

Introduction to Anatomy

Level : 1
Semester: 1
BSF Module



Dr./ Samar Fawzy

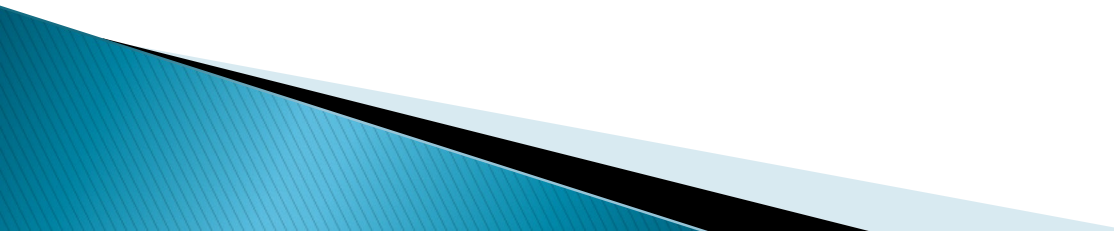
ANATOMY DEPARTMENT

Learning Objective

The students should be able to:

- Discuss bone classification.
- Explain the general feature and surface markings of bones.
- Discuss skeleton and its function

ARRANGEMENT OF STRUCTURES IN THE BODY FROM WITHIN OUTWARDS


1. Bones form the supporting framework of the body.
 2. Muscles are attached to bones.
 3. Blood vessels, nerves and lymphatics form neurovascular bundles which course in between the muscles
 4. The thoracic and abdominal cavities contain several internal organs called viscera.
 5. The whole body has three general coverings, namely (a) skin; (b) superficial fascia; and (c) deep fascia.
- 

Skeletal system

The word skeleton comes from the Greek word skeleton meaning “**dried up**”.

Include Bone and cartilage


Despite its hardness and high calcium content the bone is very much a living tissue. It is highly vascular, with a constant turn-over of its calcium content. It shows a characteristic pattern of growth.



Bone

Bones are the hard, inelastic and a tough connective tissue that forms part of the human skeleton that has the strength of cast iron and lightness of pinewood.

Functions of the skeletal system:

1. Support: it forms the internal framework
 2. Protection: bones protect soft body organs.
 3. Movement: give muscle attachment
 4. Storage: itself-serves as a storehouse of minerals “calcium and phosphors”.
 5. Blood cell formation:
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Classification of bones

Regional classification

Morphological classification

Structural classification

Developmental classification

Regional classification

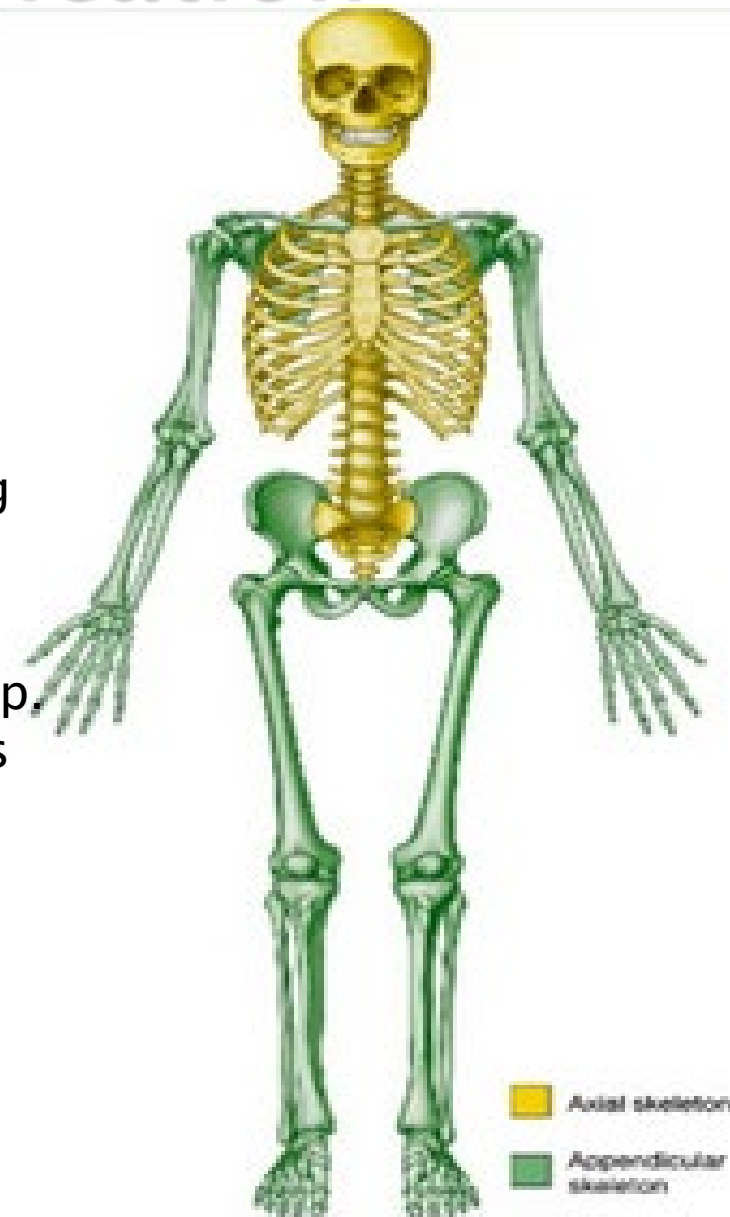
The Adult human skeletons have 206 named bones that are grouped into

***The Axial skeleton**

consist bones that lie around the axis including skull, vertebral column and thoracic cage.

***The appendicular skeleton**

consist bones of the body out of the axial group. These are Upper & lower extremities and bones of girdles



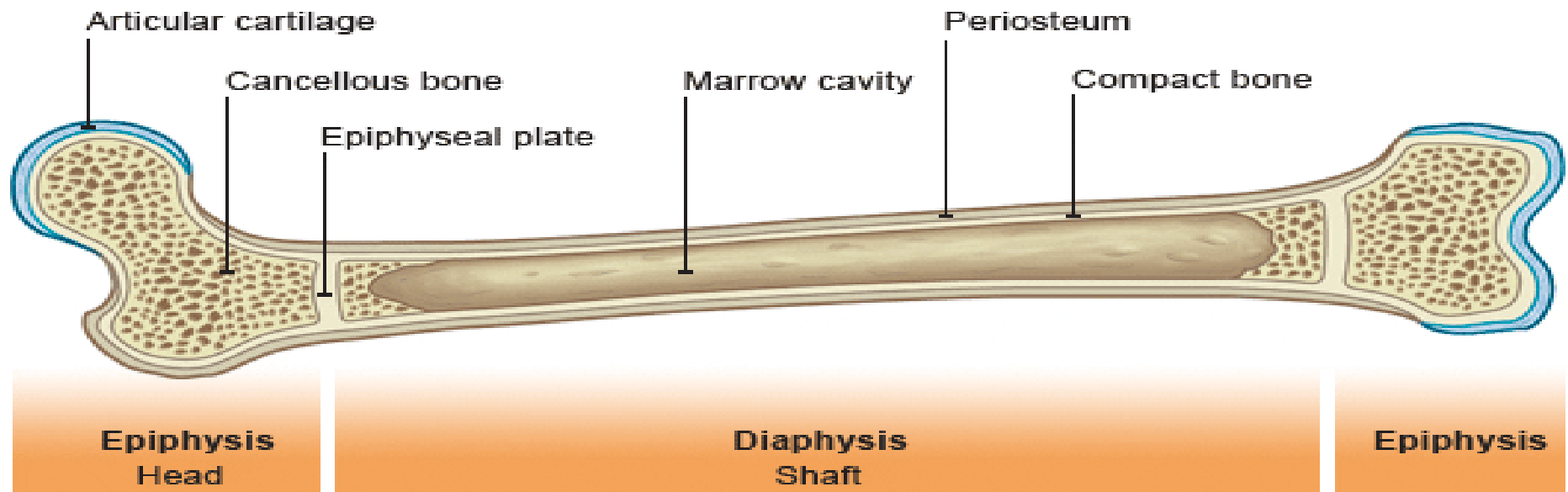
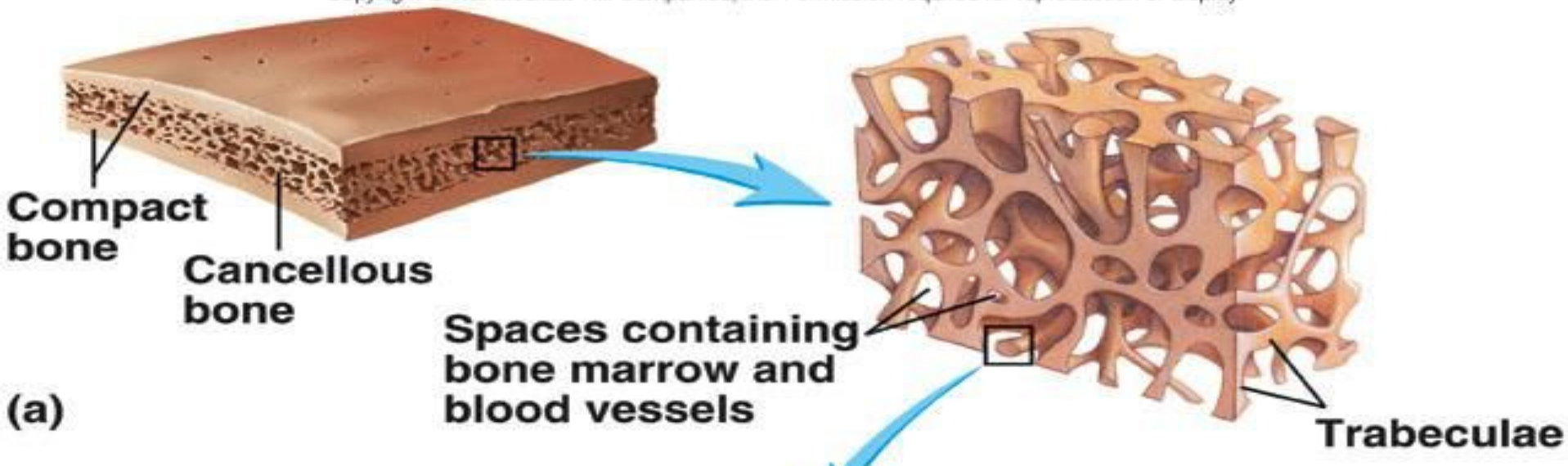
Structural classification

Macroscopically, the architecture of bone may be **compact** or **cancellous**

Compact bone	Cancellous (spongy) bone
the cortex of all types of Bone. The best developed is in the cortex of the long bones	In the epiphyses of long bone
Hard and ivory like (resist the bending and twisting)	Spongy; trabecular meshwork

Structural classification

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Developmental classification

Bones develop through a process known as
“Ossification”

Bone in embryo develops in two ways:

→ **membranous bone,**

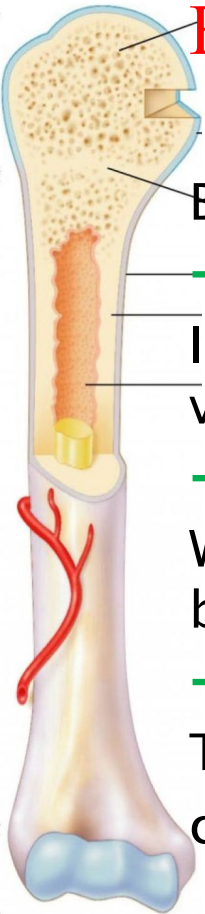
If bone develops directly from mesenchymal tissue. Examples are vault of the skull and part of the clavicle.

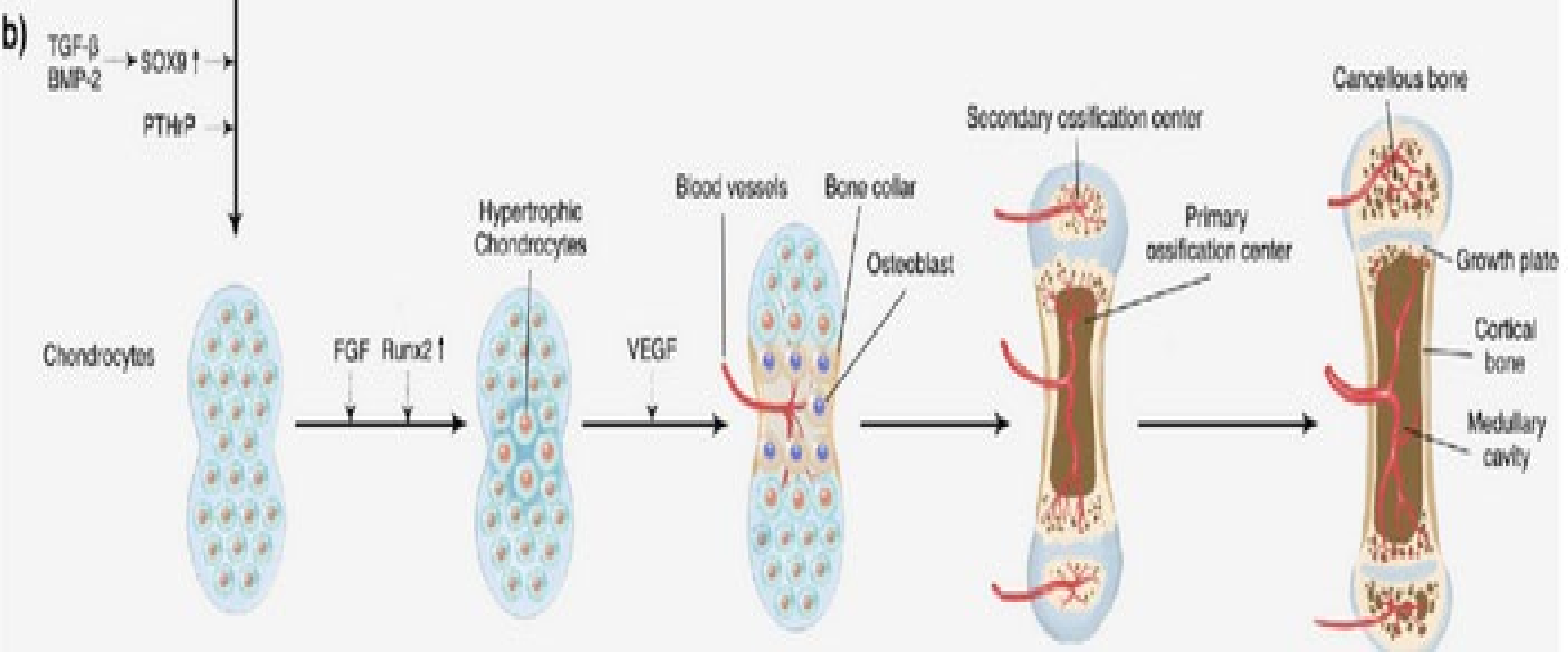
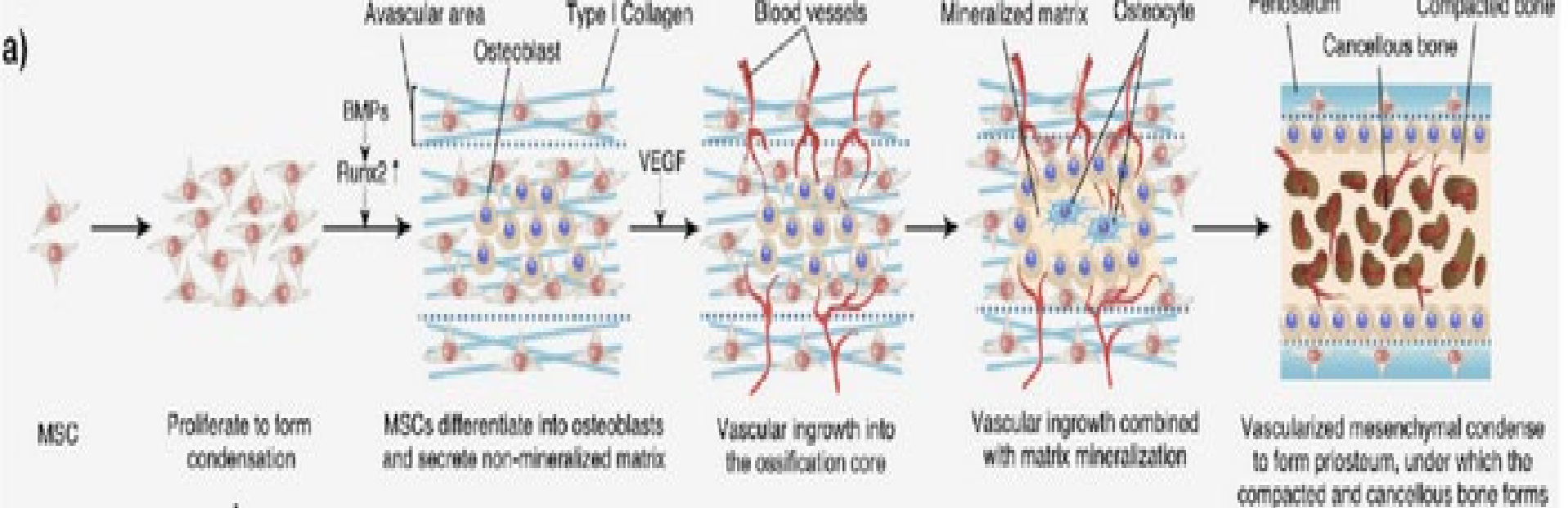
→ **Cartilaginous bone,**

When bone tissue develops by replacing hyaline cartilage as long bones of limbs and bones of thoracic cage.

→ **Bones of mixed ossification “Membrano–cartilaginous bones”:**

The bones developed partly from membrane and partly from cartilage as in the mandible and clavicle.???





Which of the following is not part of the appendicular skeleton?

- a) Scapula
- b) Clavicle
- c) Radius
- d) Ribs
- e) Tibia

Morphological classification

- 1 – long bone
 - 2 – short bone
 - 3 – flat bone
 - 4 – irregular bone
 - 5 – pneumatic bone
 - 6 – sesamoid bone
 - 7 – accessory bone
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Morphological classification

1. Long bones:

Each long bone has an elongated shaft (diaphysis) and two expanded ends (epiphyses) which are smooth and articular.

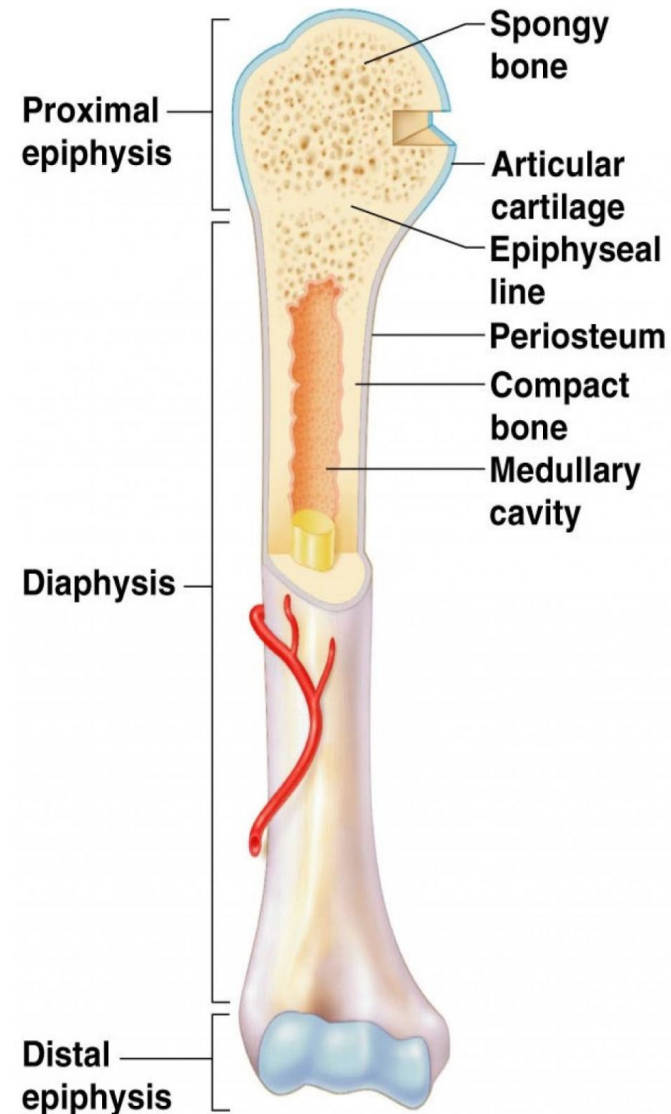
(a) typical long bones:

Has two expanded ends, a central medullary cavity like humerus, radius, ulna, femur, tibia and fibula;

(b) Atypical long bones

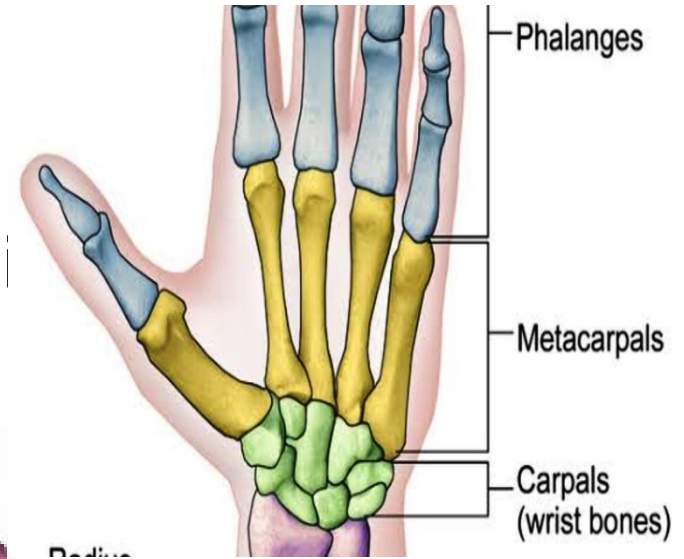
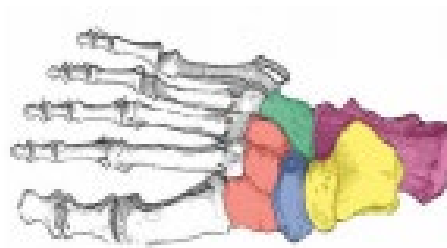
*have only one epiphysis like metacarpals, metatarsals and phalanges;

*Or have no medullary cavity like clavicle



2. Short bones:

Their shape is usually cuboid, cuneiform, trapezoid, or scaphoid
tarsal and carpal bones



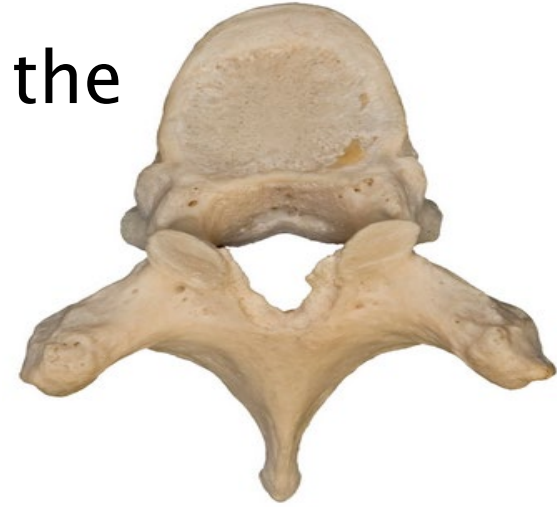
3. Flat bones

resemble shallow plates
as bones in the vault of the skull
ribs, sternum and scapula



4. Irregular bones:

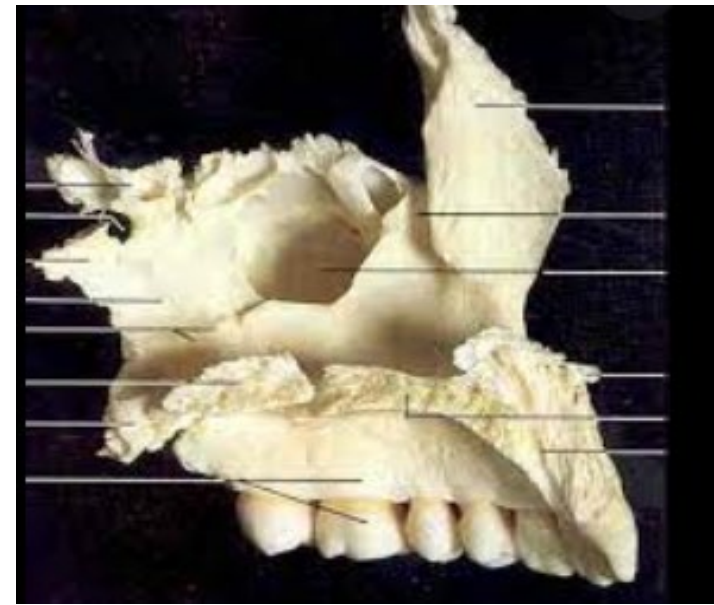
as: vertebra, hip bone, and bones in the base of the skull



5. Pneumatic bones:

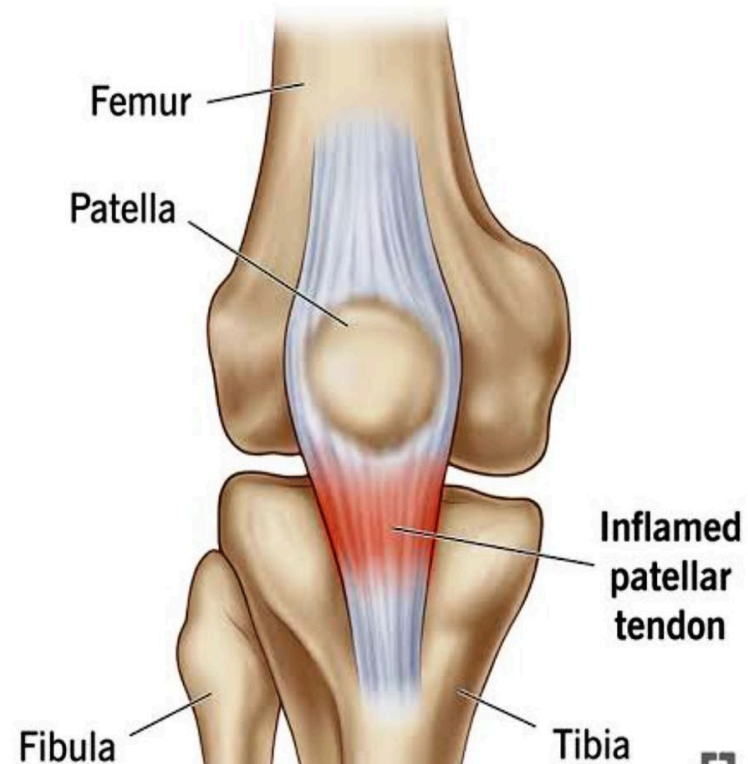
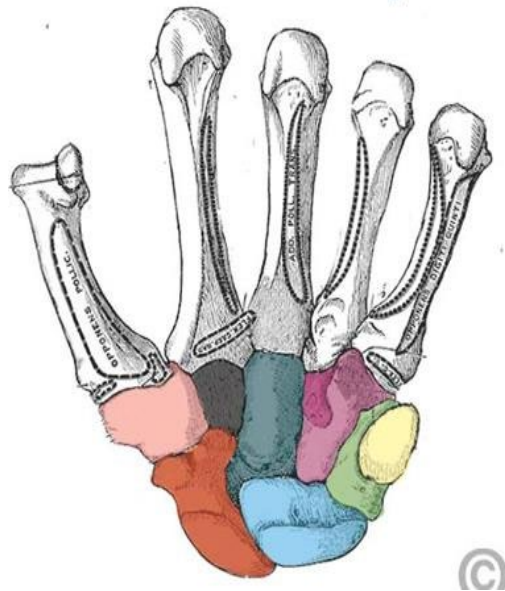
Certain bones contain large air spaces as maxilla, sphenoid, etc.

They make the skull light in weight,
help in resonance of voice



6. Sesamoid bones:

These are bony nodules found embedded in the tendons or joint capsules to resist pressure and reduce friction. They have no periosteum and ossify after birth as: patella, pisiform,



7. Accessory bones

They usually occur in the developing bone and do not fuse completely. They look like extra bones or broken on X-ray.

In medicolegal practice, accessory bones may be mistaken for fractures.



Structure of the living long bones

1) **Epiphysis:** the ends of long bone.

2) **Diaphysis:** shaft of long bone.

3) **Metaphysis:**

The epiphysial ends of a diaphysis. It is the zone of active growth. Before epiphysial fusion, the metaphysis is richly supplied with blood through end arteries forming 'hair-pin' bends

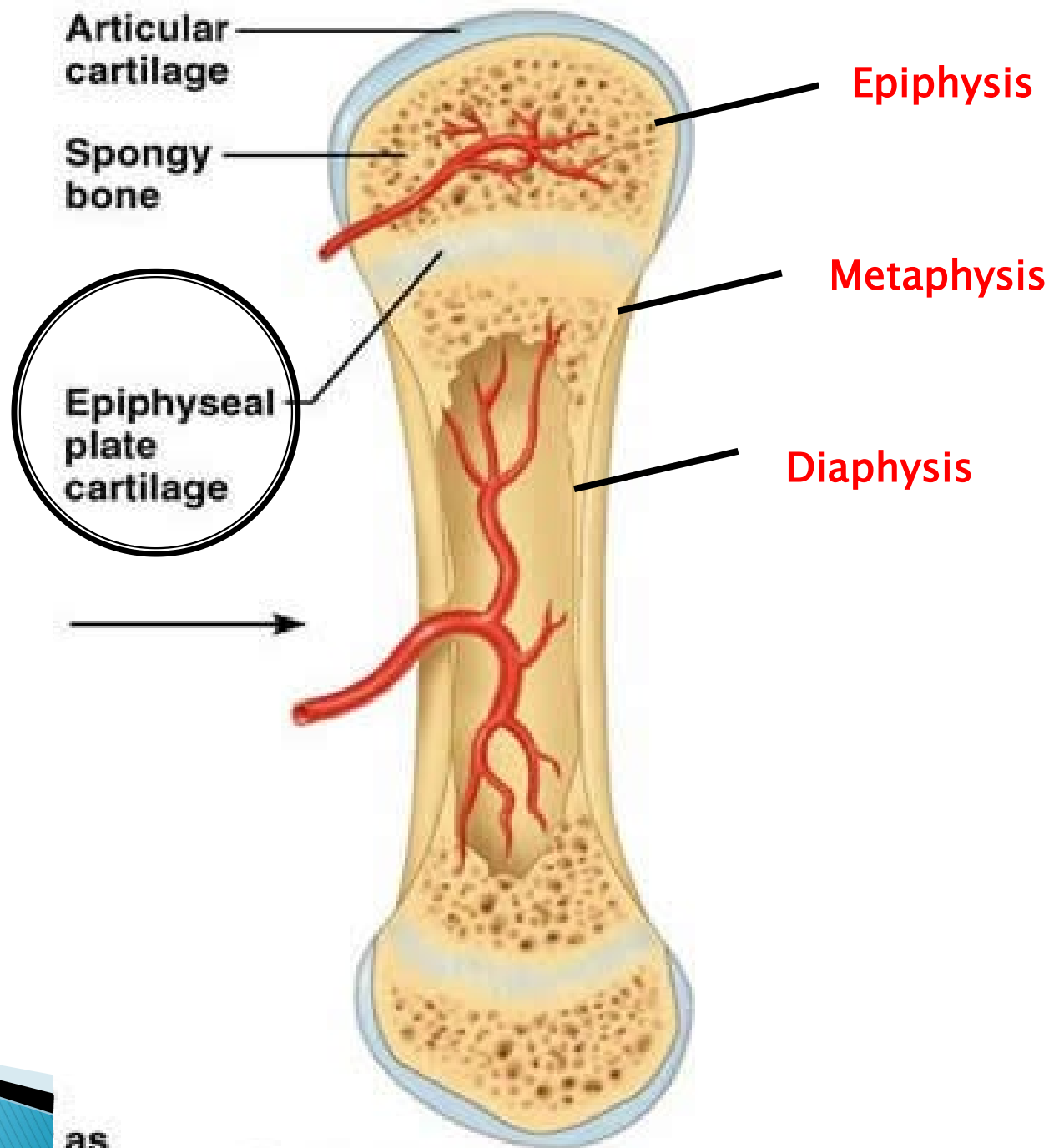
4) **Epiphyseal plate of cartilage:**

It separates epiphysis from metaphysis.

Proliferation of its cells is responsible for length growth of a long bone

It is nourished by both the epiphysial and metaphysial arteries.





The shaft (diaphysis) is formed of

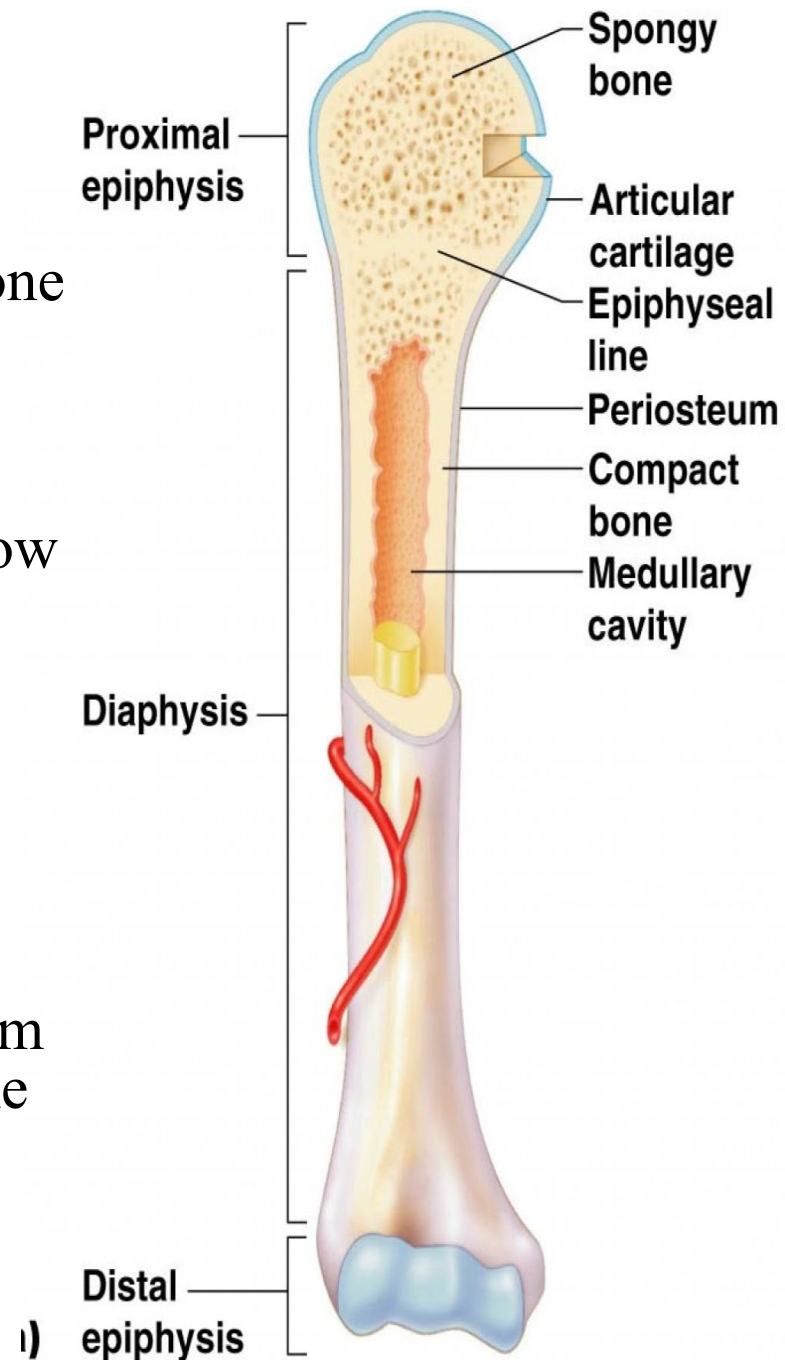
Periosteum:

It is a thick fibrous membrane covering the outer of the shaft. Important in growth of bone in thickness, innervation and nourishment

Cortex of compact bone

Medullary cavity: is filled with red or yellow bone marrow.

At birth the marrow is red everywhere with widespread active haemopoiesis(blood formation). With the age, the red marrow at many places atrophies and is replaced by yellow, fatty marrow, with no power of haemopoiesis. Red marrow persists in the cancellous ends of long bones. In the sternum ribs, iliac crest, vertebrae and skull bones the red marrow is found throughout life.



Blood supply of the bone

Arteries

1. Long Bones

(a) Nutrient artery

It enters the shaft through the nutrient foramen, through the cortex, to the medullary cavity supplies medullary cavity, inner 2/3 of cortex and inner 2/3 of metaphysis

(b) Periosteal arteries

These are especially numerous, supply the outer 1/3 of the bone cortex

(C) Metaphyseal arteries:

they supply metaphysis and anastomosis with nutrient artery

(D) Epiphyseal arteries

arise from the articular artery, they enter the epiphysis through multiple foramina at the end of the shaft

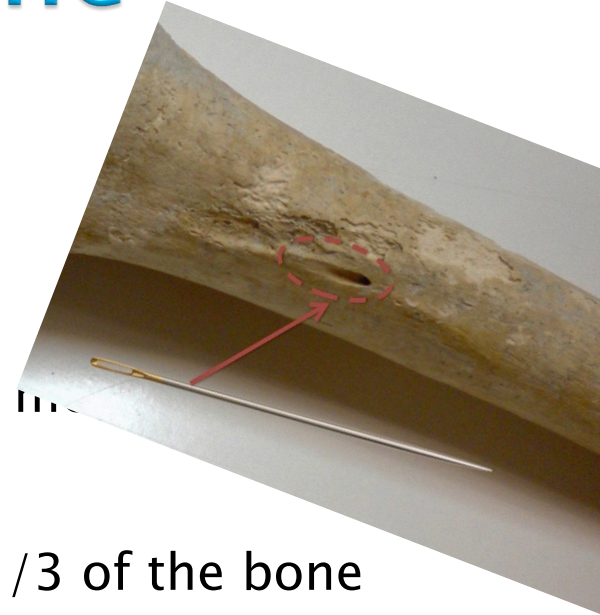
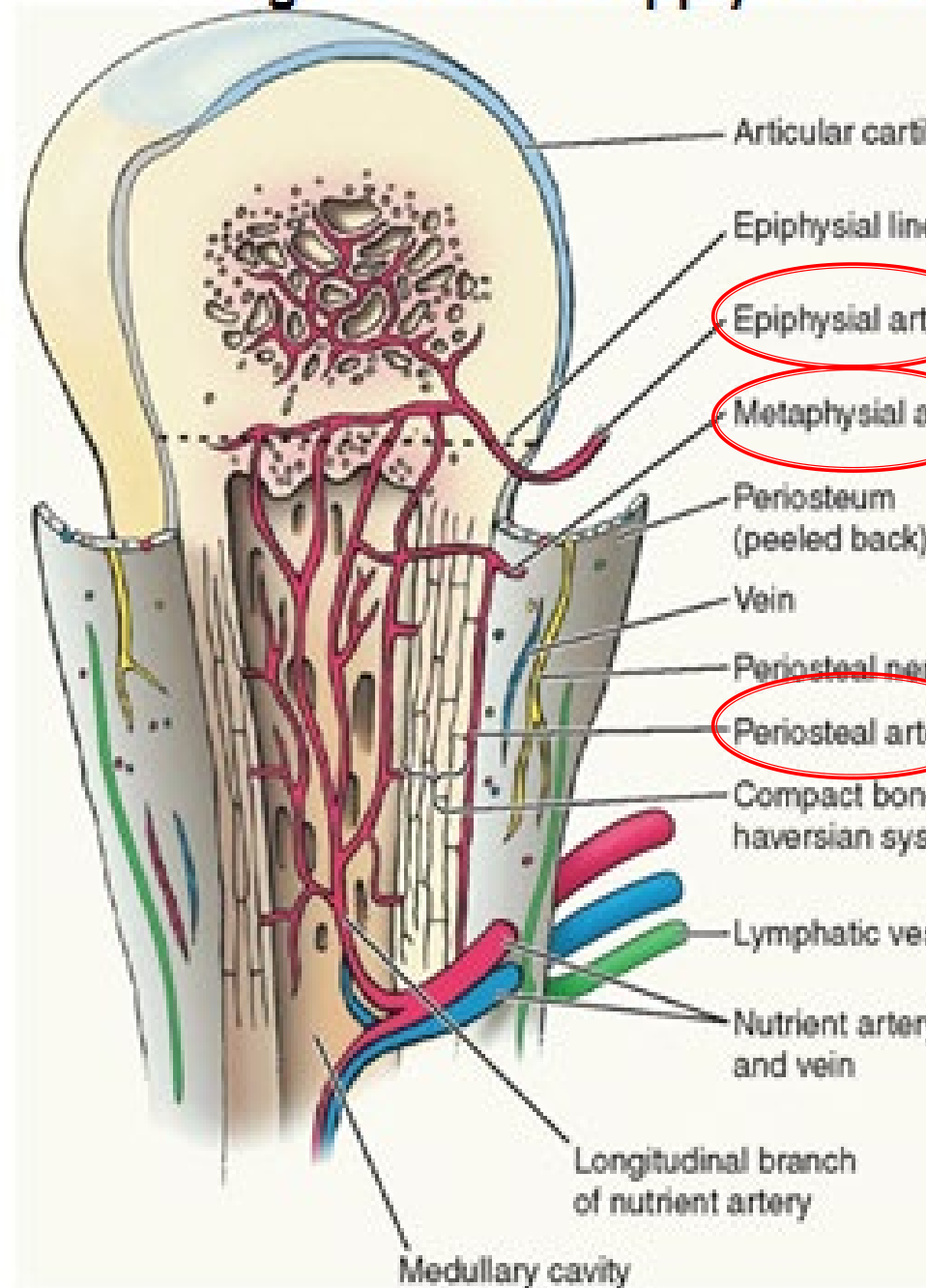
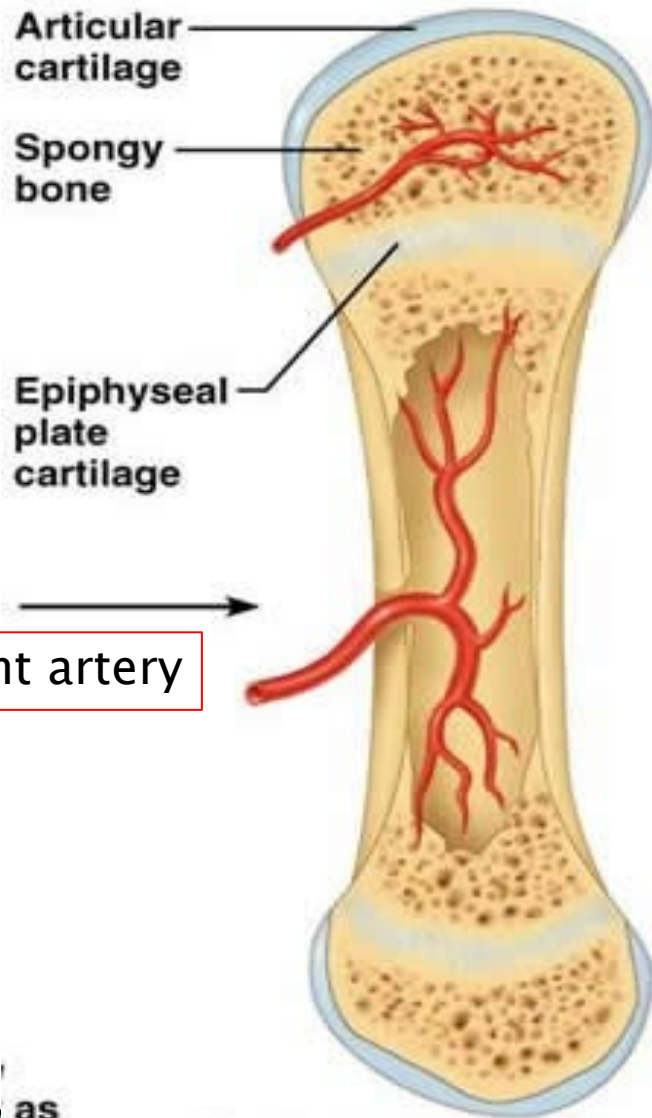
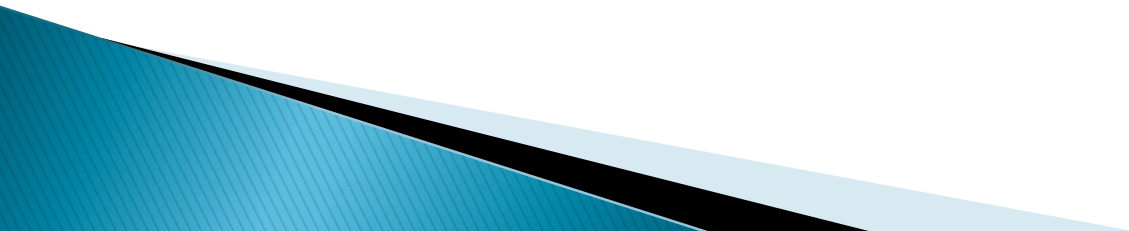


Fig .11 :-Blood supply of bone



2. Other Bones

Like Short bones are supplied by numerous periosteal vessels which enter their nonarticular surfaces.



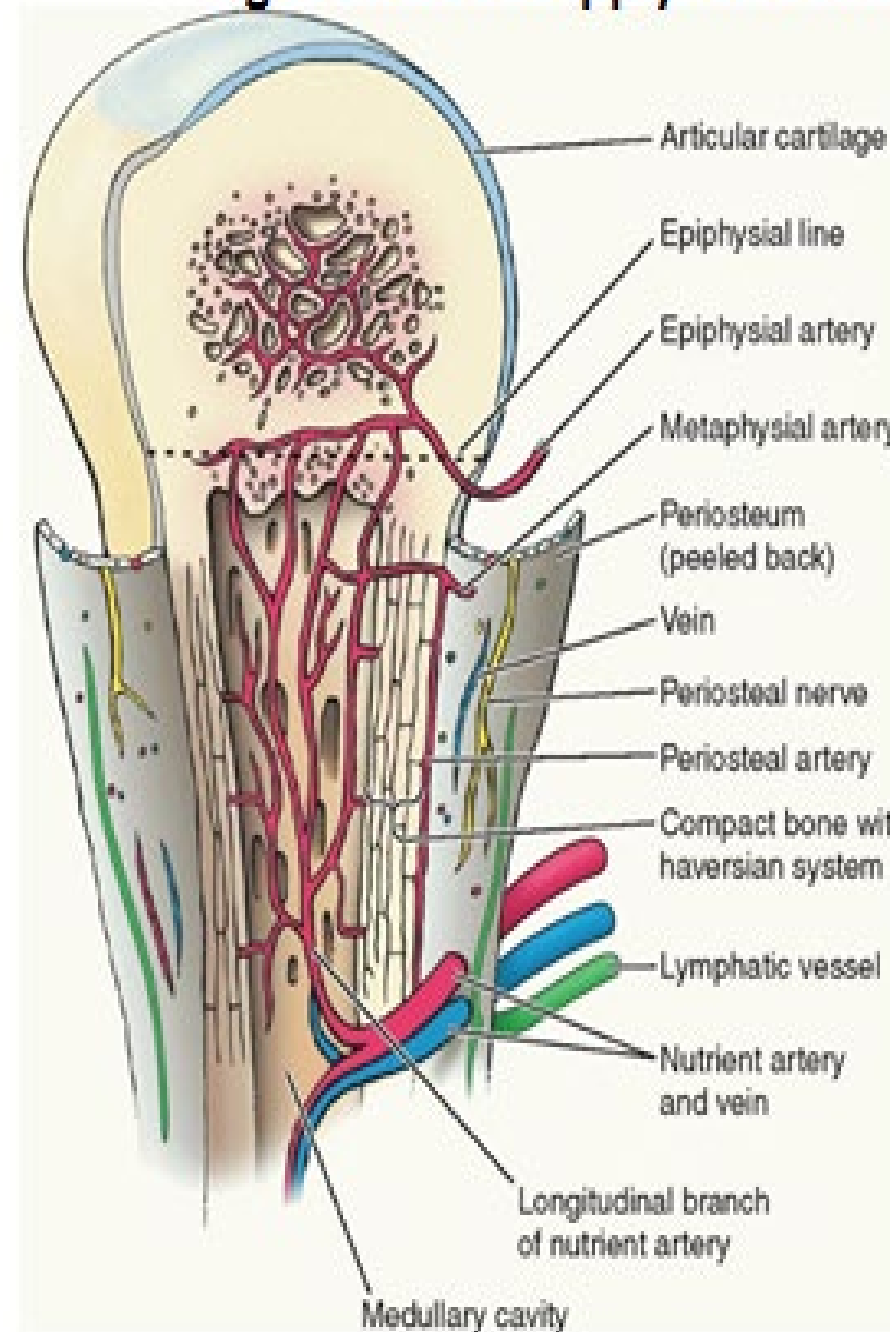
Venous drainage

The veins accompany the arteries, and are relatively small.

Lymphatic vessels:-

They accompany the periosteal vessels to the regional lymph nodes.

Fig .11 :-Blood supply of bone



***Nerve supply of bones:**

Nerves accompany the blood vessels

a– Sensory fibers

b– Vasomotor sympathetic fibers,

Quiz

Which of the following arteries supply the outer 1 / 3 of the bone cortex?

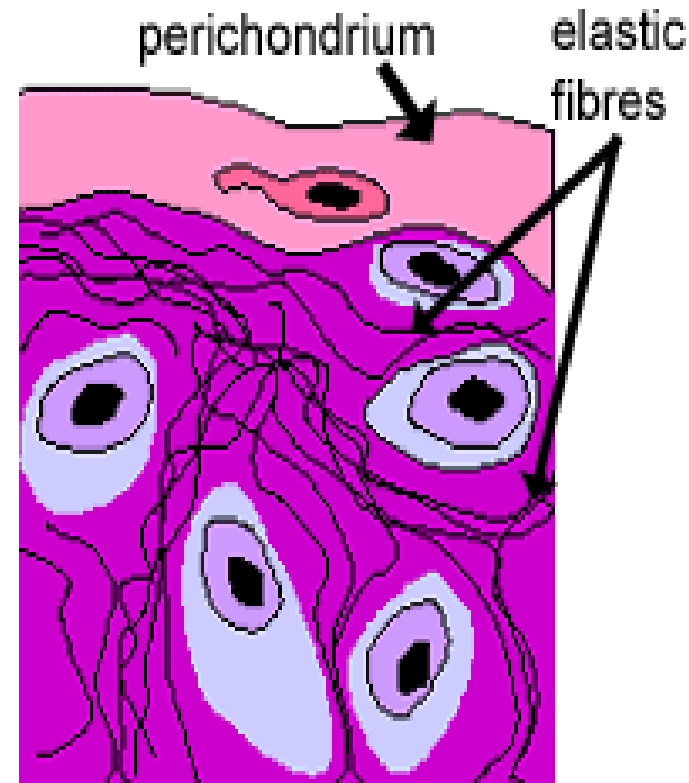
- 1– nutrient artery
- 2– periosteal artery
- 3– metaphyseal artery
- 4– epiphyseal artery

Cartilage

It forms the firm, rubber- like part of the skeleton

Features

- a non-vascular structure
- **insensitive**
- covered by a fibrous membrane named perichondrium.
- Calcification of cartilage, occurs when it is replaced by bone .
- a radiolucent



CLASSIFICATION

A– HYALINE CARTILAGE:

It is homogenous, bluish white and translucent.

Its distribution in the body is as follows:

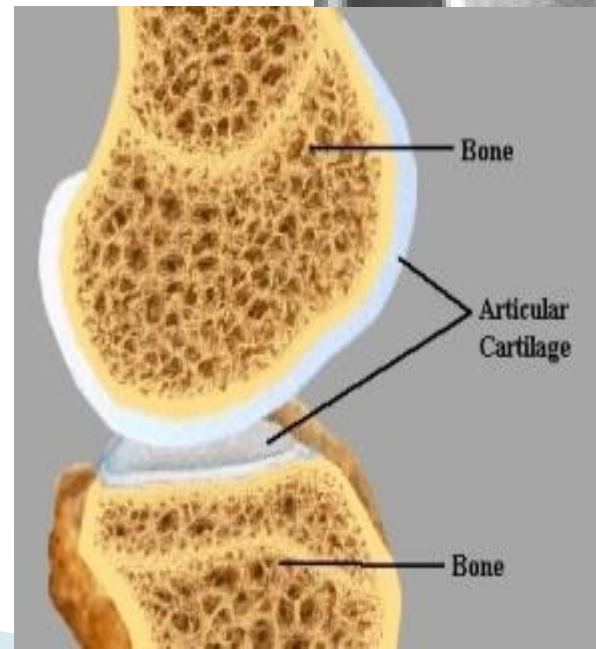
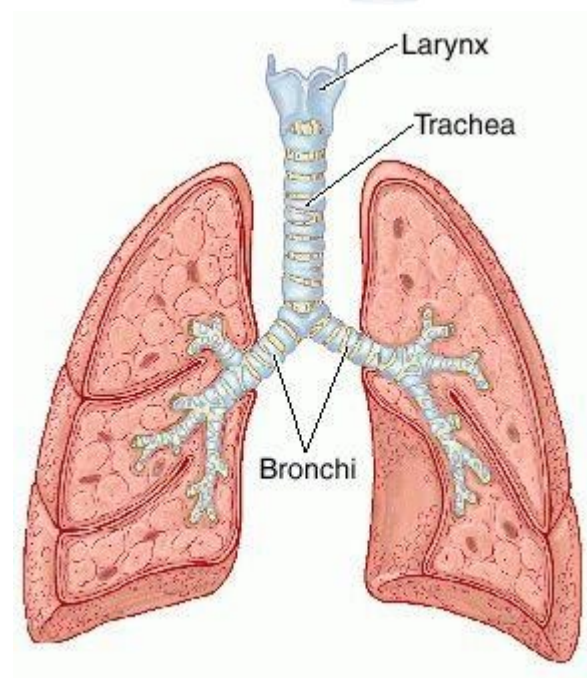
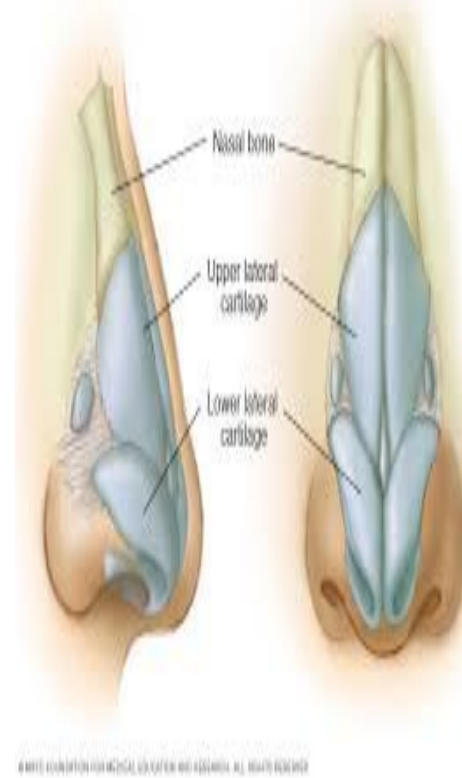
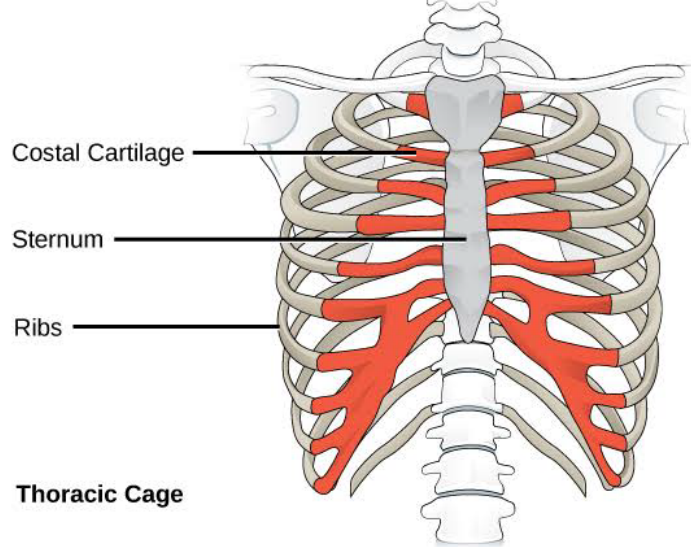
1–Articular cartilage of synovial joints

2– Epiphyseal cartilage plates

3– Costal cartilages.

4– In respiratory system:

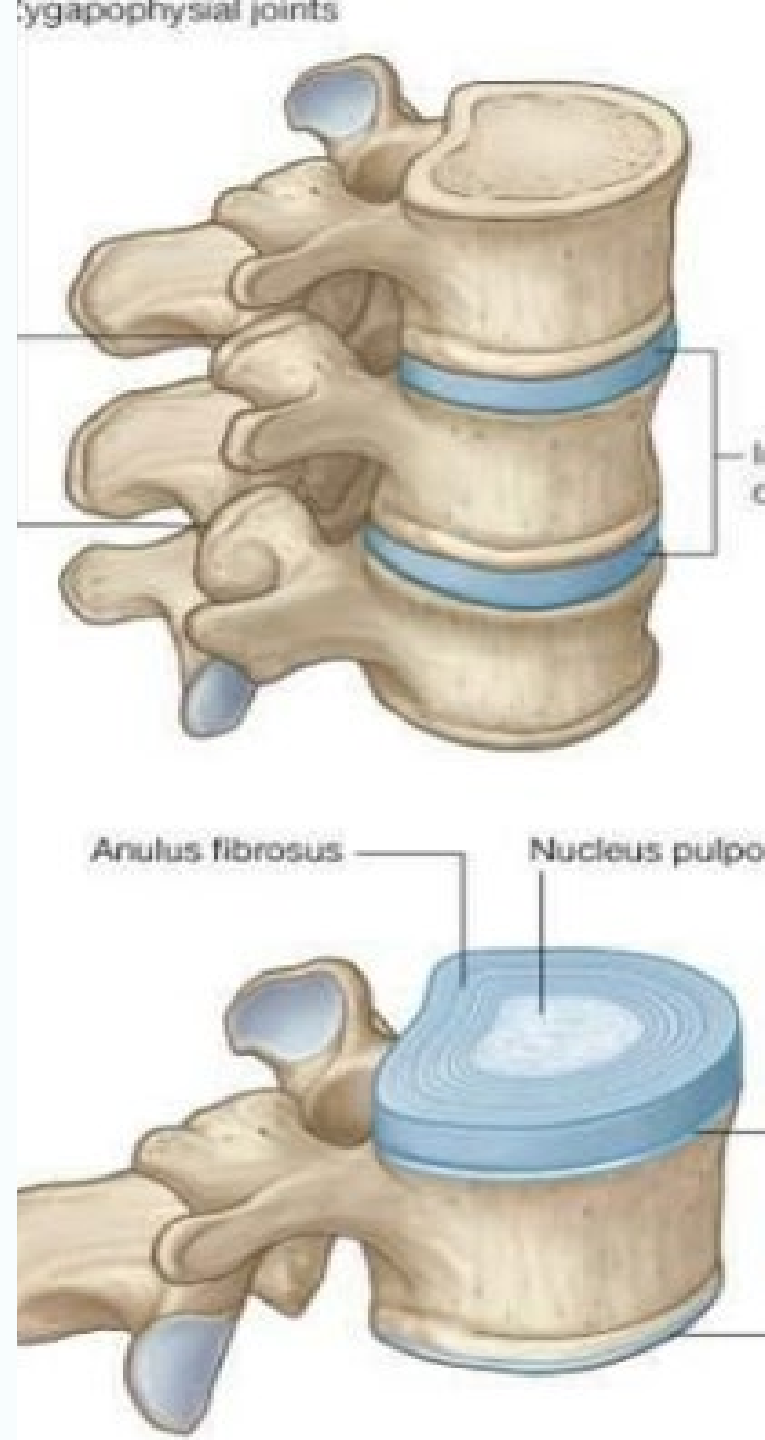
As Nasal cartilages, Larynx , the trachea and bronchi.



B– White fibrocartilage

It is the cartilage rich in white collagenous fibers, white colour and opaque appearance. It is resilient, strong and tough, and is usually found in places subjected to great pressure

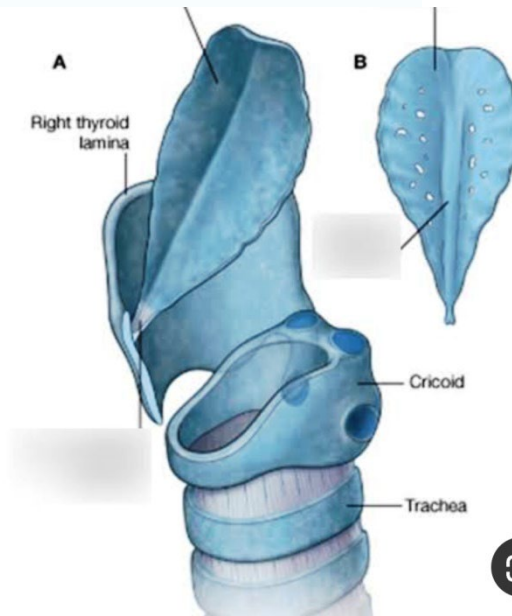
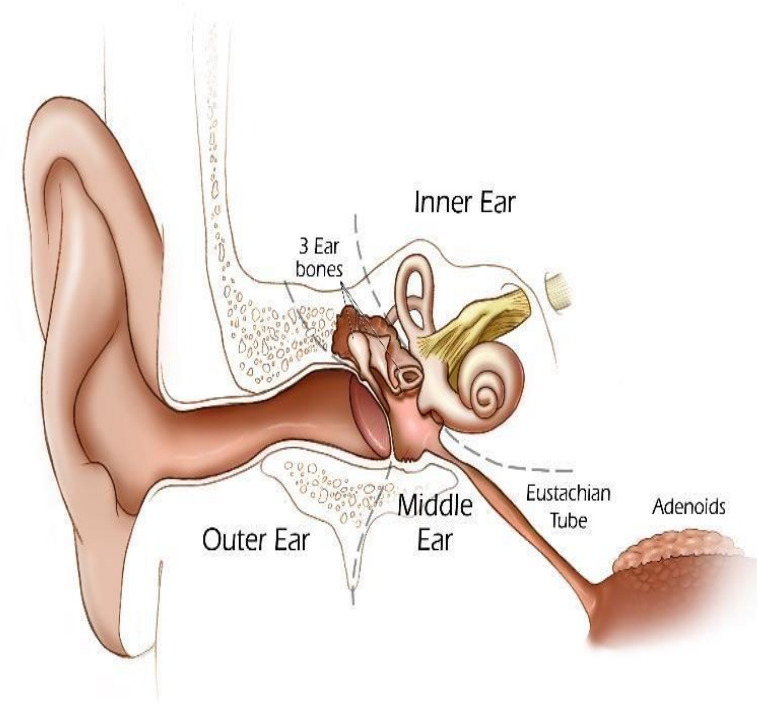
Examples:– Intervertebral discs (IVD)



C– Yellow elastic fibrocartilage

It is the cartilage rich in yellow elastic fibers which make it more flexible

- Examples:– External ear, auditory tube, epiglottis



	Hyaline Cartilage	Fibrocartilage	Elastic cartilage
Location	In the articular cartilages of long bones, sternum, ribs, nasal and some laryngeal cartilages	In the intervertebral disc of pubic symphysis, temporomandibular joints, sterno-clavicular joint	In the pinna, external auditory meatus, Eustachian tubes, epiglottis, vocal process of arytenoid cartilage
Colour	Bluish white	Glistening white	Yellowish
Appearance	Shiny or translucent	Opaque	Opaque
Fibres	Very thin, having same refractive index as matrix, so these are not seen	Numerous white fibres	Numerous yellow fibres
Elasticity	Flexible	More firm strongest	Most flexible

All the following are hyaline cartilage except

- 1– nose
- 2– articular cartilage
- 3– intervertebral disc
- 4– trachea

*Thank
you*

