OF JOINTS

STRUCTURE OF JOINT

1. Fibrous – does not move
2. Cartilaginous (made of cartilage) – some movement
3. Synovial (cartilage and fluids) – lots of movement



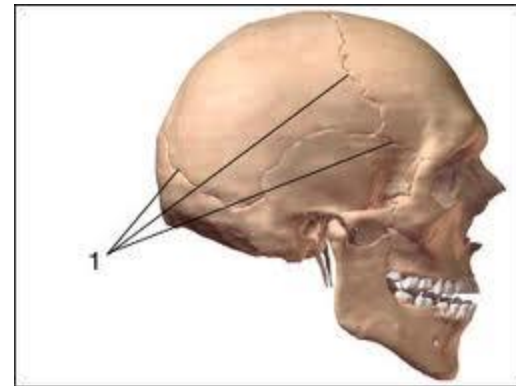
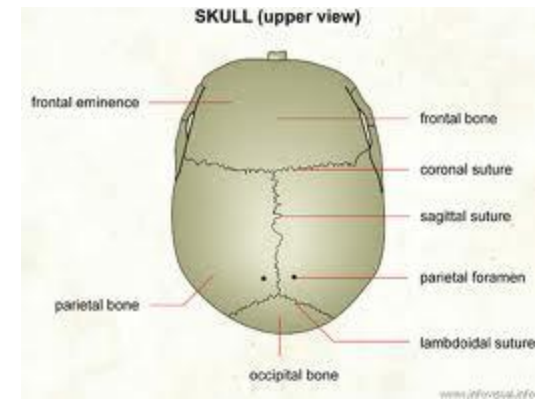
EXAMPLES

- Fibrous joints - fixed
 - Sutures of the skull
 - Allows for very little movement

Large fontanelle

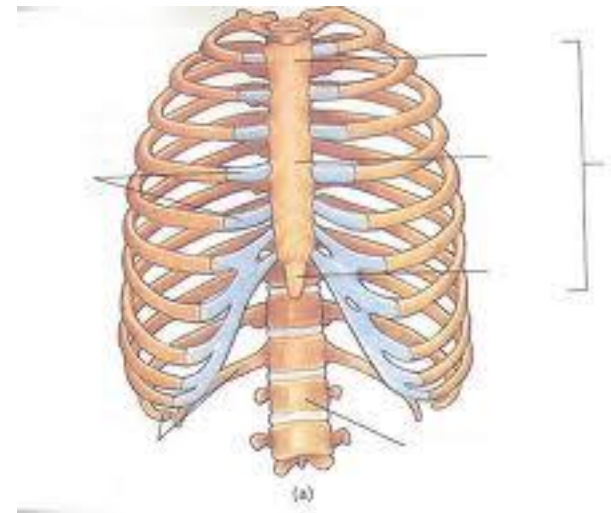
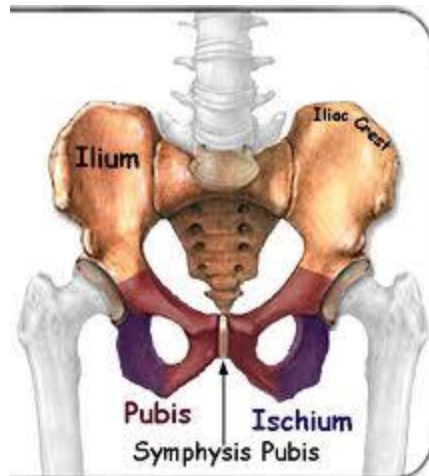


ADAM.



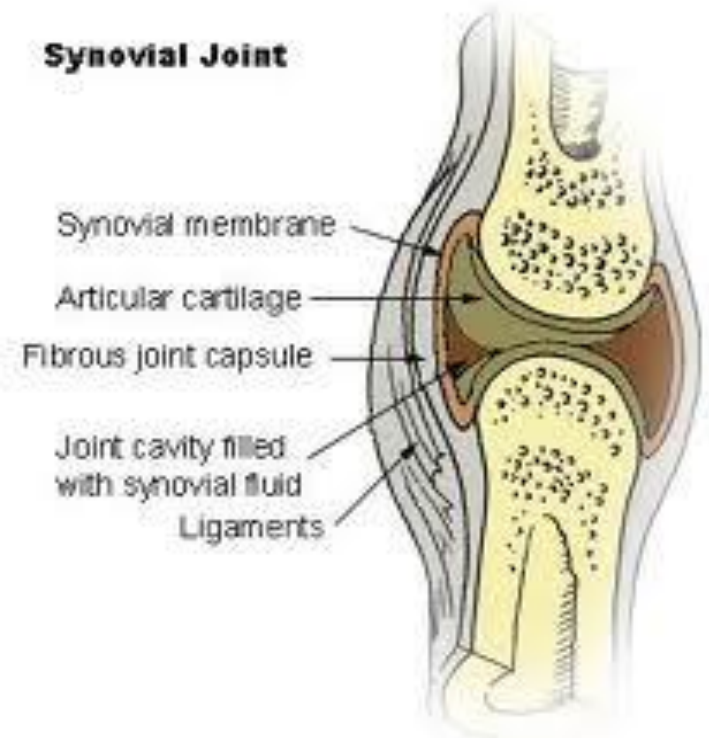
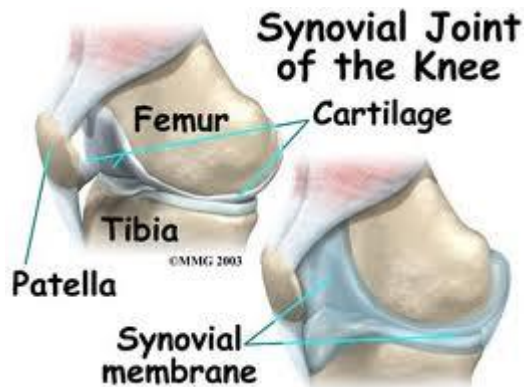
EXAMPLES

- Cartilaginous or slightly movable
 - Bone ends connected by cartilage
 - Allow small movements such as hip, spinal column, ribs



EXAMPLES

- Synovial or freely moving joints
 - Bone ends connected with a membrane bound cavity with synovial fluid in it
 - All your free moving limbs have this



BONES, VITAMINS AND HORMONES

○ VITAMIN D

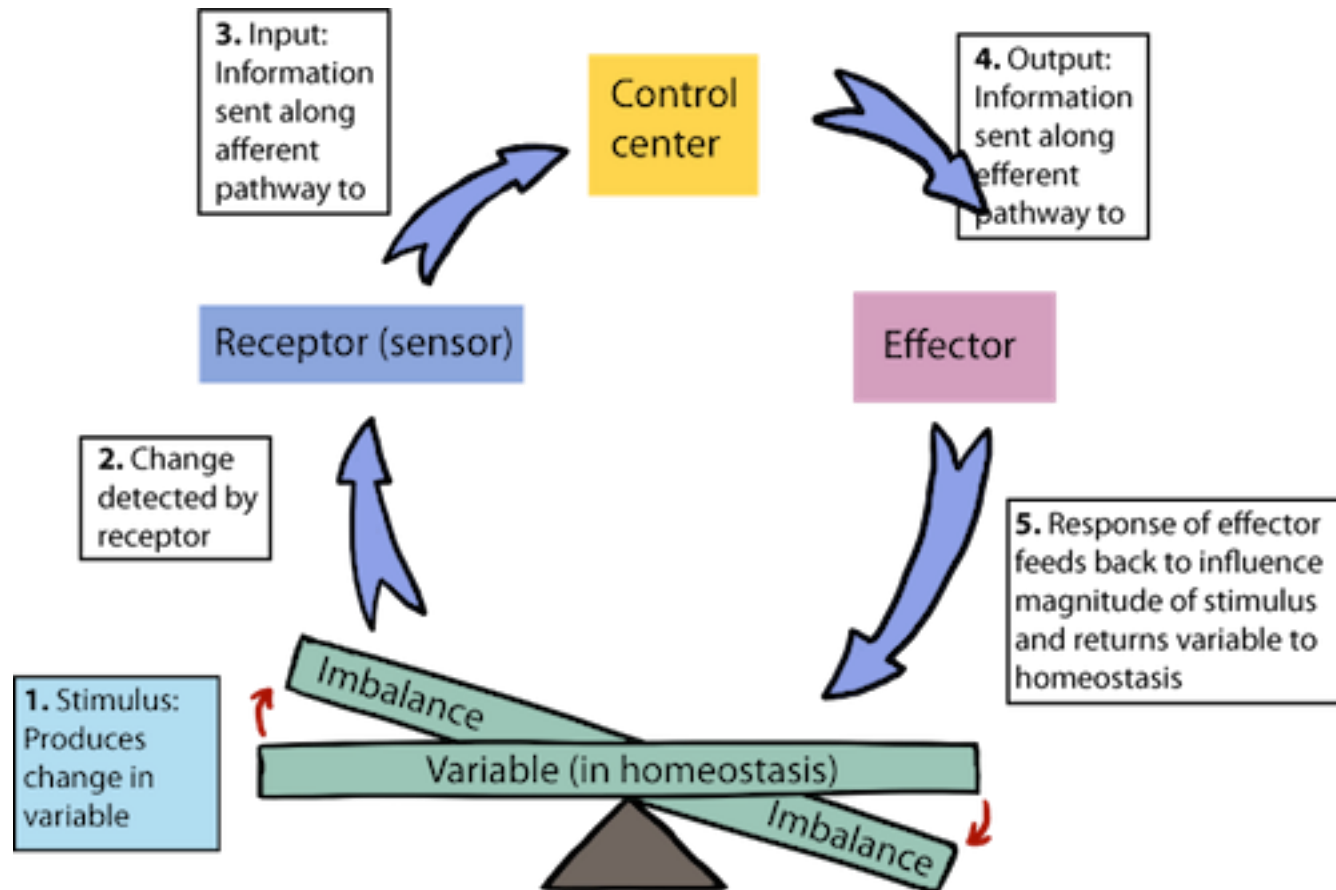
- Necessary to absorb Ca^{++} from the intestines into the blood.
- Ca^{++} is essential for bone strength

○ GROWTH HORMONE

- Causes your bones to grow
- Stop producing it in teen years.



HOMEOSTASIS



DAY 4

- Lab write up
- Bone ID activity



BONE IDENTIFICATION

- On your paper write the letters A –
- Go around to the lab benches and identify each bone.
- For the following bones identify what type of joint it makes and with what other bone
- Draw a vertebrae
 - Label with anterior (front), posterior (Back), inferior (toward the feet), superior (toward the head)
 - Where does the rib attach?
 - What goes through the hole?



DAY 5

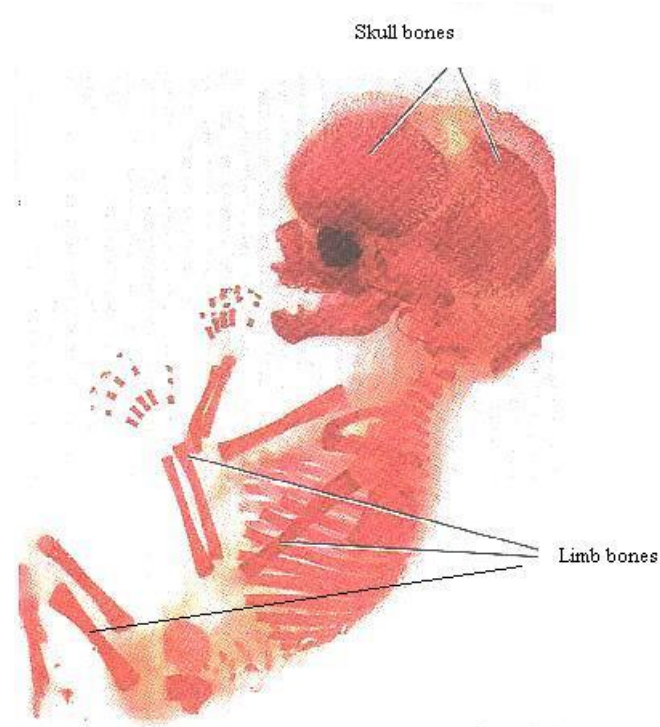
- Bone growth, regrowth and cellular structures



BONE GROWTH AND REGROWTH

First time around

- Bone starts as cartilage
- Surrounded by osteoblasts (cells that make bone)
- Ossification begins – cartilage gets eaten away and replaced by bone



REGROWTH

Simple fracture

skin not broken

Compound fracture

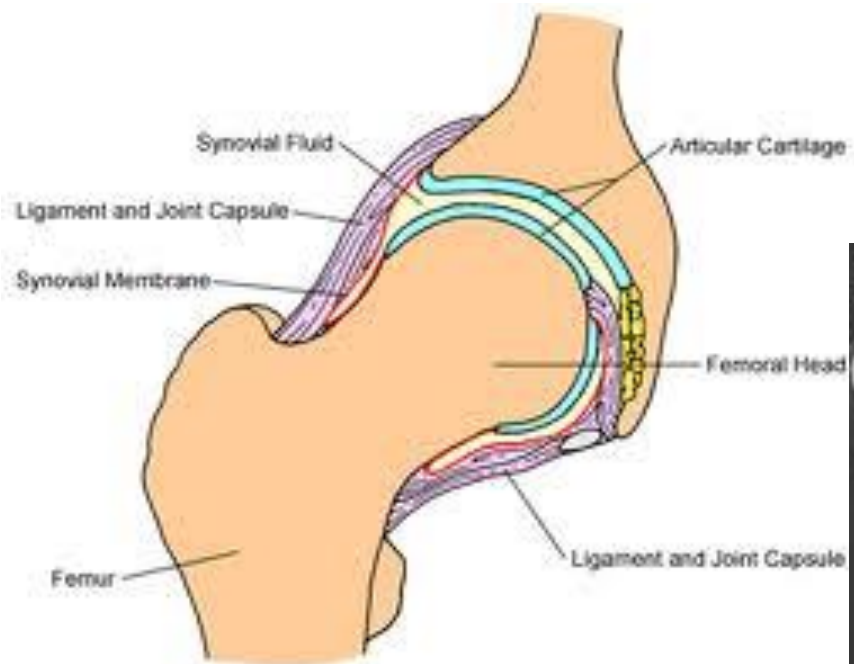
skin is broken by bone



Repair

1. Blood rushes to area
2. Cartilage is laid down
3. Osteoblasts come in and form new spongy bone
4. Osteocytes slowly strengthen over months with additional mineral deposits





SYSTEM OUT OF BALANCE

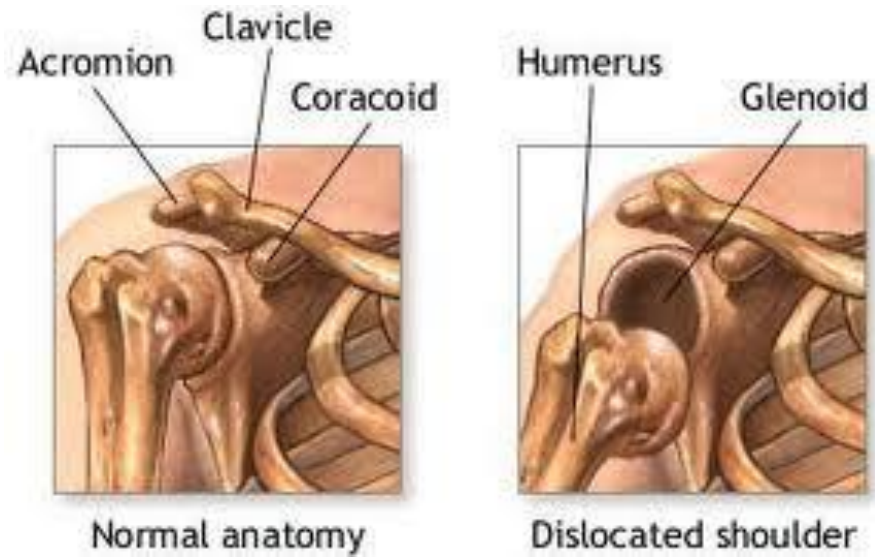
- Rickets



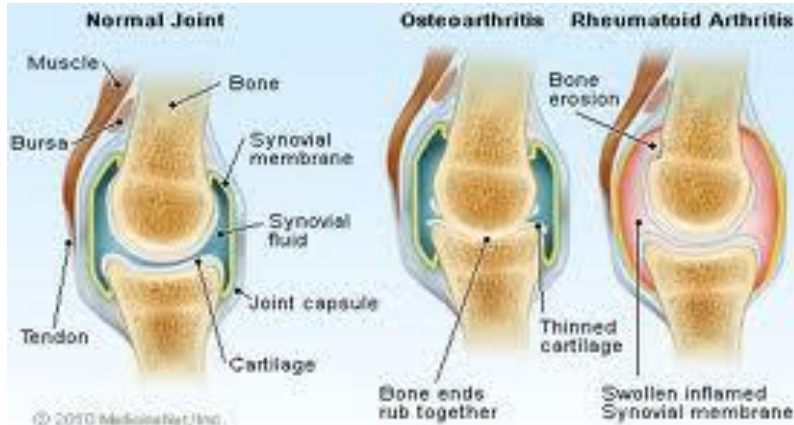
- Spinal curvatures
- Fractures



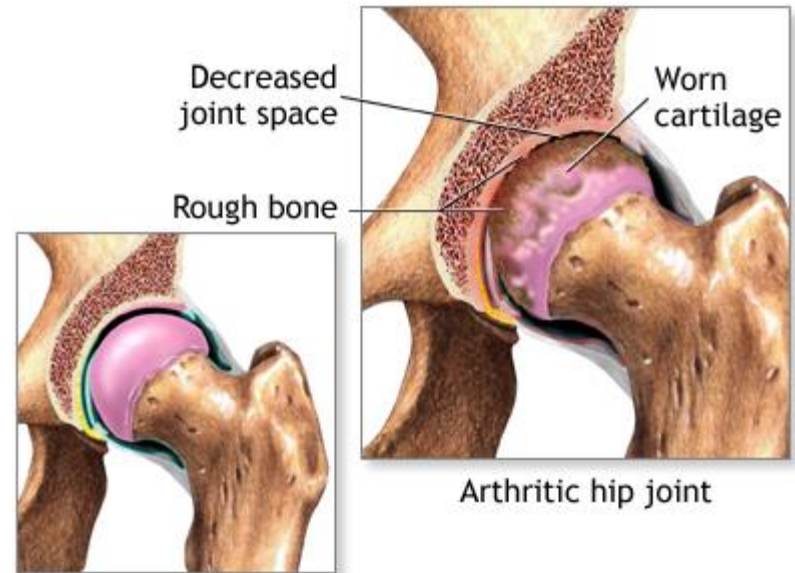
- Dislocations



OSTEOARTHRITIS



Normal and Arthritic Joints



Normal hip joint

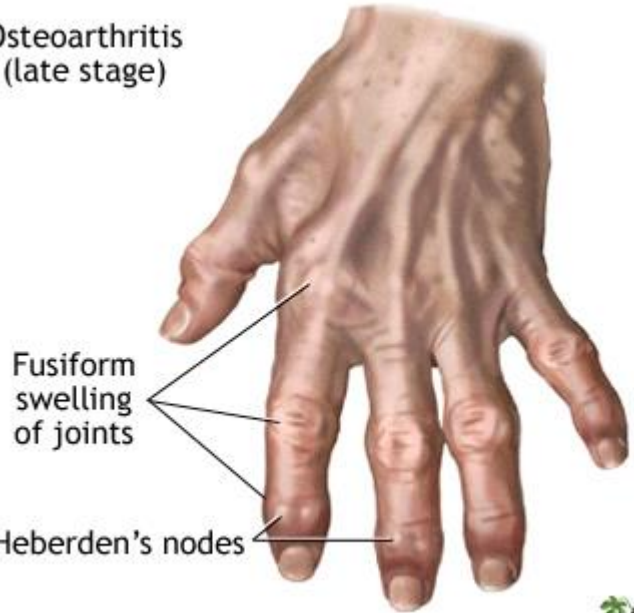
Arthritic hip joint



RHEUMATOID ARTHRITIS



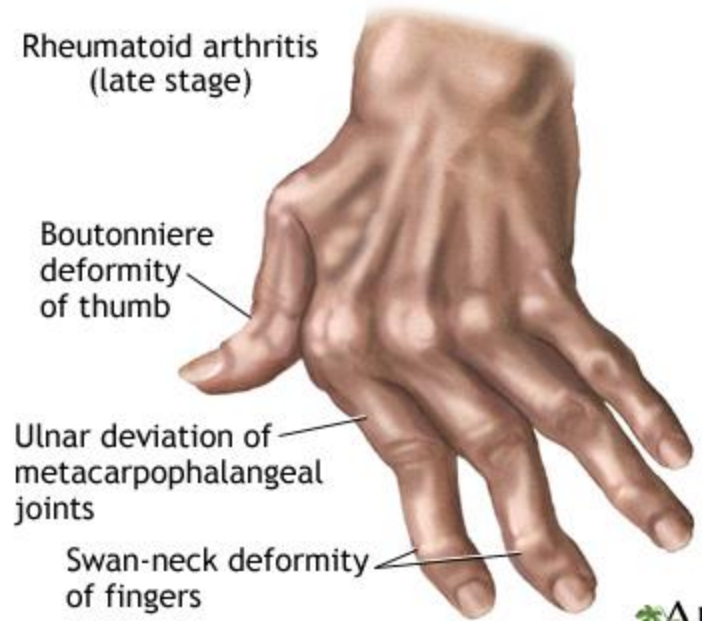
Osteoarthritis (late stage)



ADAM.



Rheumatoid arthritis (late stage)



ADAM.

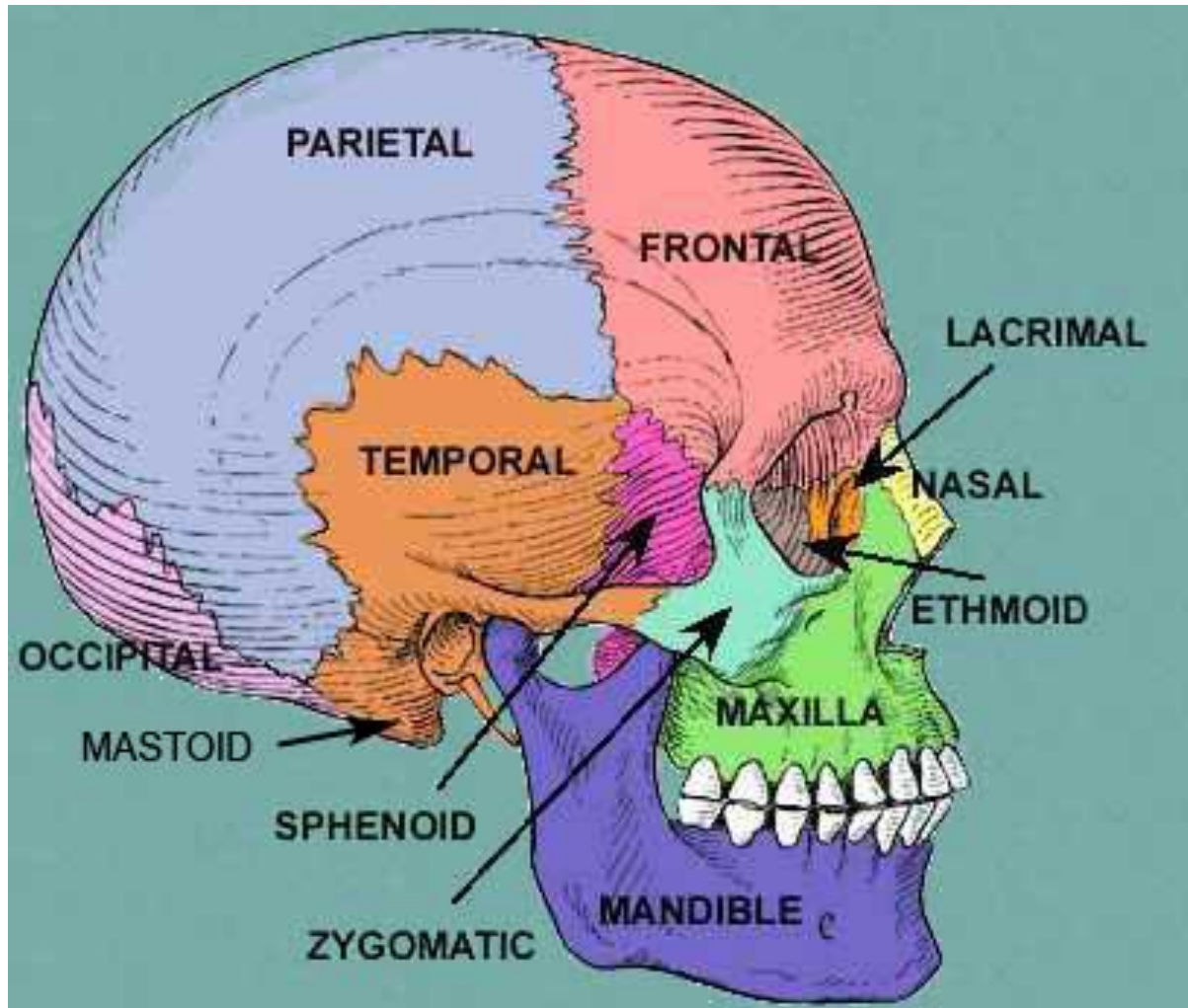


GOUT & OSTEOPOROSIS



AND NOW FOR
SOMETHING
COMPLETELY
DIFFERENT





SKULL

- Cranium
 - 8 flat bones
 - Connected by sutures
 - Note: sinus cavities
- Mandible
 - Jaw
- Hyoid
 - Only bone in the body that doesn't have a joint



VERTEBRAL COLUMN

- 3 sections
 - Cervical
 - Neck area
 - Unique movement of nodding and shaking
 - Thoracic
 - Mid area
 - Lumbar
 - Base of spine
 - Fused portions at very end – sacrum and coccyx

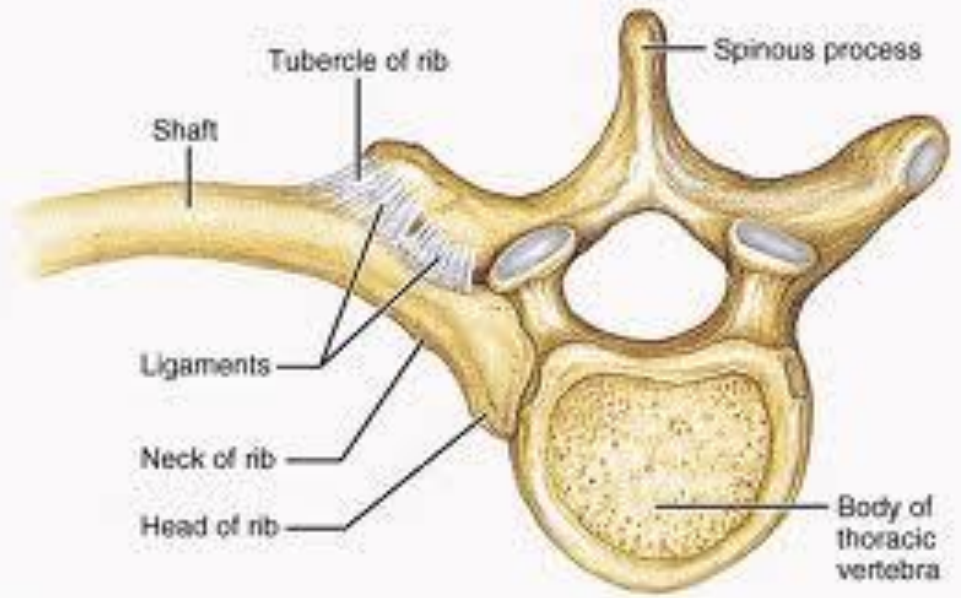
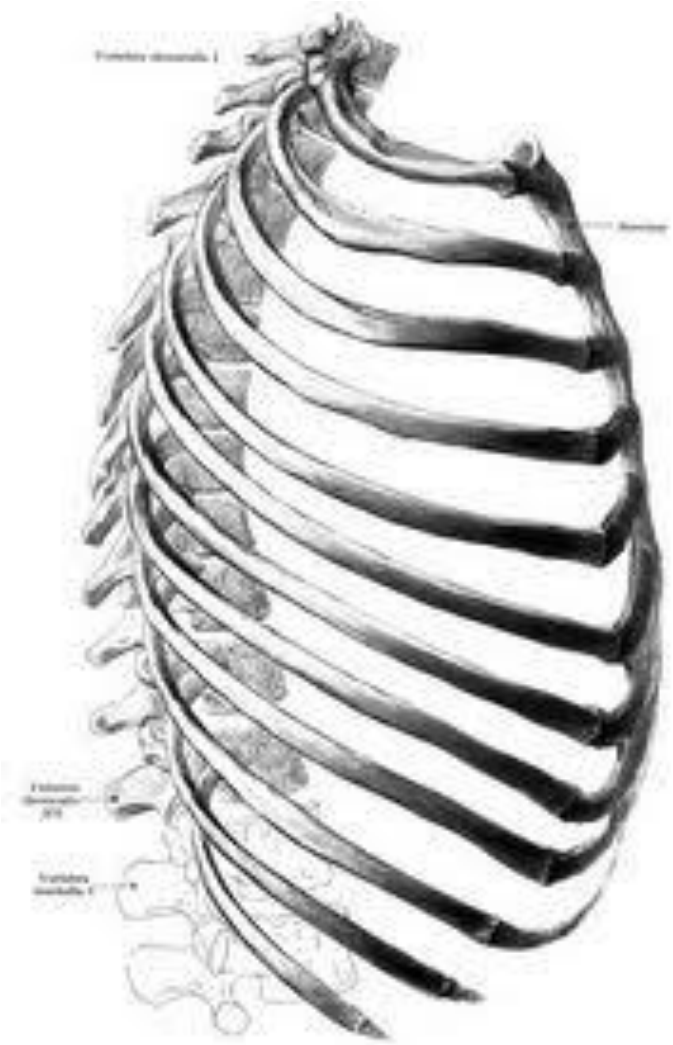
Cartilage between each vertebra



BONY THORAX THORACIC CAGE OR RIB CAGE

- 2 parts – sternum and ribs
- 12 pairs of ribs
 - “true Ribs” first seven - they attach to sternum
 - “False Ribs” next 5 do not directly attach to sternum
 - Floating ribs – final 2 false ribs so not attach at all





(b)

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BONES TO KNOW – YOU HAVE THIS LIST

- Clavicle
- Humerus
- Radius/Ulna
- Phalanges
- Femus
- Patella
- Tibia/Fibula

- A few others:
 - Carpals
 - Metacarpals
 - Tarsals
 - Metatarsals
 - Hyoid

Axial – skull, vertebrae,
ribs, sternum

