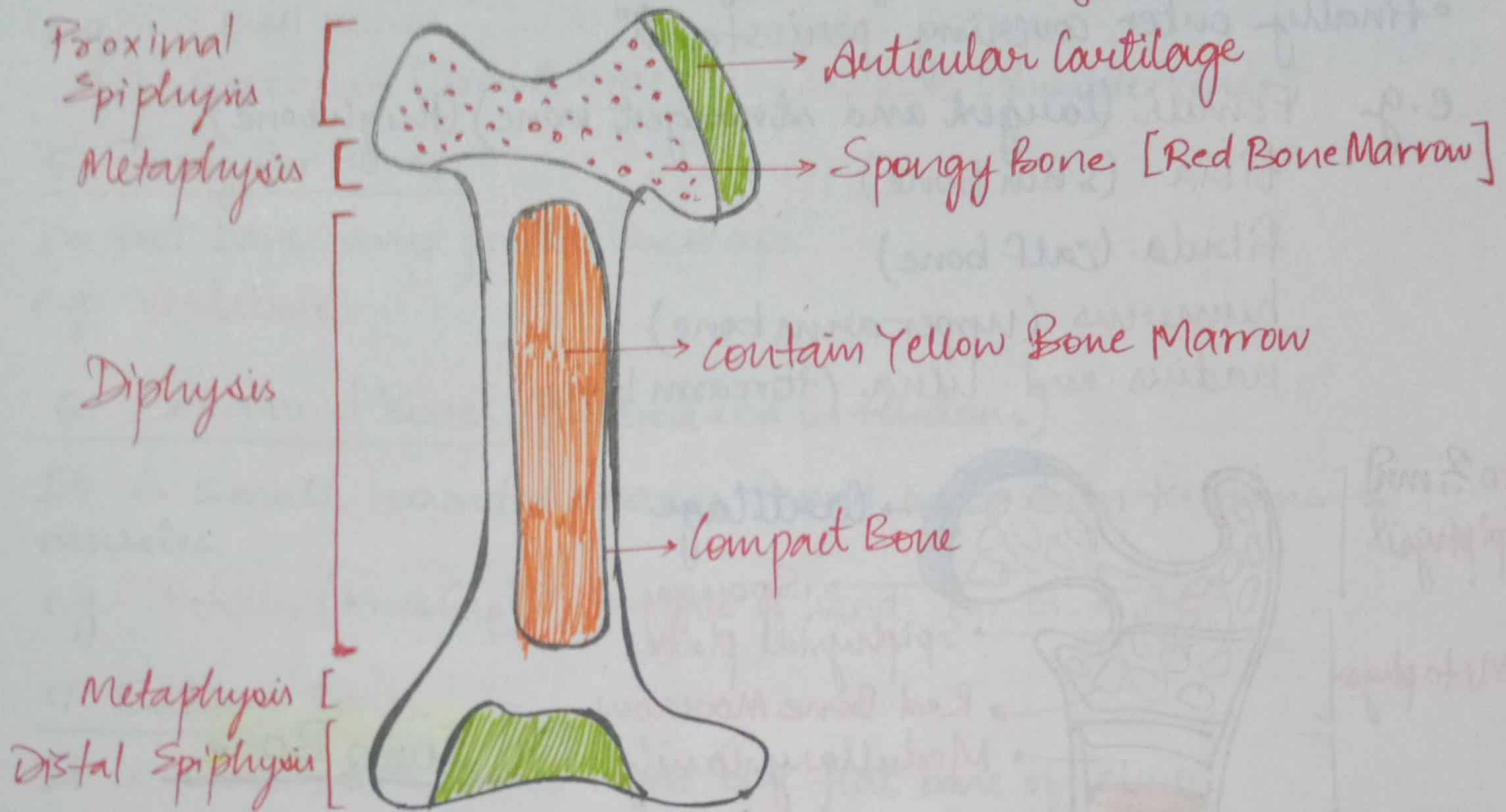


Unit II - Skeletal System

- It is consist of Bone.
- Bone = 20% collagen protein + 35% minerals salt of phosphate with Ca^{2+} (mainly) + 45% water



General Bone Structure

Types of Bones.

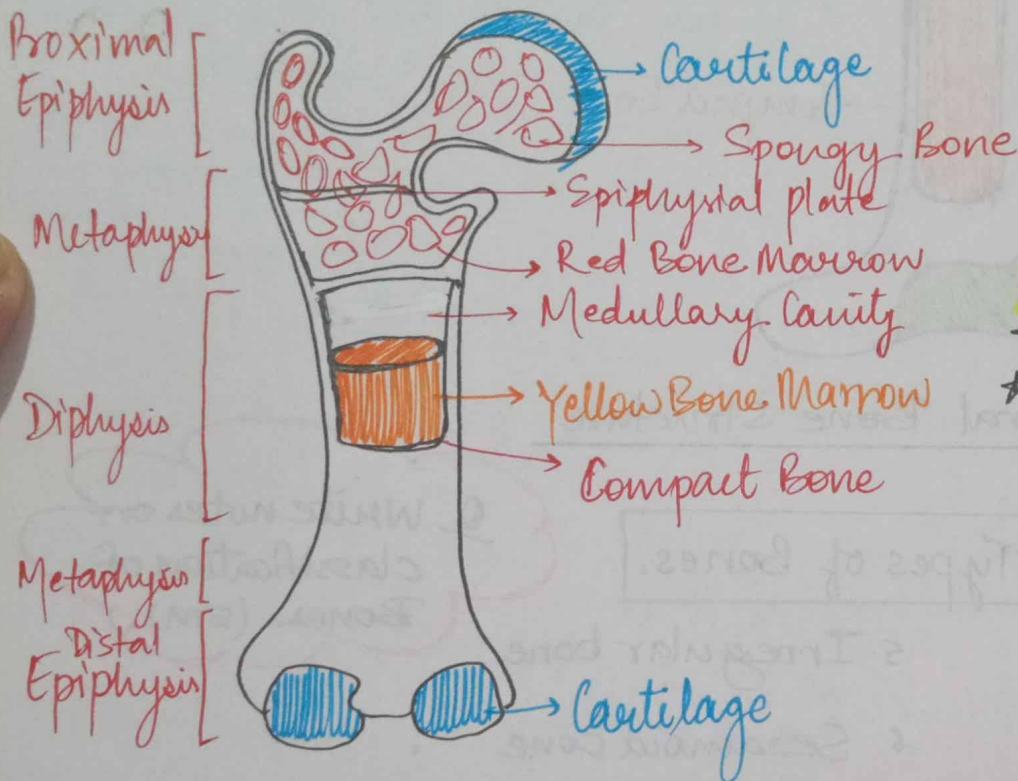
1. Long Bone
2. Short Bone
3. Long-short Bone
4. Flat Bone
5. Irregular bone
6. Sesamoid bone
7. Sutural bone
8. Pneumatic bone

Q Write notes on classification of Bones. (5M)

1. Long Bones and blood supply. (5m) each.

- It consists of marrow cavity, which is surrounded by the spongy bone layer (spongy or cancellous bone).
- Spongy bone surrounded by compact bone.
- Finally outer covering "periosteum".

e.g. **Femur** (largest and strongest bone) (thigh bone)
tibia (shin bone)
fibula (calf bone)
humerus (upper arm bone)
radius and ulna (forearm bone)



Long Bone

* Labelled Diagram (2m)

2. Short Bones

- It does not have any shaft.
- Contain spongy substance covered by shell of compact bone.

e.g. **Tarsal** (bone of feet)
Carpal (bone of wrist)

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3. Long-Short Bones

e.g. Metatarsals and Metacarpals.

4. Flat Bones

It contains two layers of compact bone with a spongy sub. in b/w.

e.g. Skull bones
Sternum (breast bone) ribs.
scapula (shoulder blade)

5. Irregular Bones

Do not have any particular shape.

e.g. Vertebrae

6. Sesamoid Bones (embedded in tendons)

It is small rounded masses found in certain tendons of muscles.

e.g. Patella (knee cap), Carpals of hand, Tarsals of feet.

7. Sutural Bones

It is small, flat bones found b/w flat bones of skull.

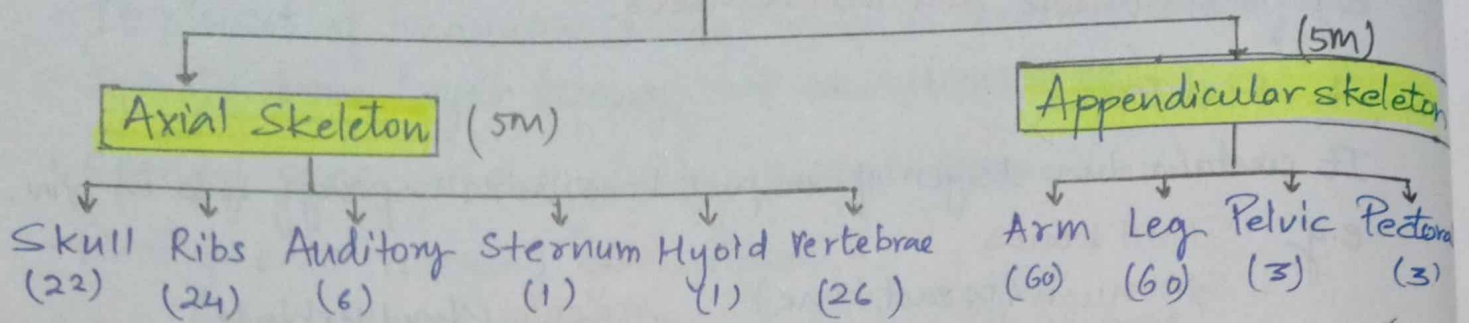
e.g. Skull bone.

8. Pneumatic Bones

Bones contain air-filled cavities.

e.g. Maxilla, frontal, sphenoid bones.

Bones in Skeleton



Skull

Cranial (8)

Frontal (1)
Parietal (2)
Temporal (2)
Occipital (1)
Sphenoid (1)
Ethmoid (1)

Facial (14)

Zygomatic (2)
Lacrymal (2)
Nasal (2)
Inferior concha (2)
Palatine (2)
Vomer (1)
Mandible (1)
Maxilla (2)

Thorax

Ribs (24)

1-7 pair
[True rib]

8, 9, 10 pair
[False rib]

11 and 12 pair
[Floating rib]

Sternum (1)

Vertebral Column

Cervical column
C₁-C₇

Thoracic column
T₁-T₁₂

Lumbar column
L₁-L₅

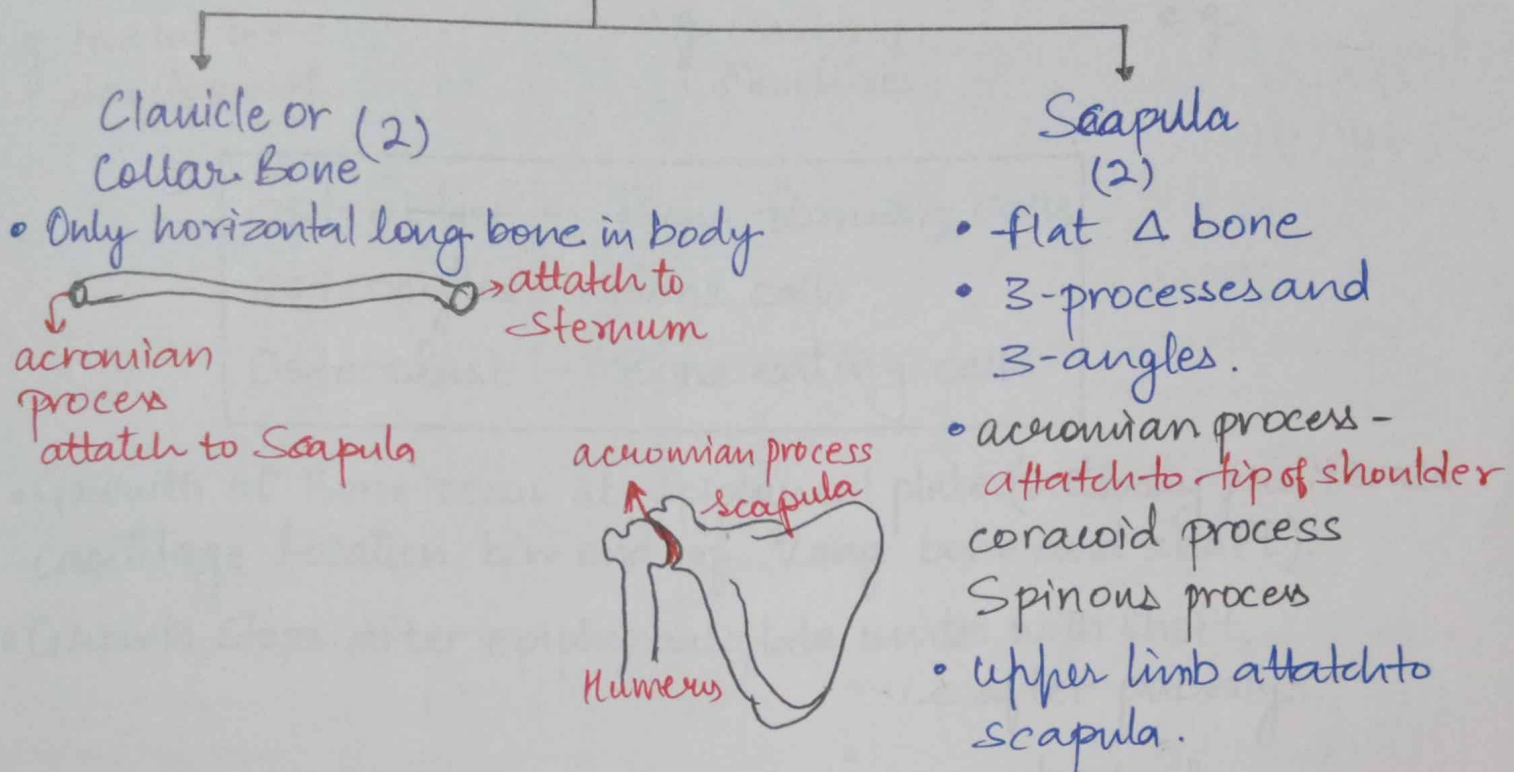
Sacrum
S₁-S₅
(fused)

Coccyx
(fused)

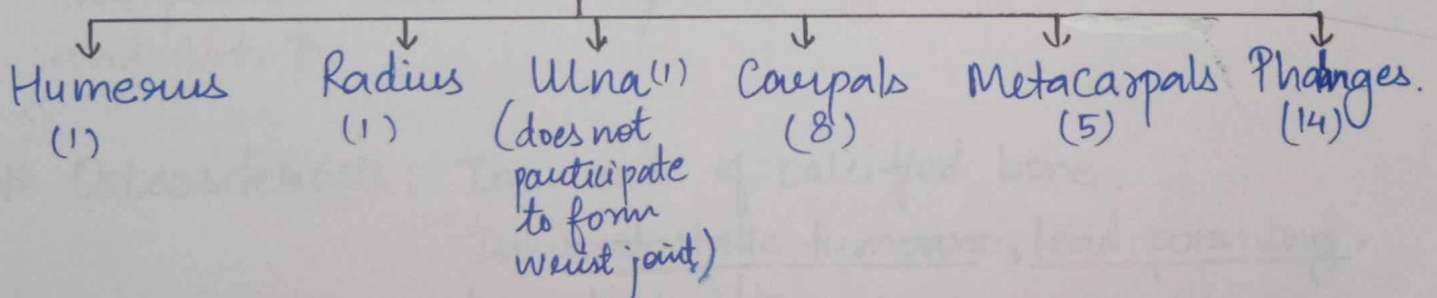
- Auditory Bones
- Malleus (2)
 - Incus (2)
 - Stapes (2)

Hyoid • only bone that donot attach with any other bone.

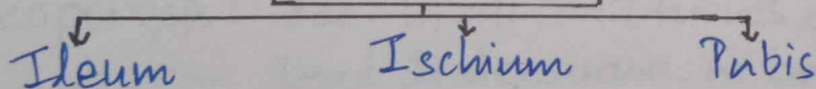
Pectoral Girdle



Upper limb



Pelvic Girdle



lateral surface of hip-bone is cup-shaped depression called "Acetabulum" which articulates the head of femur to form hip joint.

Lower limb

Femur Tibia fibula Patella Tarsals Metatarsals Phalanges



Upper limb

Humerus (1) Radius (1) Ulna (1) Carpals (8) Metacarpals (5) Phalanges (14)

Palmaris Cystis

Tendon

@surgeon11

Bone formation

Endochondral formation

Bone formation takes place after formation of cartilages.

e.g. foetal bone development

Membranous formation

Bone formation occurs without cartilaginous phase.

e.g. Clavicles, Mandibles

Endosteal formation

Bone formation occurs as constant process of remodelling.

e.g.

Osteoblast — Bone forming cells

Osteocytes — Bone cells

Osteoclast — Bone eating cells

- Growth of Bone occurs at epiphyseal plate (actively proliferate cartilage location b/w end of long bone and shaft).
- Growth stops after epiphyseal plate unites with shaft.
i.e. after puberty.
- The formation of bone is called "mineralisation".
This process is controlled by Parathyroid hormone, Calcitonin and Vit. D.

Osteosclerosis: Inc. amt. of calcified bone.

In metastatic tumours, lead poisoning, hypothyroidism

Osteoporosis: dec. in all constituents of bone.
Lead to decrease in bone mass.
occurs after 40yr of age.

Rickets (Vit. D deficiency)

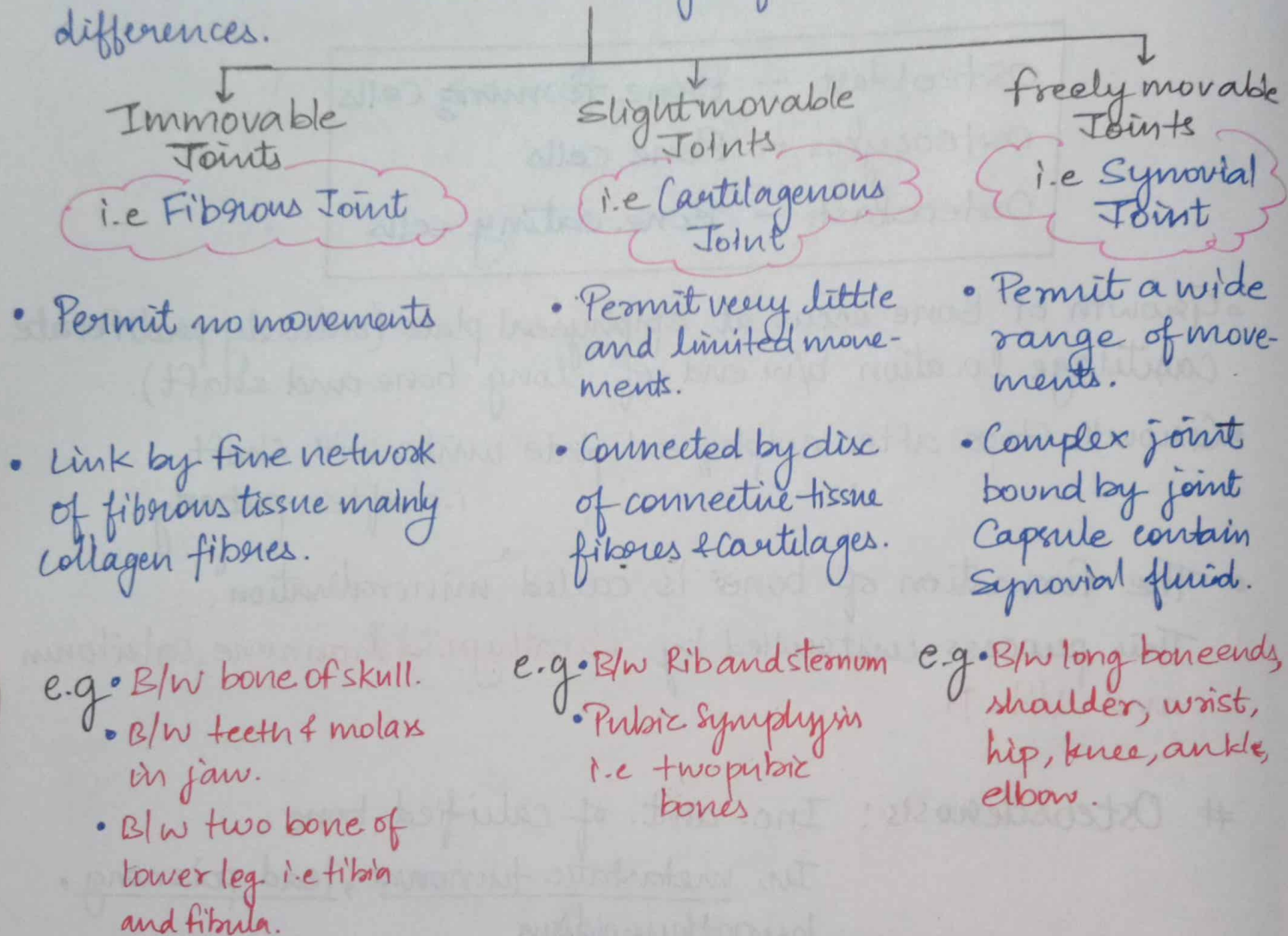
Osteomalacia inadequate absorption of Ca owing to deficiency of Vit. D.

Q Define Joint. Explain feature of synovial joints with suitable examples with its anatomy. (15M)
Describe classification of joints. (5M)

Joint : The place where the two or more bone surfaces meet.
Study of joints is known as "Arthrology".

Joint Classification

Classification is based on range of movements and structural differences.



Features of synovial Joints:

1. In synovial joint both the bones of a joint are lined with an extremely tough layer of hyaline cartilage. which act as the "shock absorber".

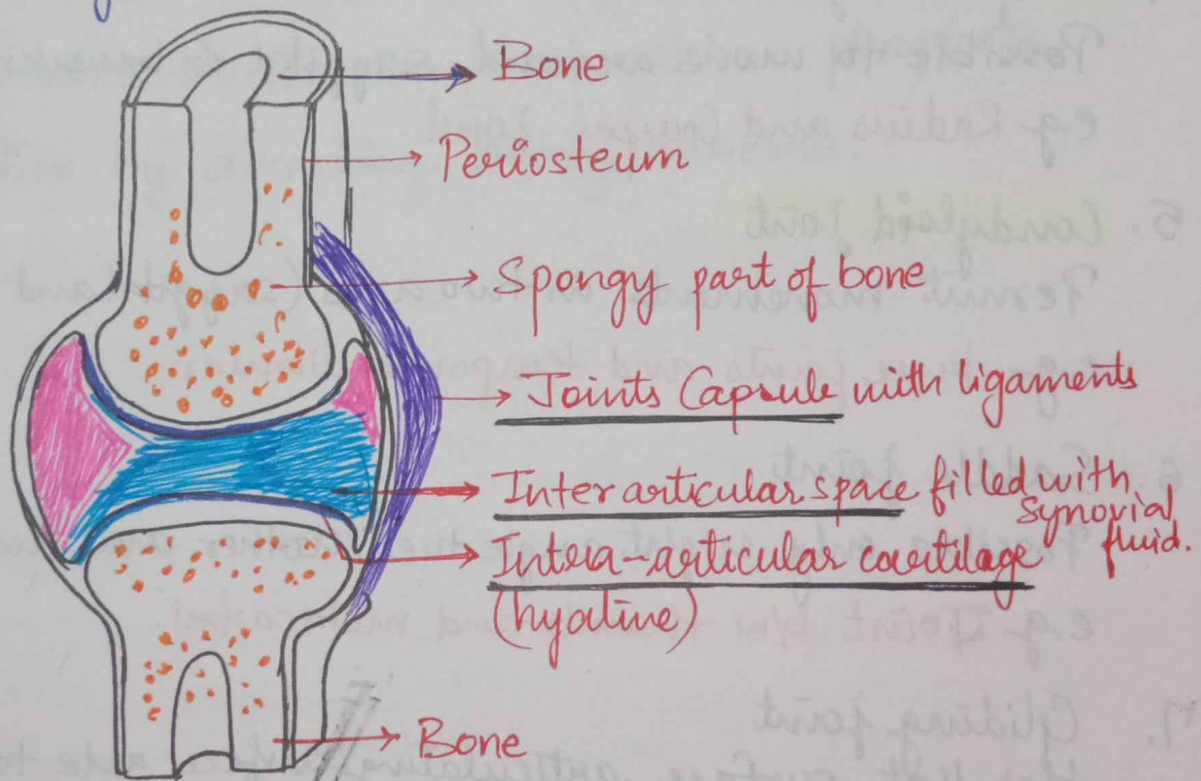
2. Hyaline cartilage has an extremely smooth surface due to presence of joint oil i.e synovial fluid b/w the joint surface. This fluid permits joint movements.

3. Articular capsule surround the joint and is continuous with periosteum of articulating bones.
It contain 2-layers:

Fibrous (outer): consist of white fibres. Hold together the bones.

Synovial (inner): It absorb and secretes synovial fluid & exchange nutrient b/w blood and joint.

4. Articular cartilage: covered by thin hyaline cartilage.
Articulating Bones are



Different Types of Synovial Joints

- ① Ball & socket
- ② Hinge
- ③ Pivot
- ④ Ellipsoidal
- ⑤ Condylloid
- ⑥ Saddle
- ⑦ Gliding

1. Ball and Socket Joints

Possible to move in all directions.

e.g. Shoulder joint & Hip joint

2. Hinge joint

Possible to move in transverse axis.

e.g. Elbow joint, knee joint, joint b/w finger phalanges.

3. Pivot (roll) joint

Possible to move around longitudinal axis.

e.g. Radius rotates in relatⁿ to ulna

Atlas (1st cervical vertebra) rotates in relatⁿ to axis (2nd C₂)

4. Ellipsoidal joint

Possible to move around sagittal & transverse axis.

e.g. Radius and Carpals joint.

5. Condylar joint

Permit movements in two axes (sagittal and transverse)

e.g. knee joints and tempomandibular.

6. Saddle joint

Possible only right angle to each other and ~~not~~ relatⁿ possible.

e.g. Joint b/w thumb and metacarpal.

7. Gliding joint

Has flat surface, articulating surface able to slide one another.

e.g. B/w bone of wrist and B/w bone of ankles.

Q Functions of the Bone? (5M)

- i) Support - supporting framework for body.
- ii) Protection - protects vital organs (brain & thoracic cavity)
- iii) Movement/lever - allows movement and flexion as well as levers for different movements.
- iv) Mineral storage - Calcium and Phosphate.
- v) Hematopoiesis - Principle site for blood cell formation in red marrow in flat ~~sets~~ bones.
- vi) Electrolyte balance of calcium and phosphorus.
- vii) Acid/Base balance buffers the blood calcium phosphate.
- viii) Detoxification by absorbing heavy minerals.