Al-Mustansiriyah university
College of medicine
Dept. of anatomy, Histology & embryology
Assist. Prof. Dr. Sameh Sameer Akkila


# An introduction to anatomy

## part 1: Anatomical terminology

### Objectives:

- Understand the terms used in anatomical & medical studies (how and when to use them)

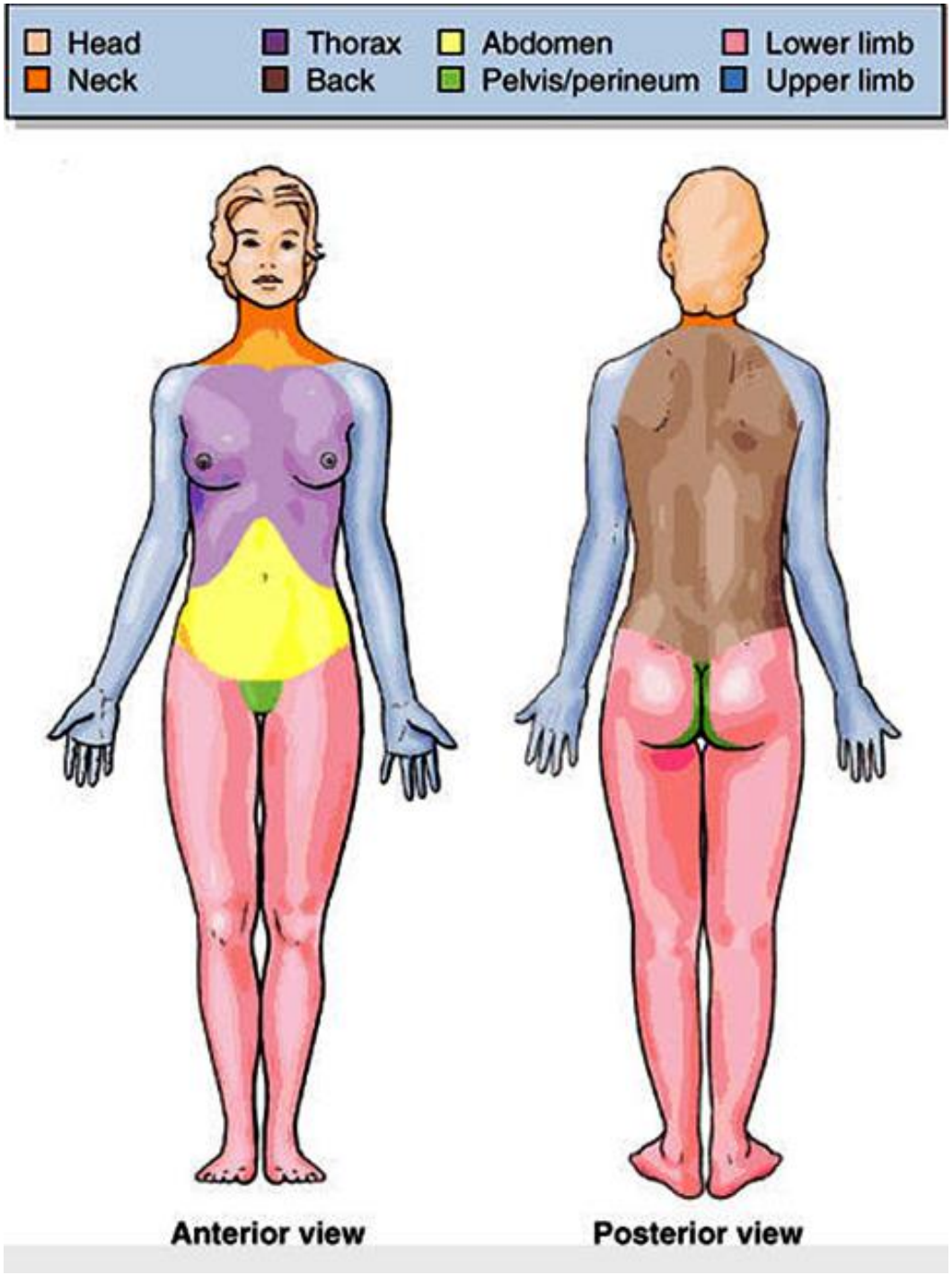
Supplementary text provided
Gray's anatomy for students 4th edition pp.2-4

# THE DEFINITION OF ANATOMY

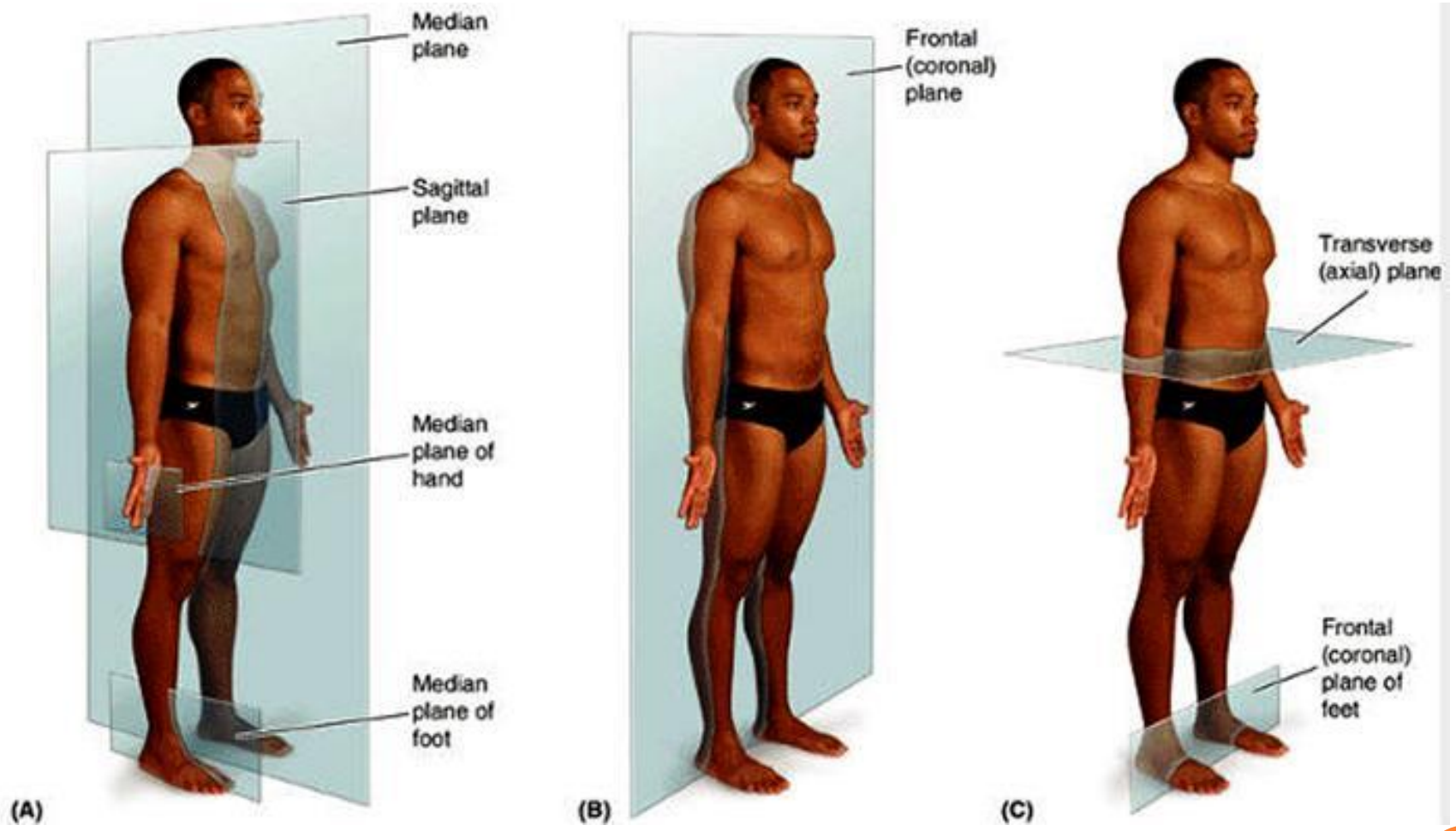
- Anatomy
  - Greek=to cut up, or dissect
  - The science that deals with the structures of the body
- Kinds:
  - Gross Anatomy (Systematic, Regional)
  - Microscopic Anatomy (Cytology, Histology)
  - Developmental Anatomy (Embryology)
  - Comparative Anatomy

Describes & Relates

# Body regions



# The body planes



# Directional (relative) Terms of the Body

- Directional terms are precise and brief, and for most of them there is a correlative term that means just the opposite.

The mouth is below the nose.
The mouth is under the nose.
The mouth is beneath the nose.
The mouth is underneath the nose.
Which one to use?

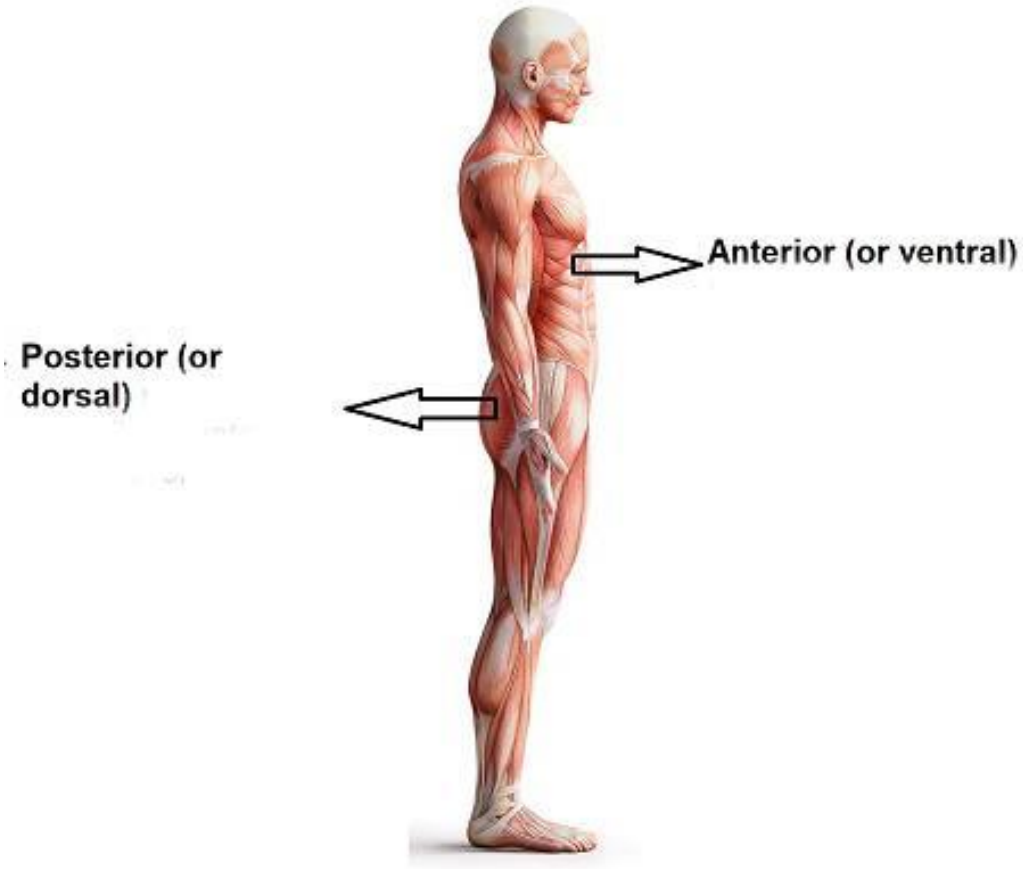
# Relative and Directional Terms of the Body

- Relative to front (belly side) or back (back side) of the body :
  - **Anterior** (ventral) = In front of; toward the front surface
  - **Posterior** (dorsal) = In back of; toward the back surface

e.g.

- The back is the posterior surface of the body. (position)

- The ear is posterior to the eye. (relation)

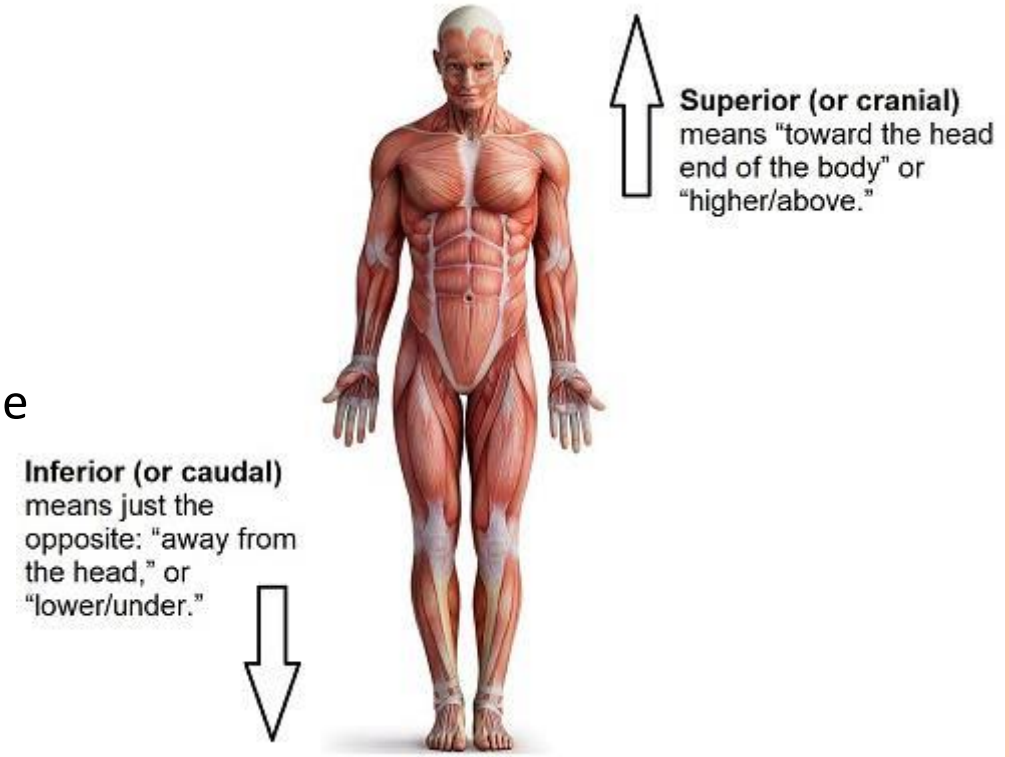


# Relative and Directional Terms of the Body

- Relative to the head or feet:
  - **Superior** (cranial) = Toward the head or upwards
  - **Inferior** (caudal)= Toward feet or downwards

e.g:

- The ankle is an inferior joint in the lower limb. (position)
- In the lower limb, the knee is superior <u>to</u> the ankle.(relation)

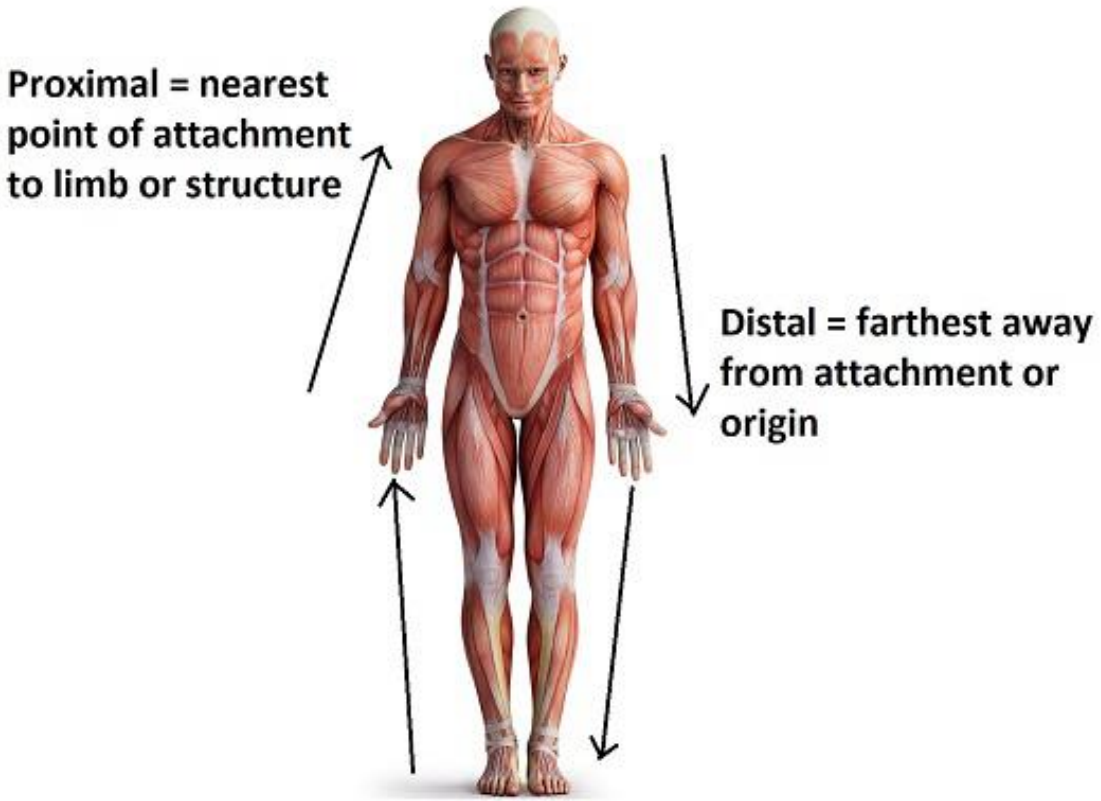


# Relative and Directional Terms of the Body

- Relative to point of attachment of the limb or structure:
  - **Proximal** = Closer to point of attachment to trunk
  - **Distal** = Further from point of attachment to trunk

e.g.

- The shoulder is a proximal joint in the upper limb. (position)
- The hand is distal <u>to</u> the forearm. (relation).

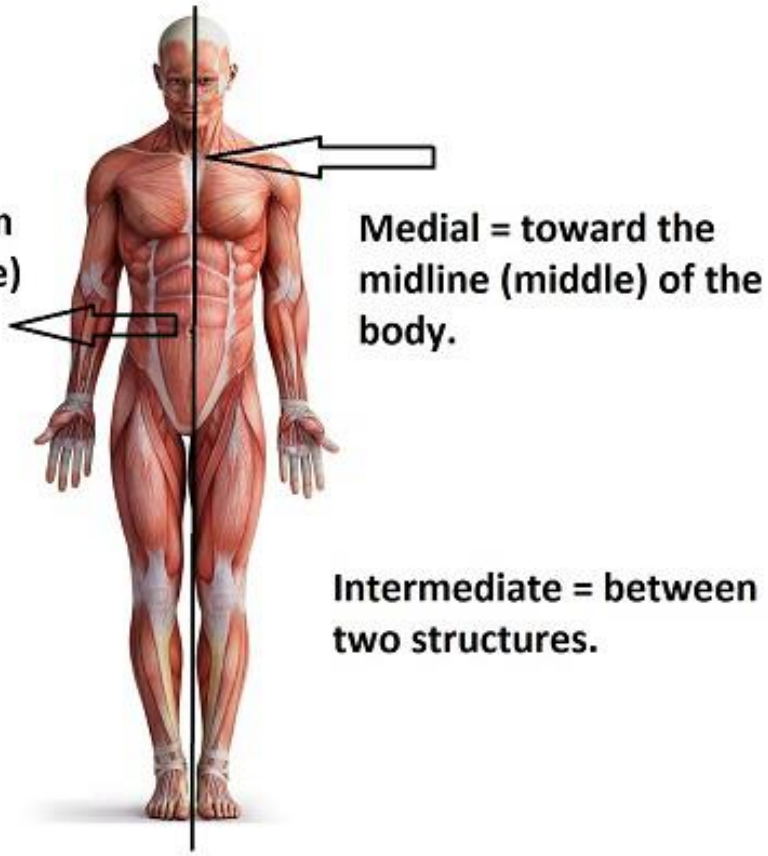


# Relative and Directional Terms of the Body

- Relative to the midline or center of the body:
  - **Medial** = Toward the midline of the body
  - **Lateral** = Away from the midline of the body
  - **Intermediate**= in between

e.g.

- The forearm has two bones, one medial, the other is lateral. (position).
- The arm is lateral <u>to</u> the chest. (relation).



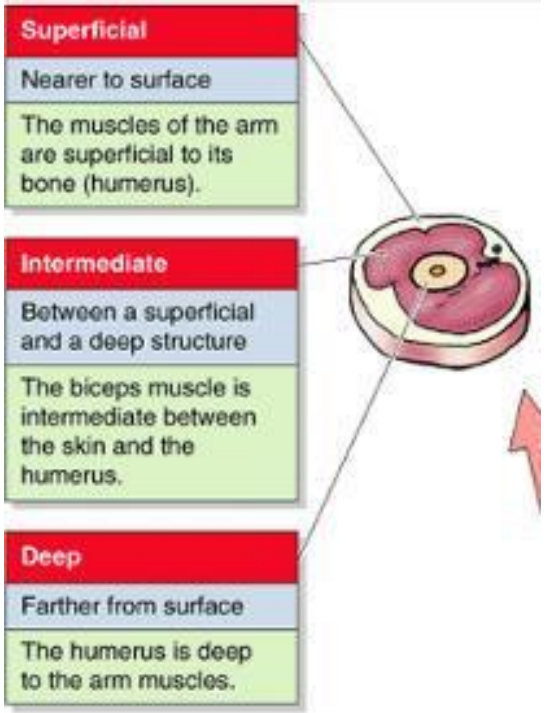
# Relative and Directional Terms of the Body

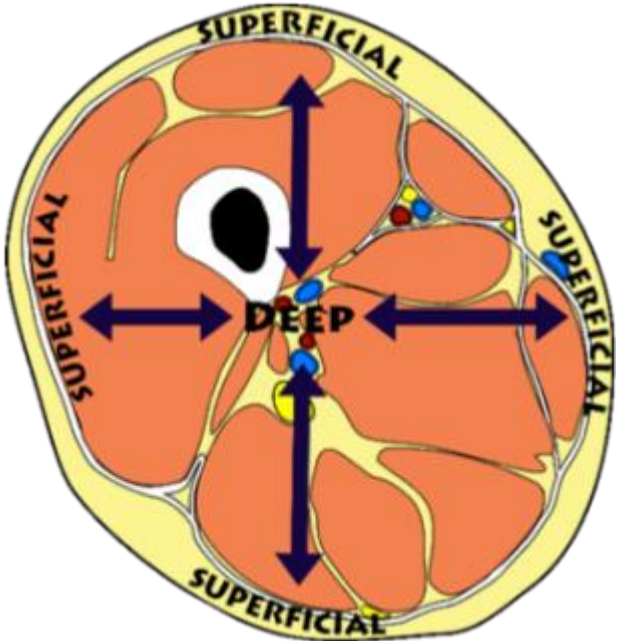
❖Relative to the surface of the body (skin):

- **Superficial** = Closer to the skin
- **Deep** = Further from the skin
- **Intermediate** = in between

e.g.

- The bone is deep <u>to</u> the skin and the muscles are intermediate.



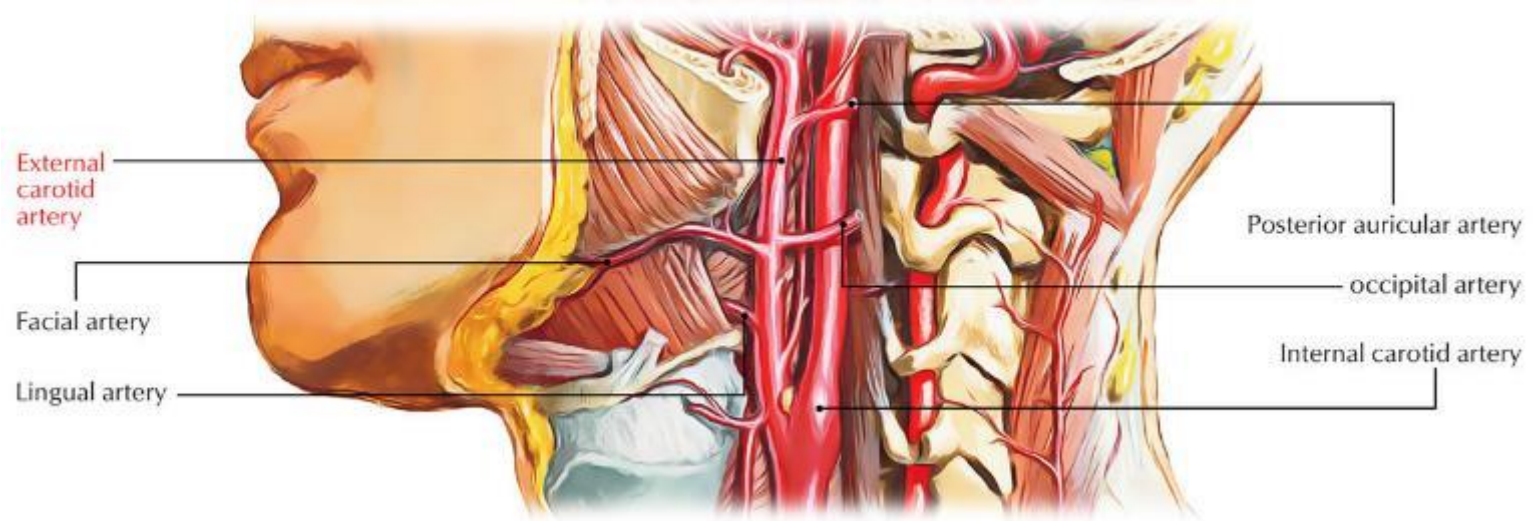
# Relative and Directional Terms of the Body

❖Relative to the surface of an organ or region

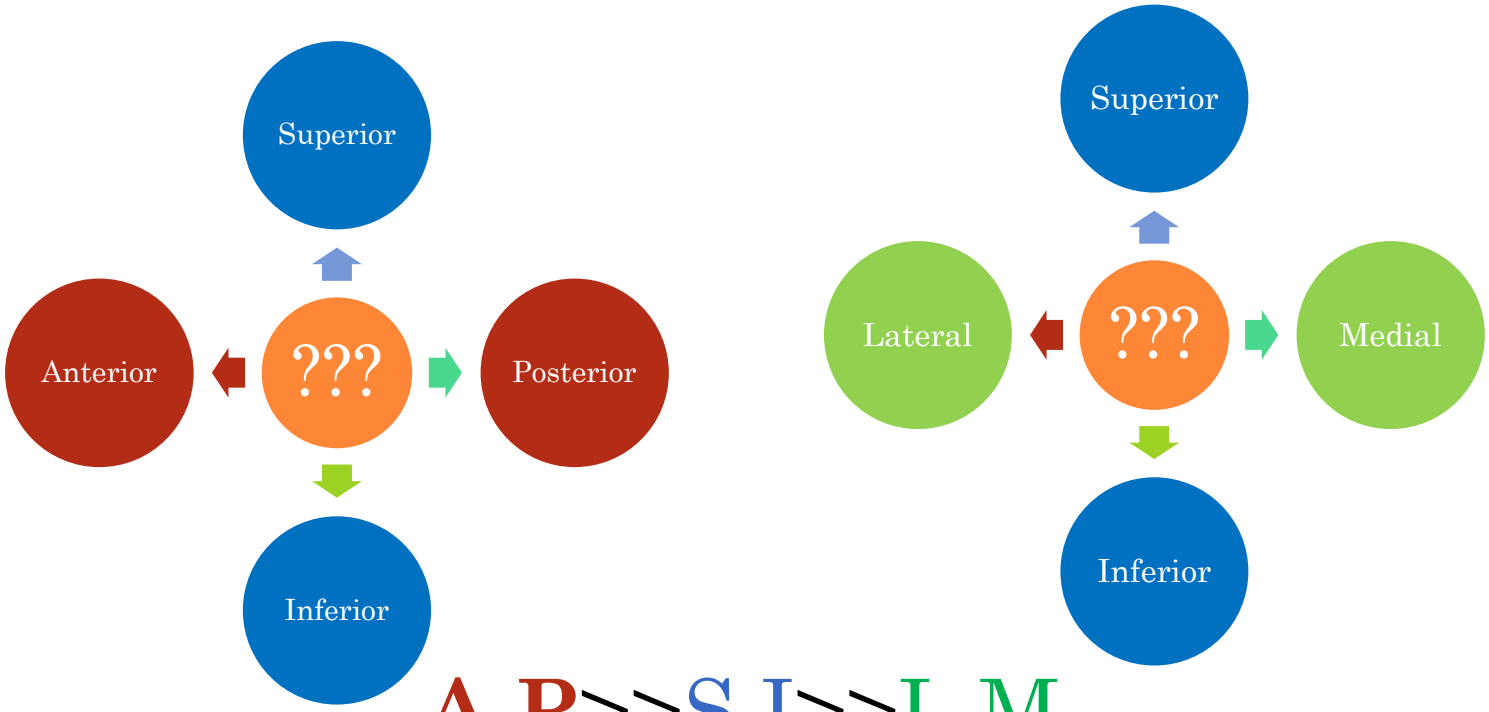
- **External** = Closer to the surface
- **Internal** = Further from the surface
- **Intermediate** = in between

e.g.

- There are two carotid arteries in the neck, one external and the other internal.



# The anatomical compass




**A,P>>S,I>>L,M**

e.g.

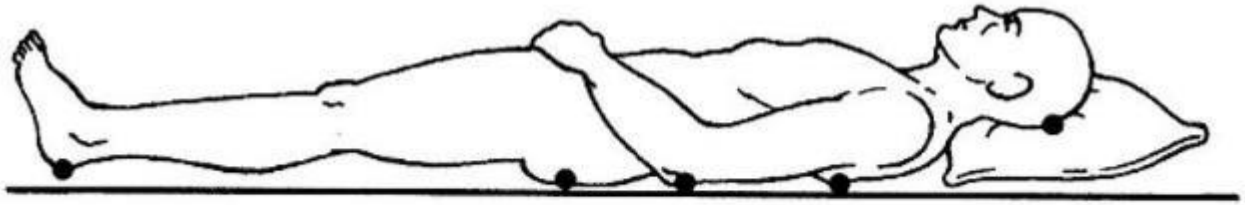
- The nose is anteromedial to the ear.
- The thigh in inferolateral to the navel.
- The buttock is posteroinferior to the chest.

# The anatomical position

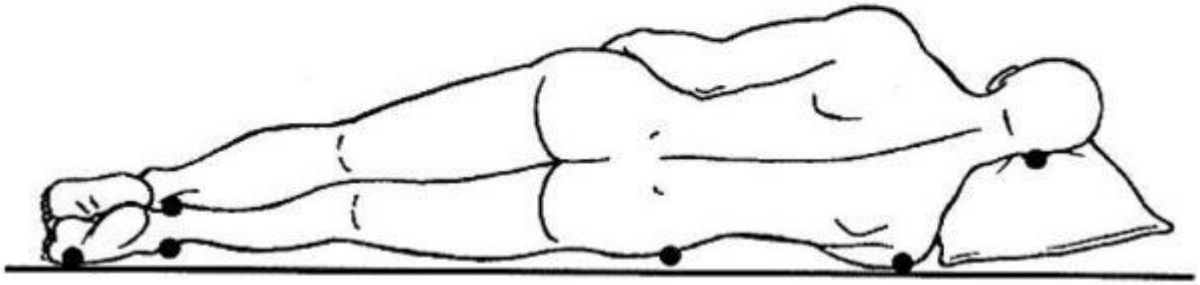
- Anatomic position is a fixed body position in which an individual stands upright with the feet kept together parallel and flat on the floor.
- The head is level, and the eyes look forward toward the observer.
- The arms are at either side of the body with the palms facing forward and the thumbs pointing away from the body.

# Other positions

PRONE



SUPINE

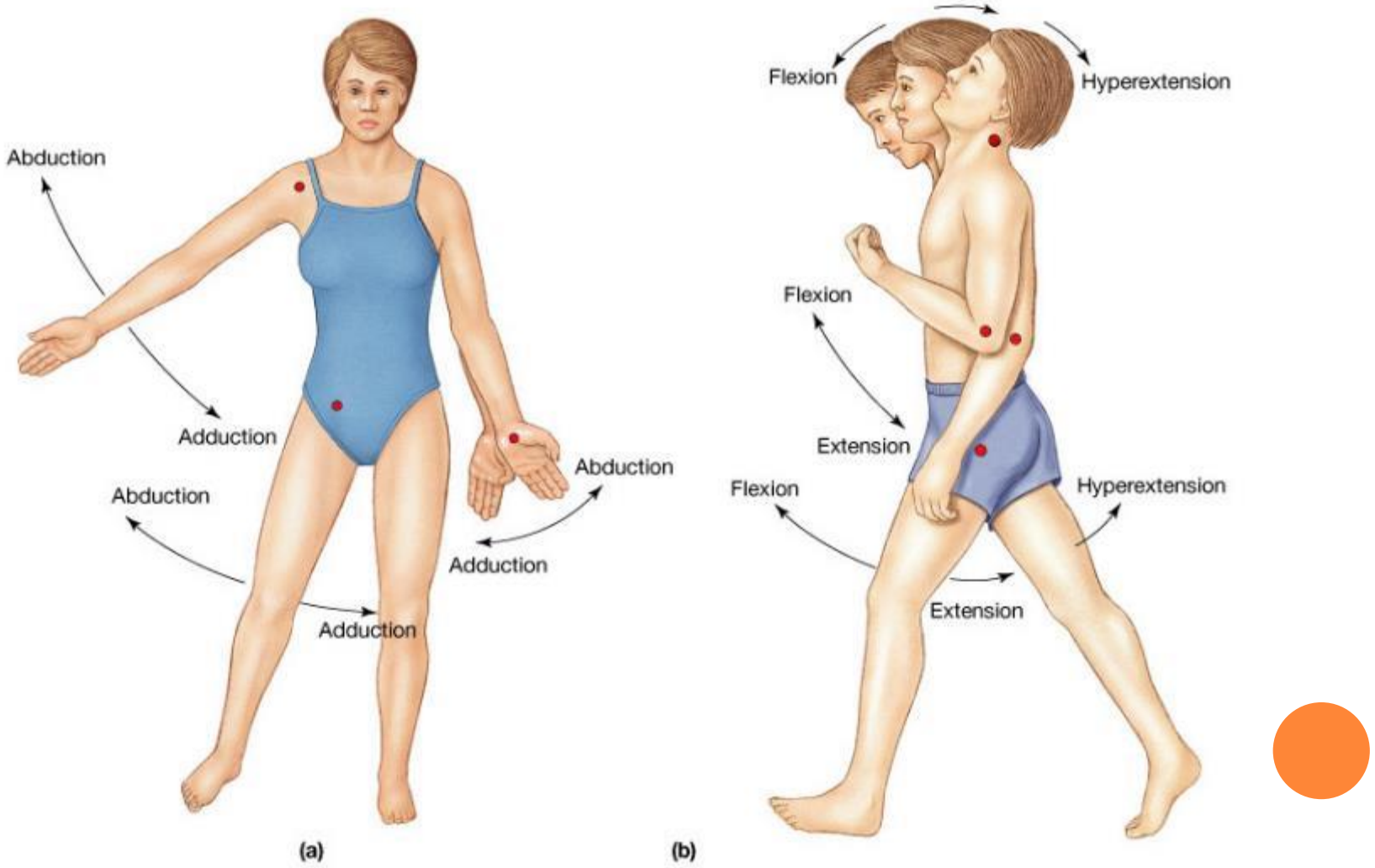


LATERAL DECUBITUS (recumbent)

# Angular movements

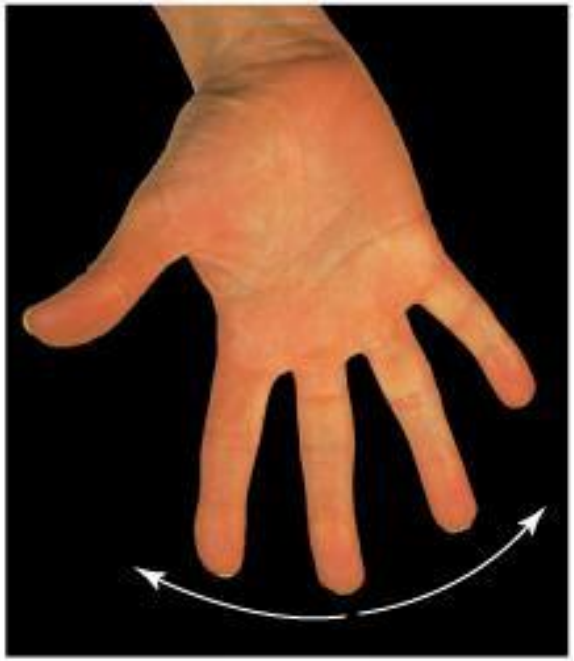
Flex (flexion): to fold X Extend (extension): to unfold

Abduct (abduction): to move away X Adduct (adduction) to move inward



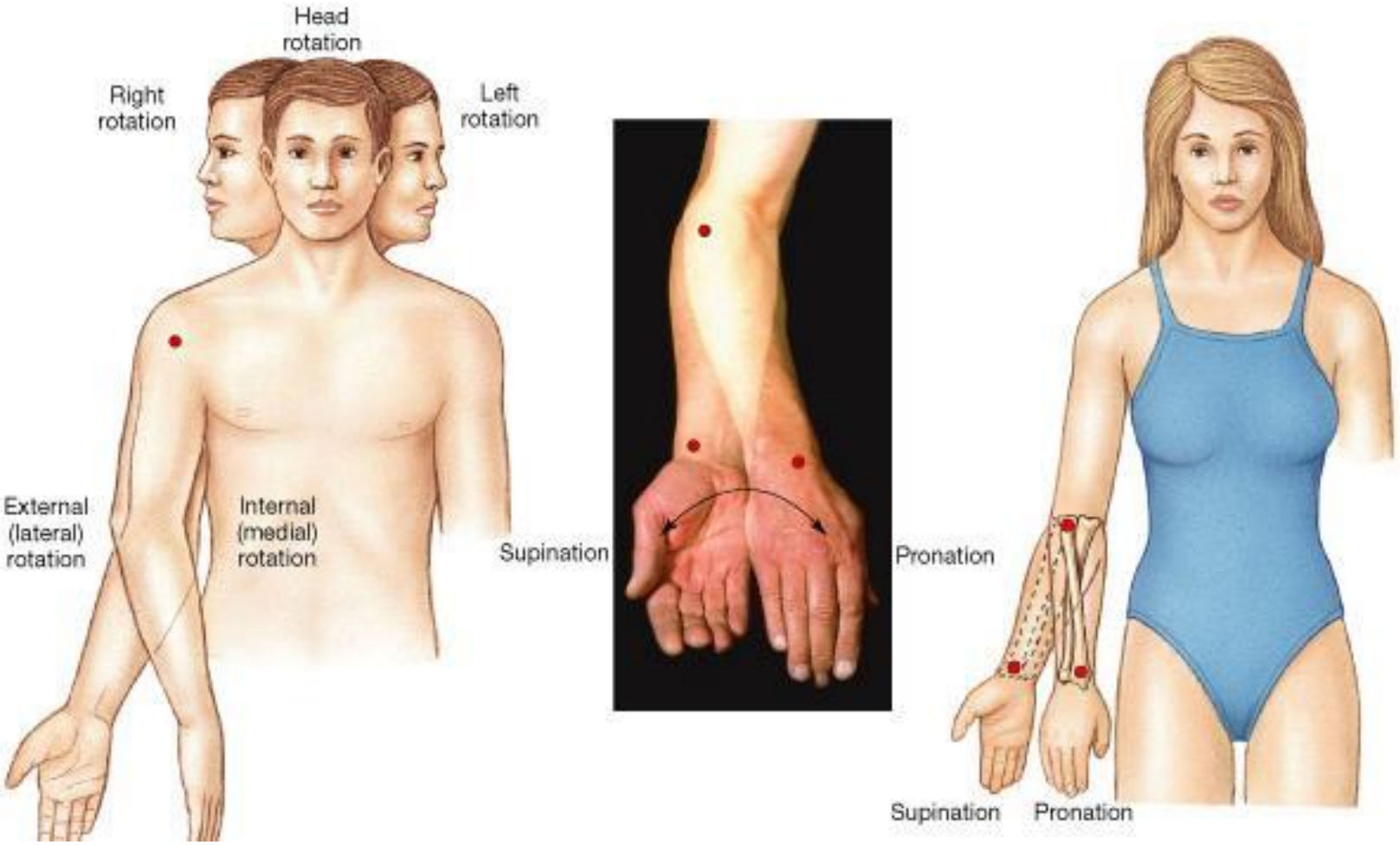
# FINGER MOVEMENTS

Adduction

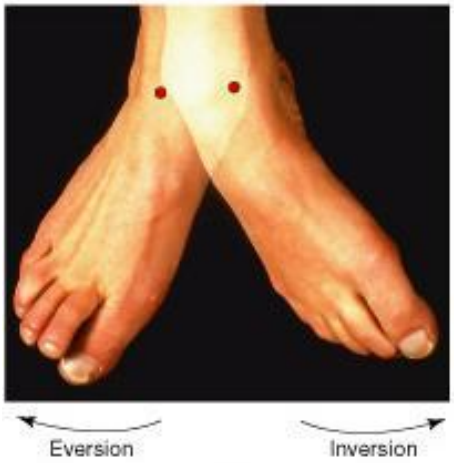


Abduction

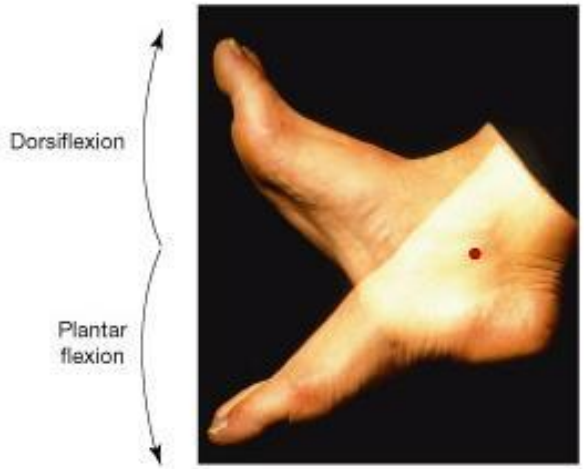
# CIRCULAR MOVEMENTS



# OTHER MOVEMENTS

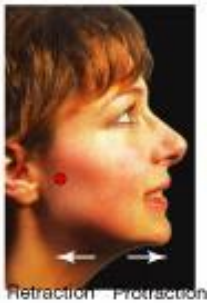


(a)



(b)


(c) Lateral flexion



(d)


Opposition
(e)


Elevation


Depression
(f)

# TEST YOUR KNOWLEDGE

## Fill in the blanks:

- The arm is …… To the chest
- If the ear is posterolateral to the nose, then the nose is…… to the ear.
- In the anatomical position the palms are directed……
- Turning the forearm so that the palm is facing backwards is called……
- The angular movement that moves the thigh away from the midline is called……..
- Turning the head to the side is…… Of the neck

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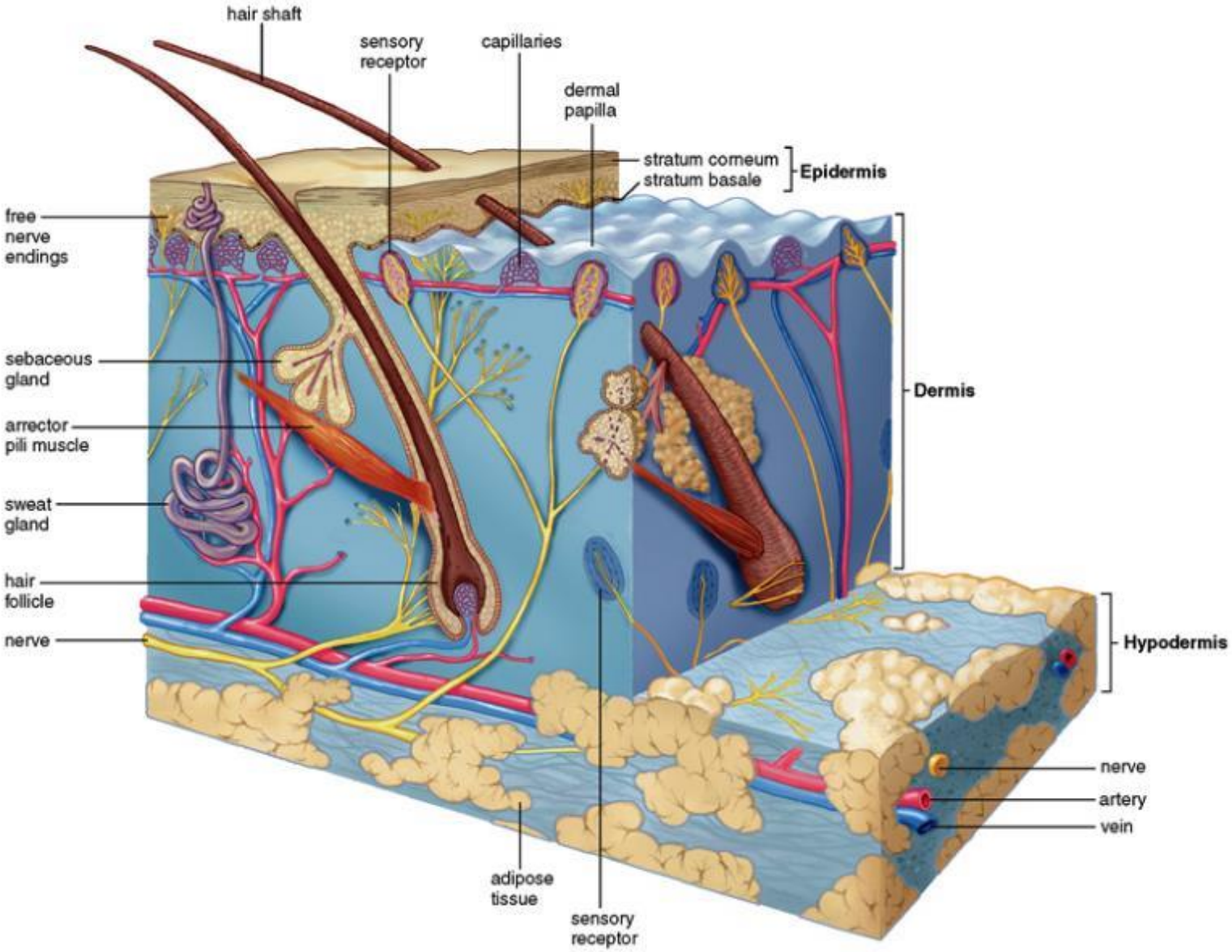
# Basic anatomical structures

## Skin, Fascia & Muscles

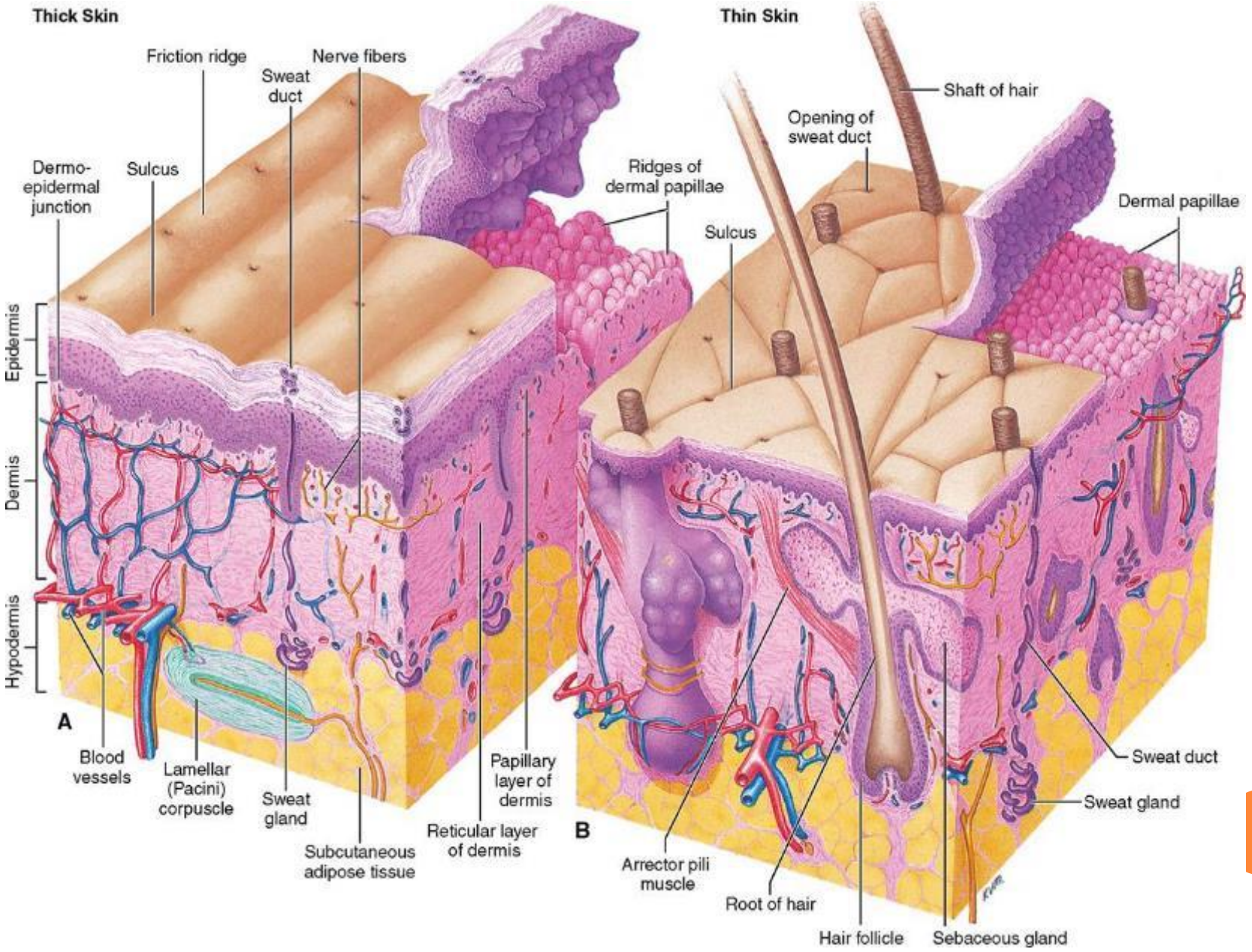
**Objectives:**

- Identify the skin layers and their clinicoanatomical importance
- Define fascia and differentiate its types & functions
- Identify the types of muscles and how they function

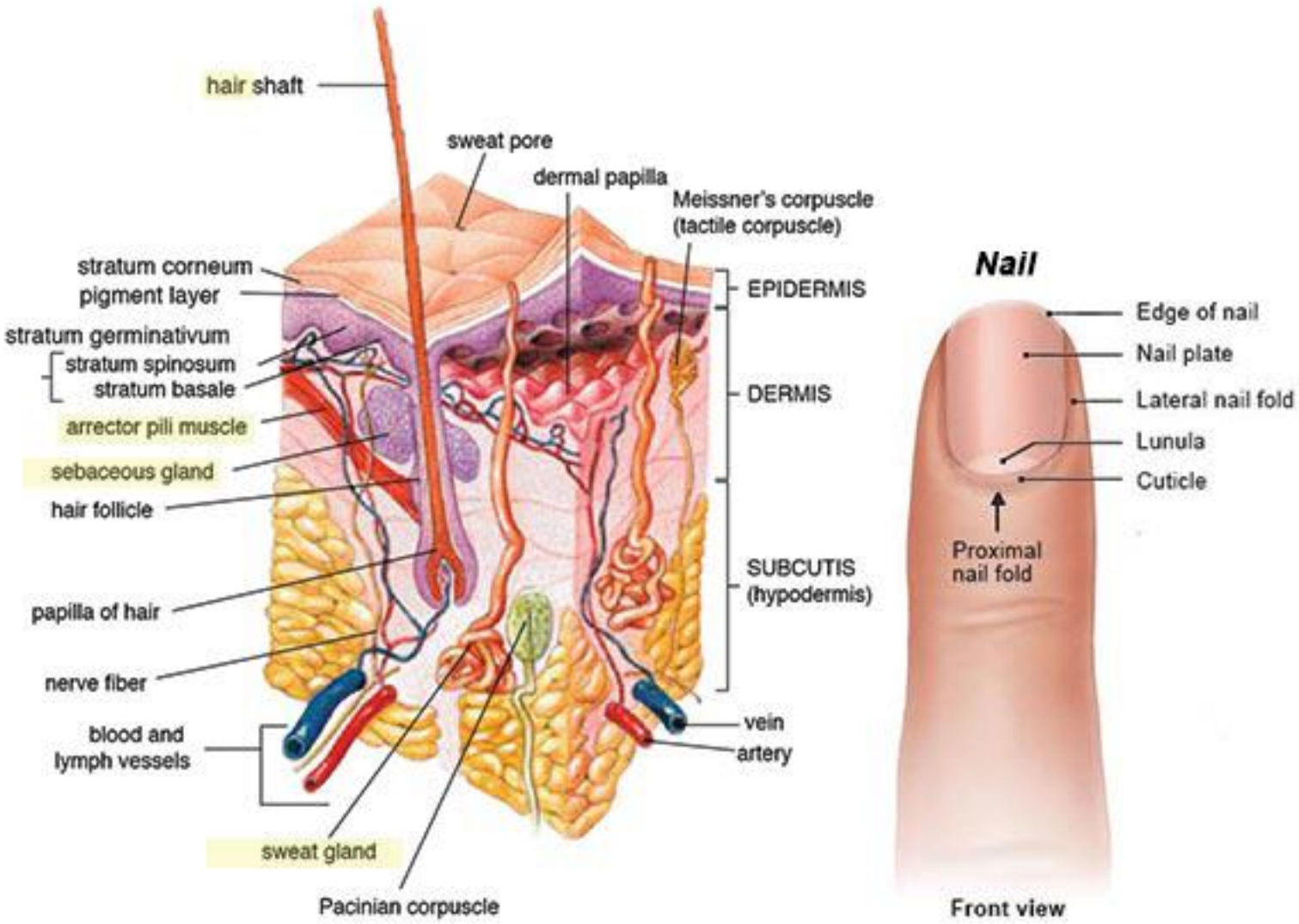
# The skin


hair shaft
sensory receptor
capillaries
dermal papilla
stratum corneum
stratum basale
Epidermis
free nerve endings
sebaceous gland
arrector pili muscle
sweat gland
hair follicle
nerve
Dermis
Hypodermis
nerve
artery
vein
adipose tissue
sensory receptor

# Thin vs Thick skin

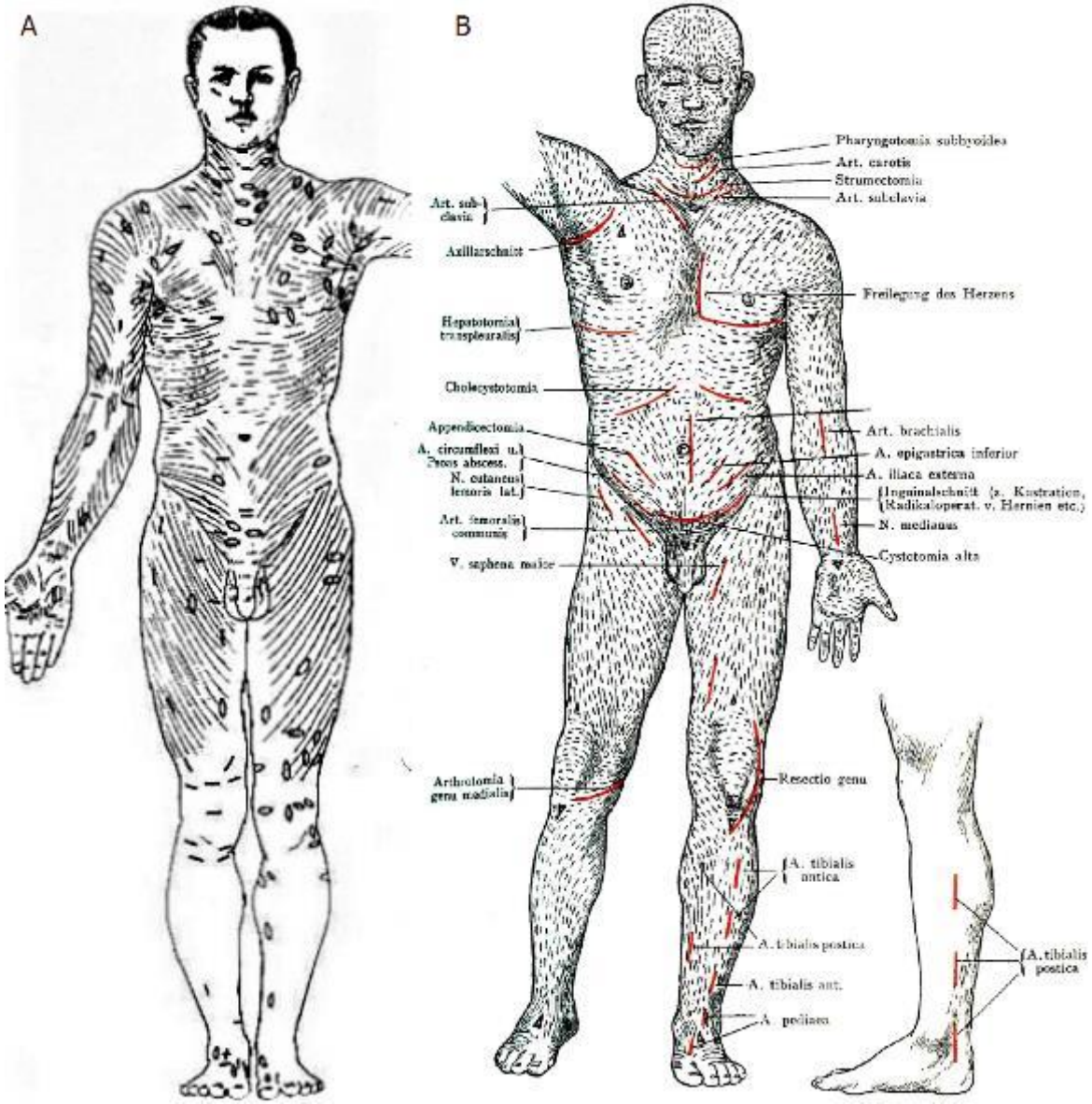


# Epidermal appendages

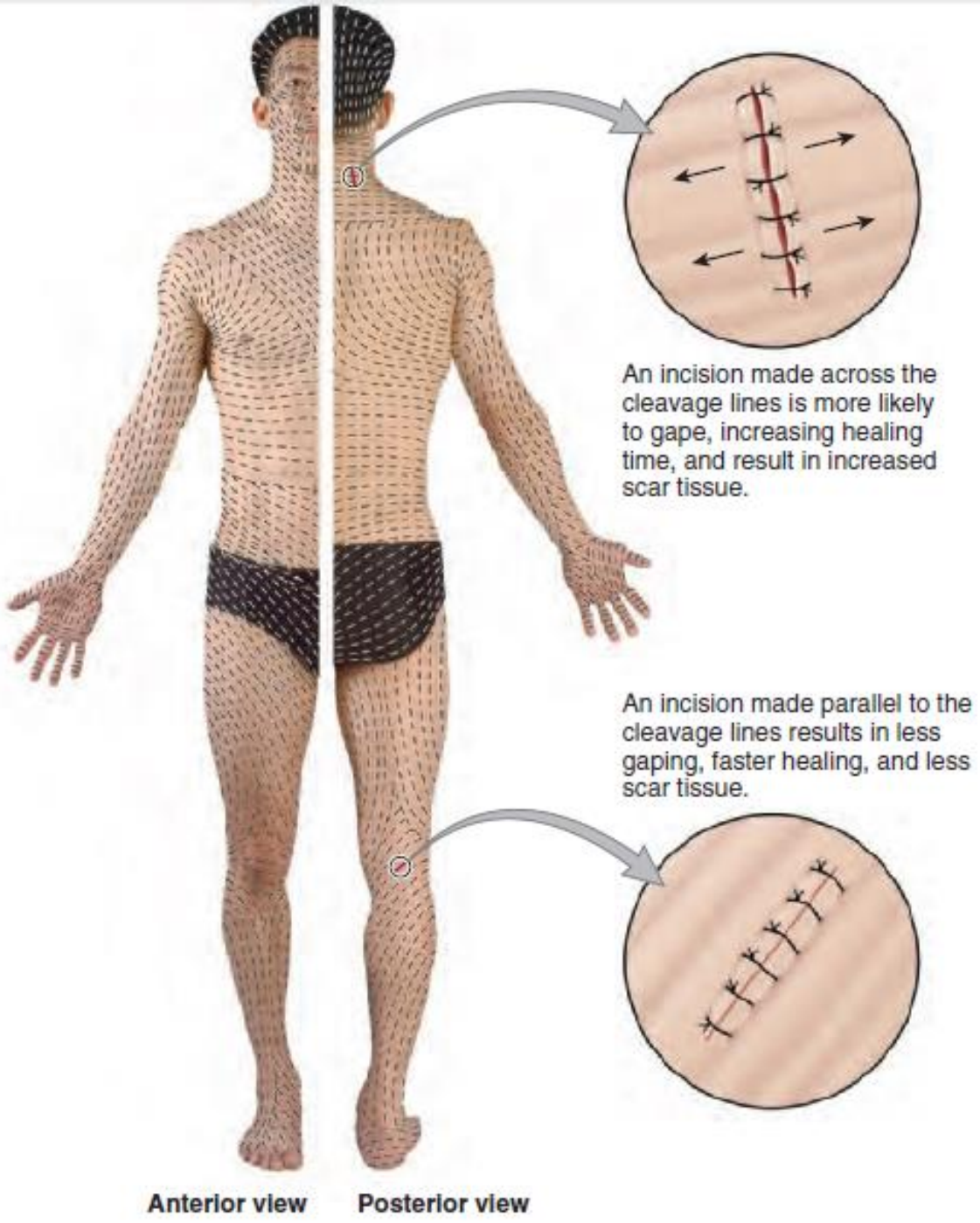


# Skin wrinkles / Creases

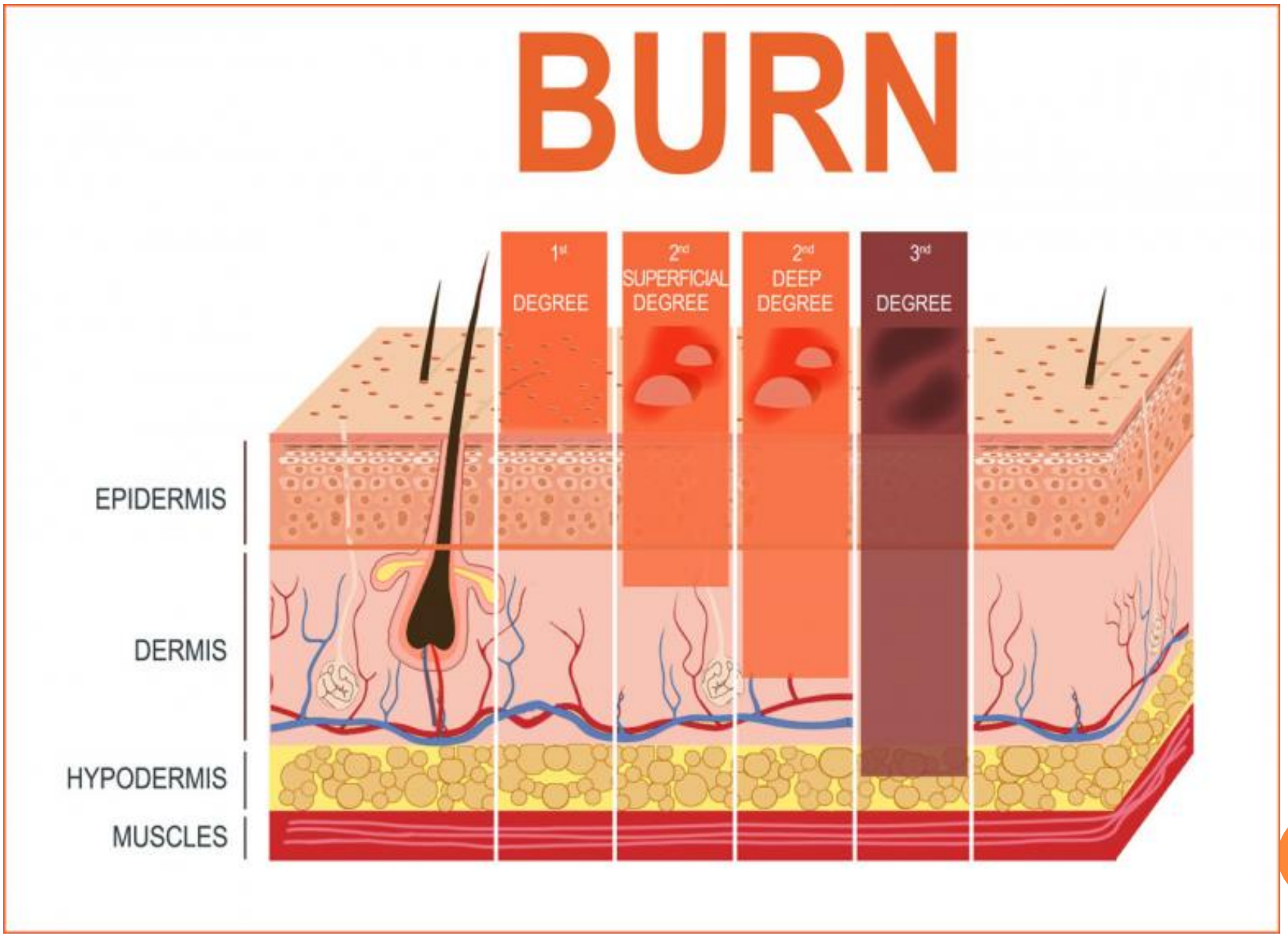
# Tension lines of Langer's

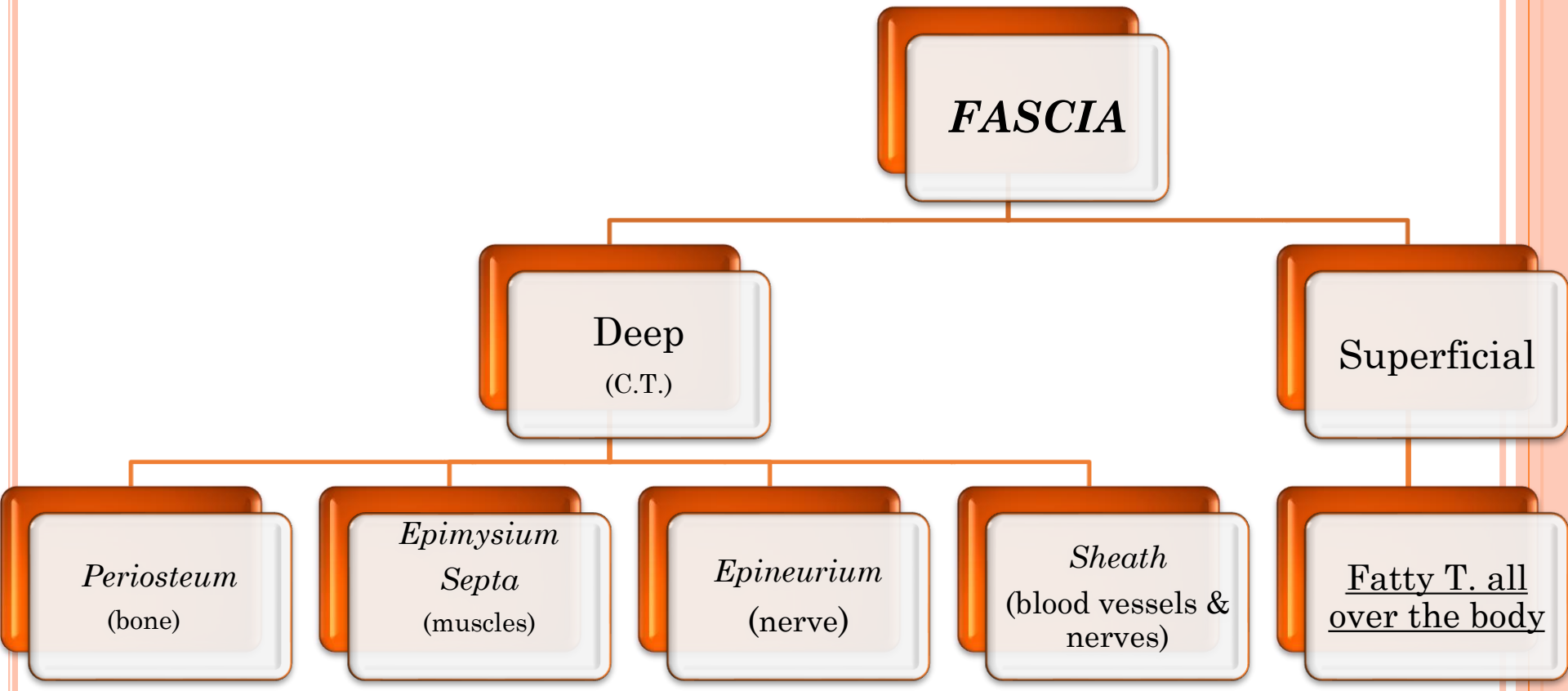



# Tension lines

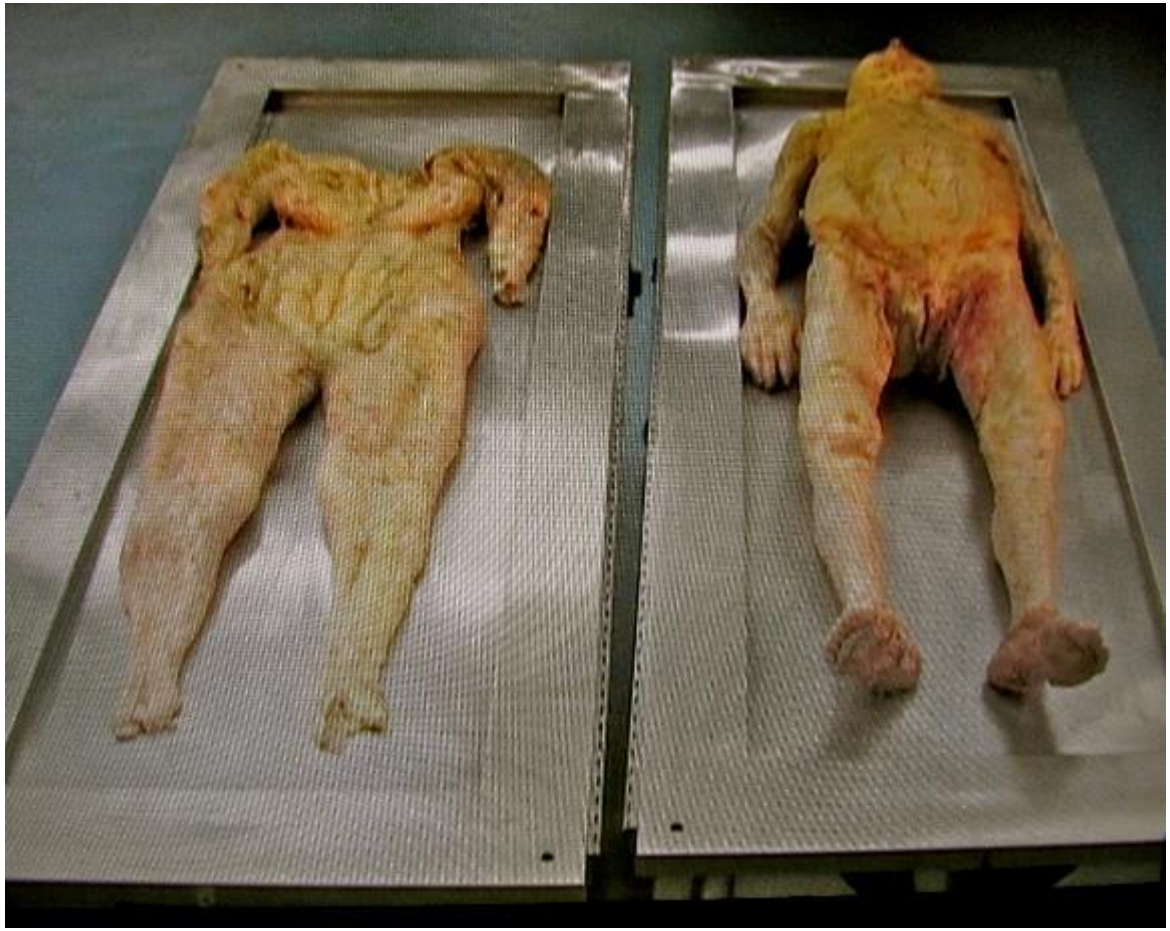


# BURN DEGREES




FASCIA
Deep
(C.T.)
Superficial
Periosteum
(bone)
Epimysium
Septa
(muscles)
Epineurium
(nerve)
Sheath
(blood vessels & nerves)
Fatty T. all over the body

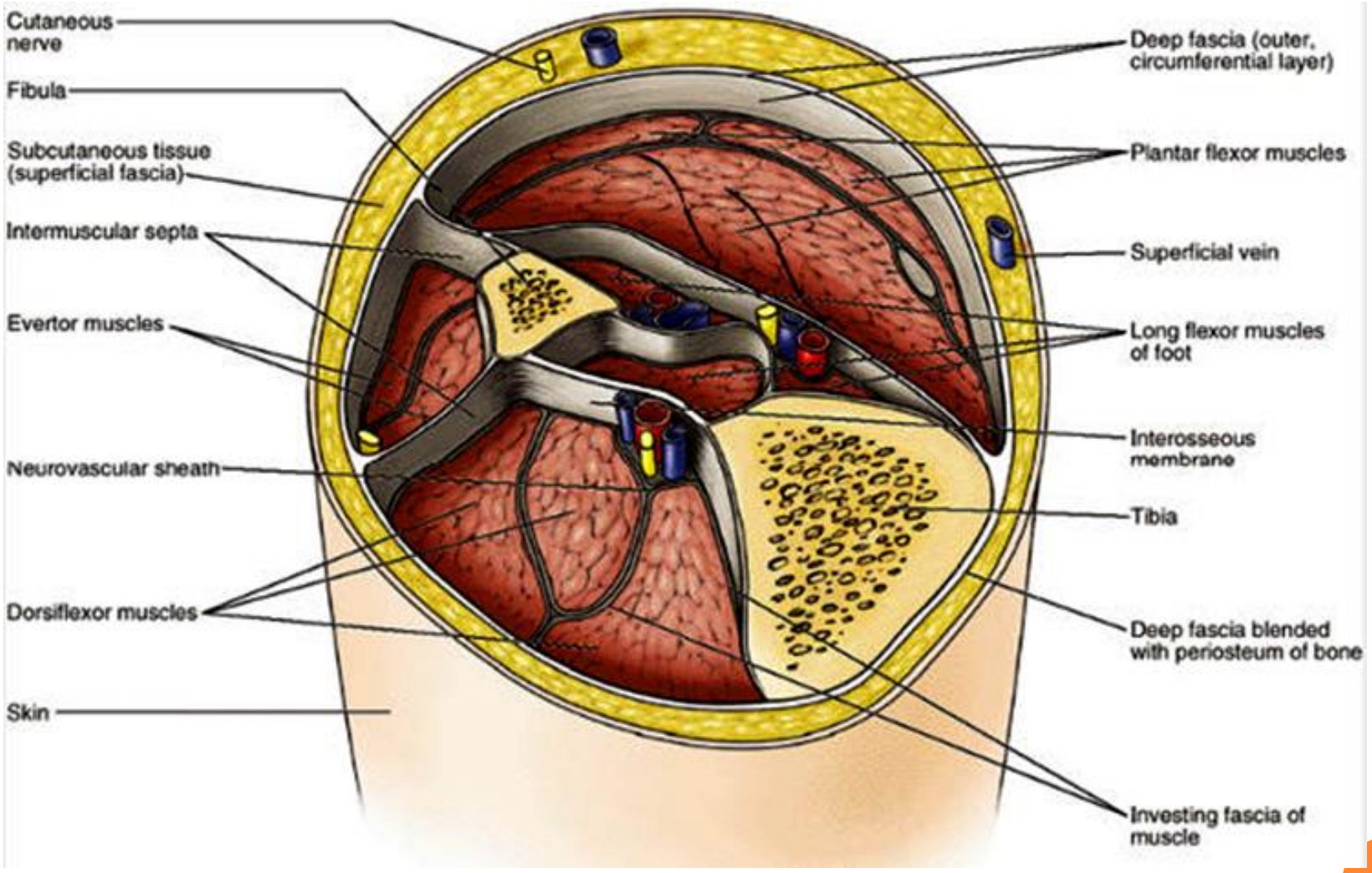
# Superficial fascia



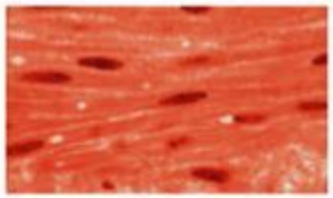
Contains:

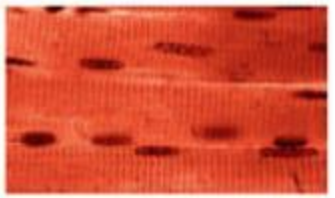
- Superficial veins & lymphatics
- Cutaneous nerves & arteries
- Occasionally, skeletal muscle

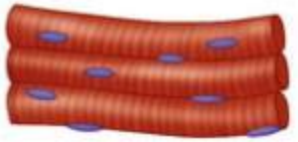
# DEEP FASCIA


Cutaneous nerve
Fibula
Subcutaneous tissue (superficial fascia)
Intermuscular septa
Evertor muscles
Neurovascular sheath
Dorsiflexor muscles
Skin
Deep fascia (outer, circumferential layer)
Plantar flexor muscles
Superficial vein
Long flexor muscles of foot
Interosseous membrane
Tibia
Deep fascia blended with periosteum of bone
Investing fascia of muscle

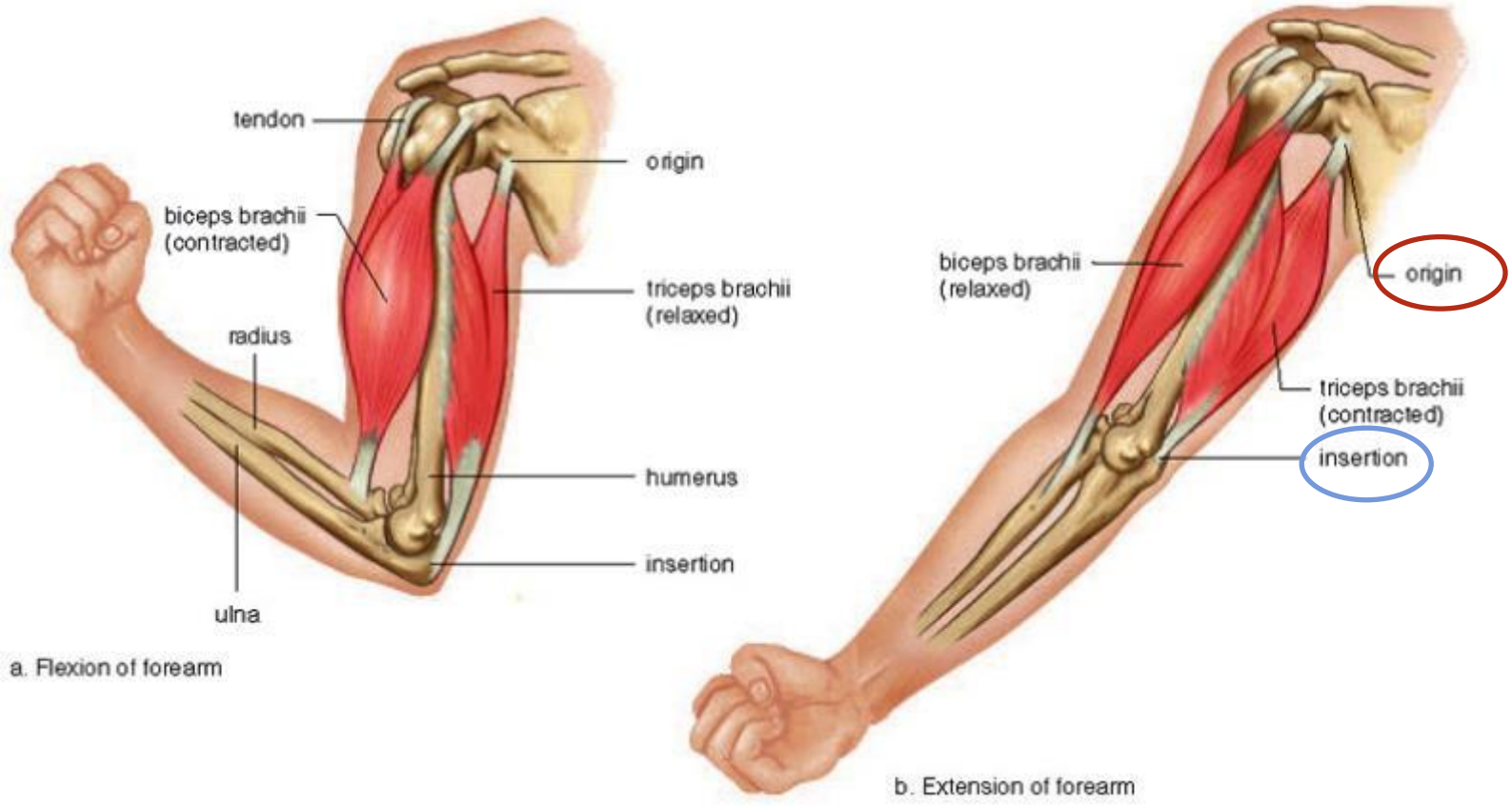
# Muscle types







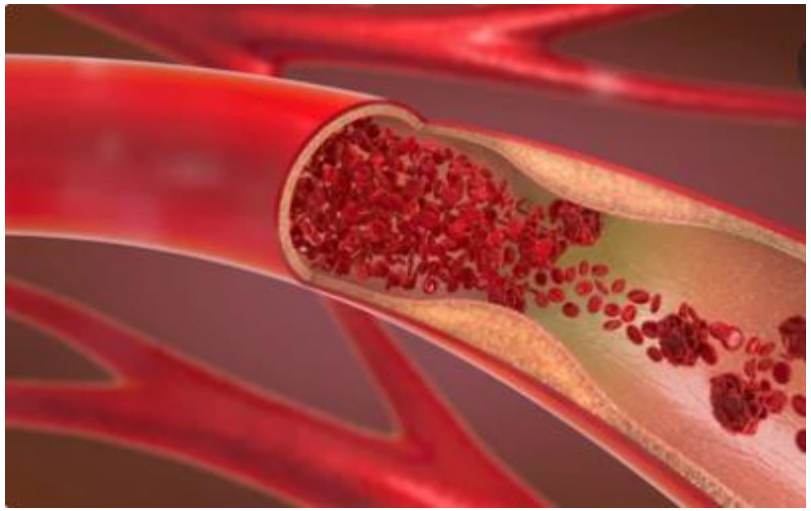
# Skeletal muscle parts

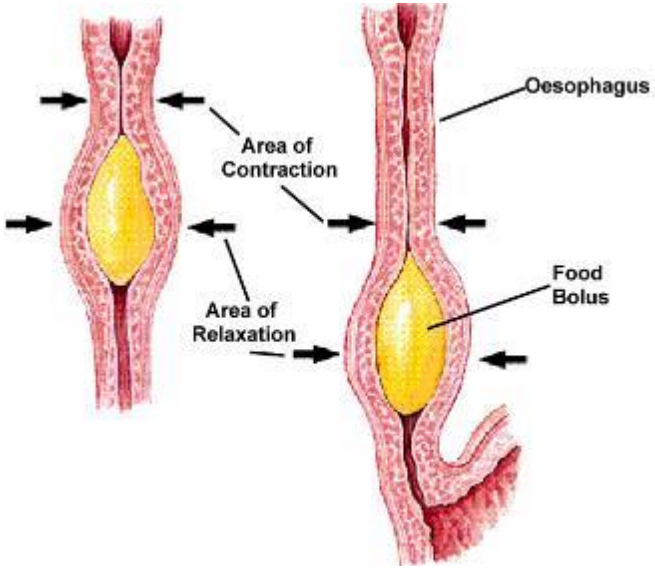



From origin & insertion → Action (function)

# Smooth muscles

## 1. Tubes (Pulse / Peristalsis)






## 2. Hollow organs (Evacuation)

# TEST YOUR KNOWLEDGE

## Fill in the blanks:

- First degree burns affect the……
- With advancing age, loss of ……. fibers in the……. Leads to appearance of wrinkles.
- The functions of superficial fascia are……
- The part of the skeletal muscle that moves the most is……
- Contraction of the smooth muscles of the uterus leads to……

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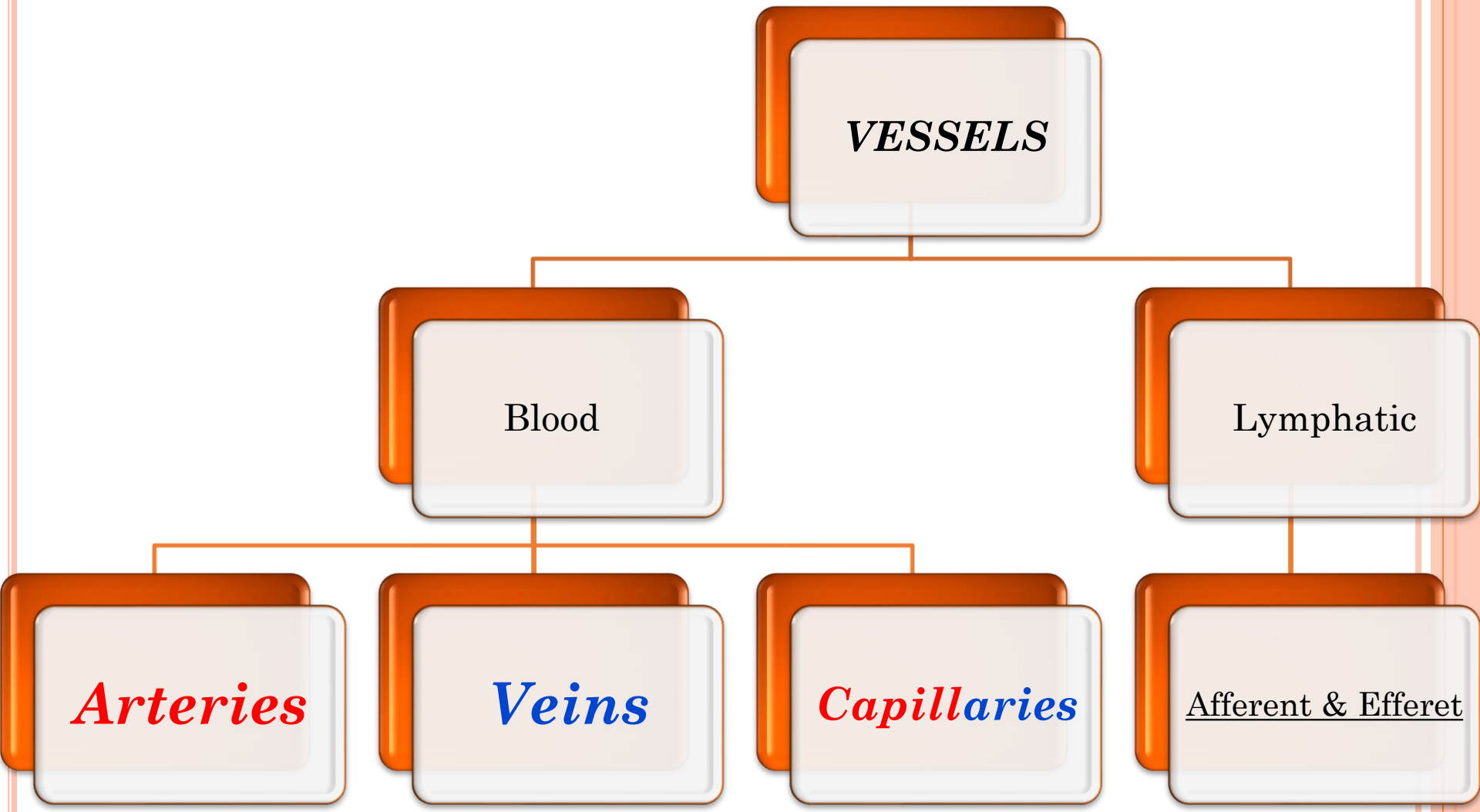
# Basic anatomical structures

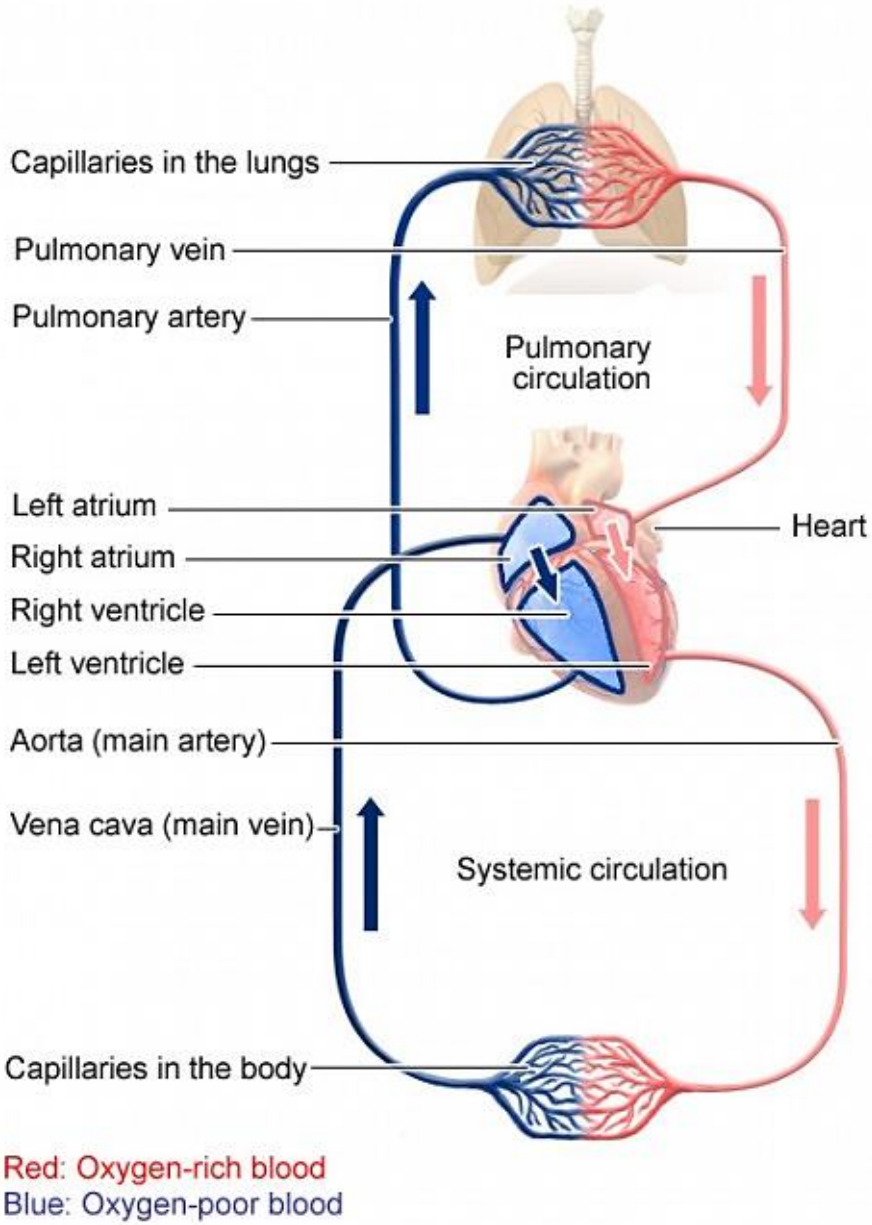
## Vessels & Glands

**Objectives:**

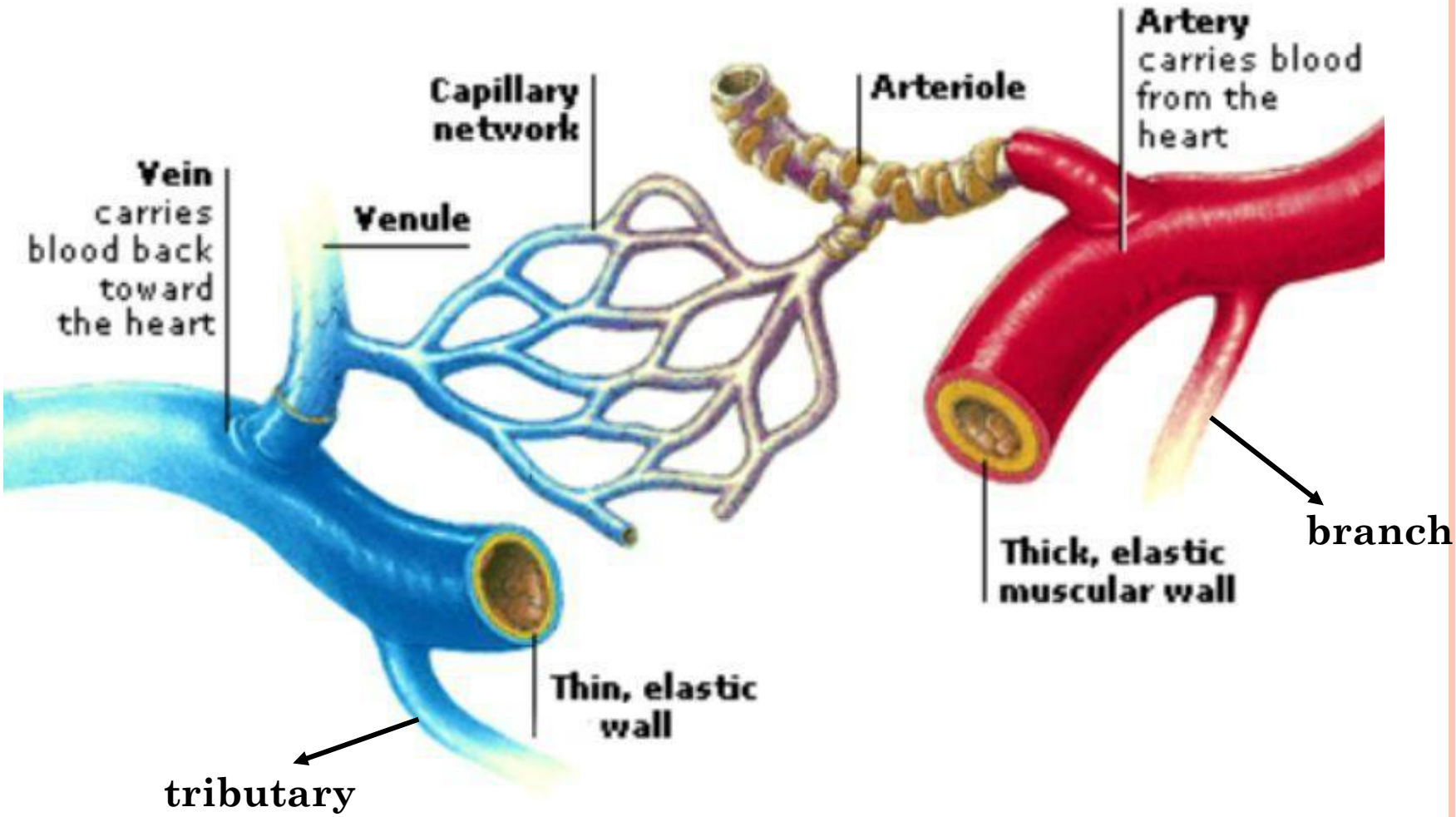
- **Identify the different types of blood vessels, how they differ and how to study them.**
- **Define lymph & understand the clinical importance of lymphatic circulation**
- **Identify the two major types of glands**


VESSELS
Blood
Lymphatic
Arteries
Veins
Capillaries
Afferent & Efferet

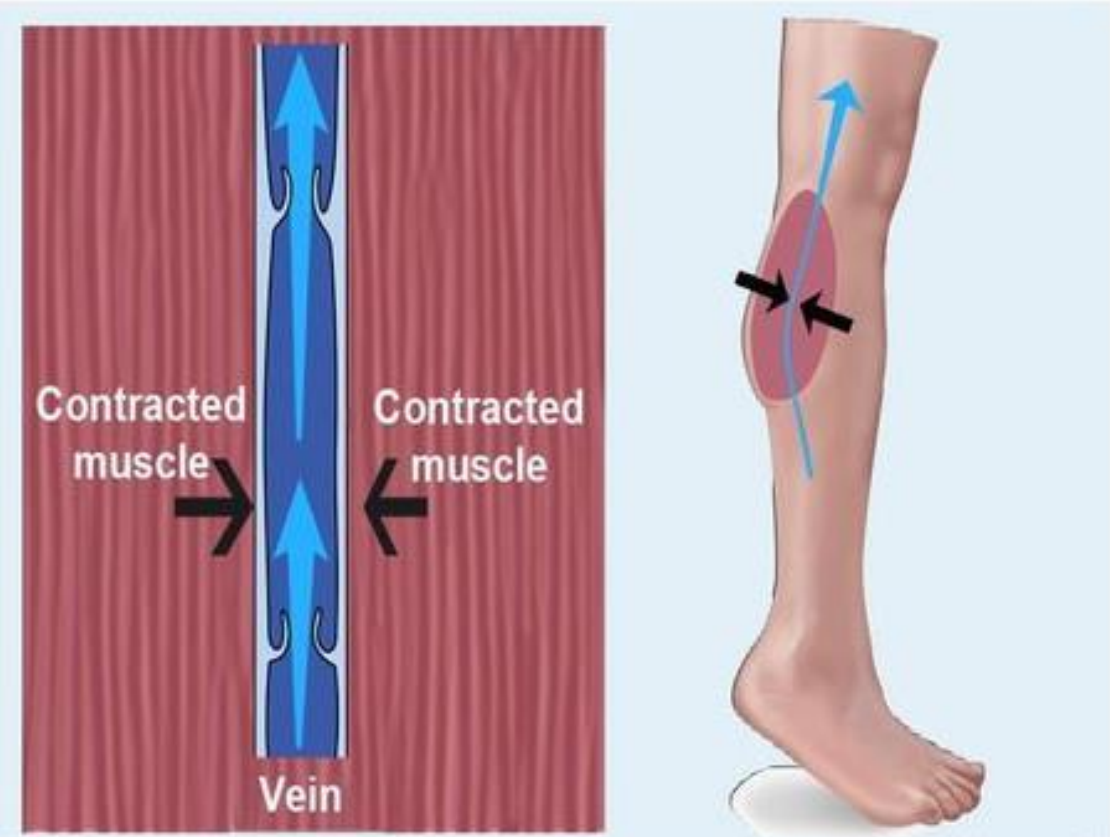
# Blood circulation



# Arteries, veins, capillaries

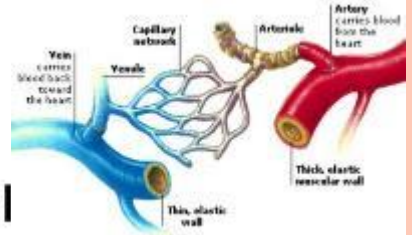


# Venous emptying



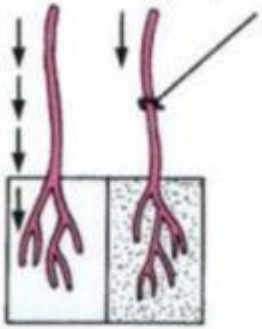

Calf muscle contracts forcing venous blood toward heart

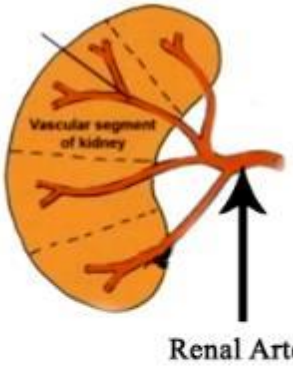
# Anastomosis & venous plexus




**Anatomical End arteries**

No overlap in area of supply

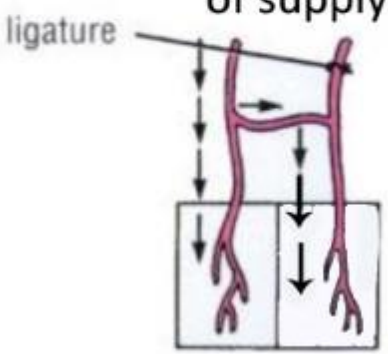


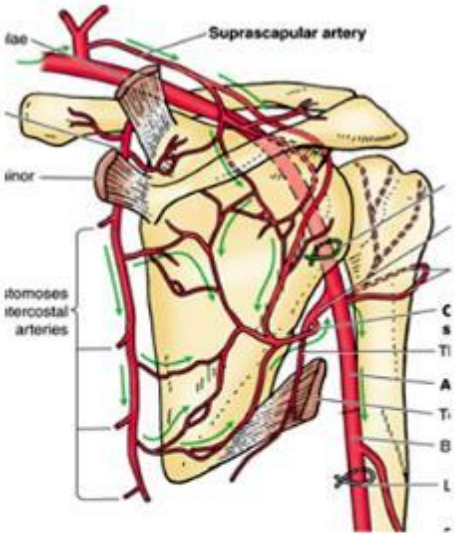



Renal Artery

**Anastomosis**

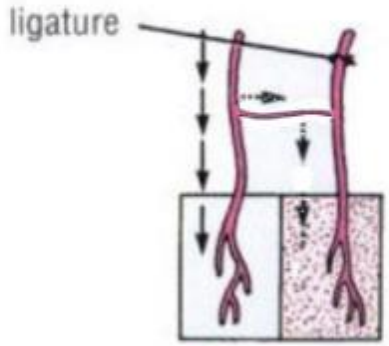
Alternative route of supply

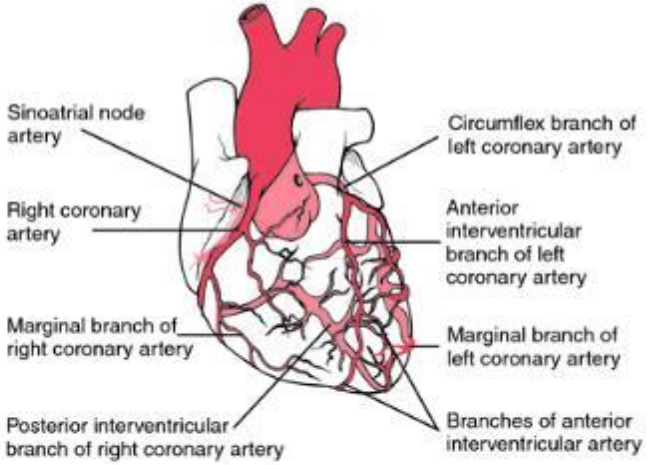



Scapular anastomosis

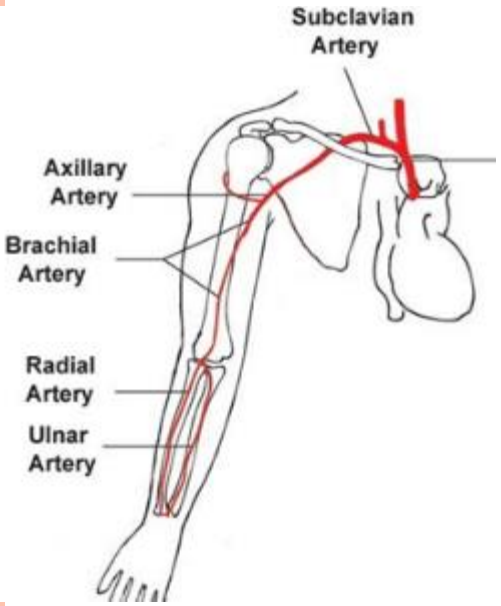
**Functional End arteries**




Coronary arteries

# How to study arteries & veins




Starting point

Course & branches

Ending point

from heart

A

artery

B

to heart

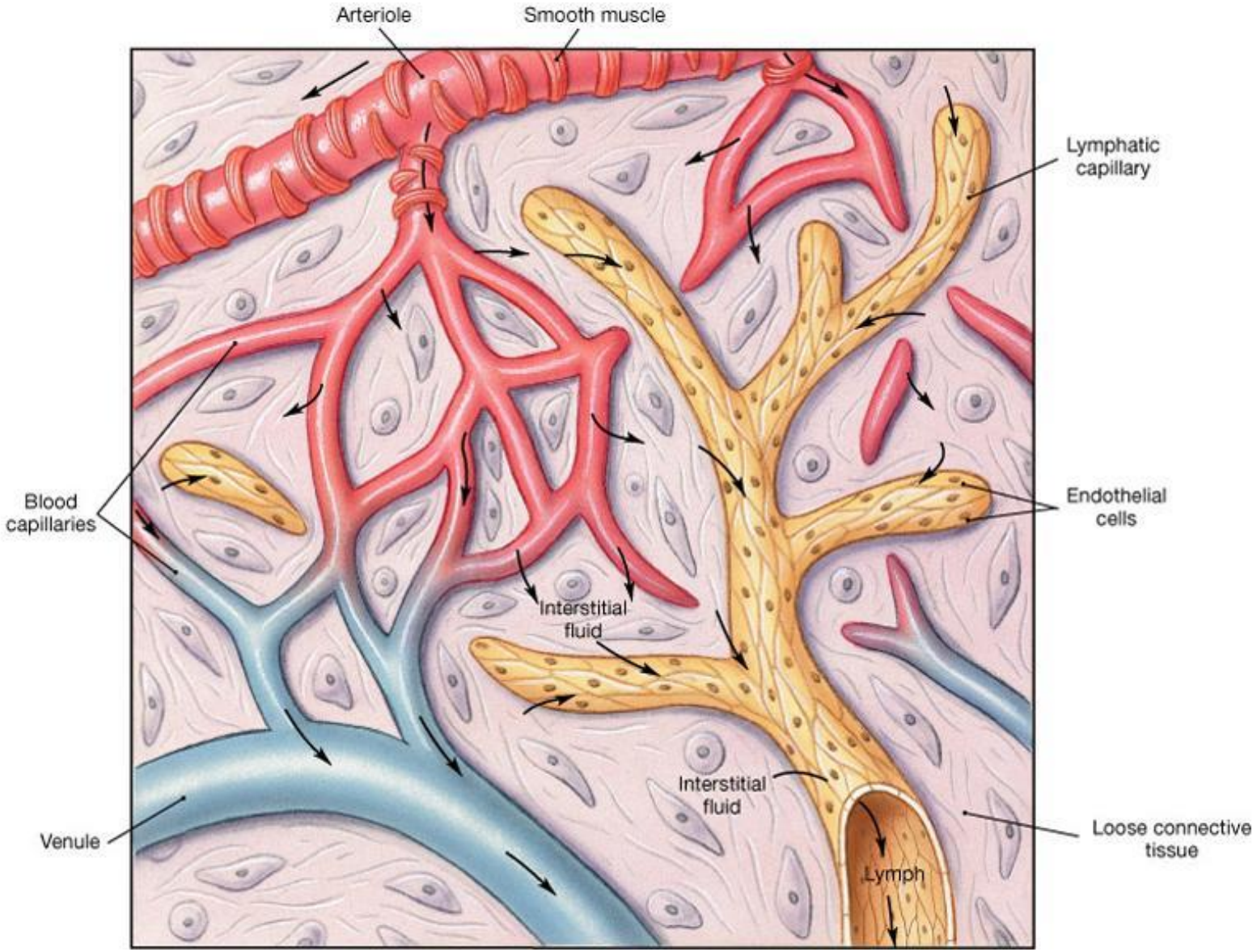
Ending point

vein

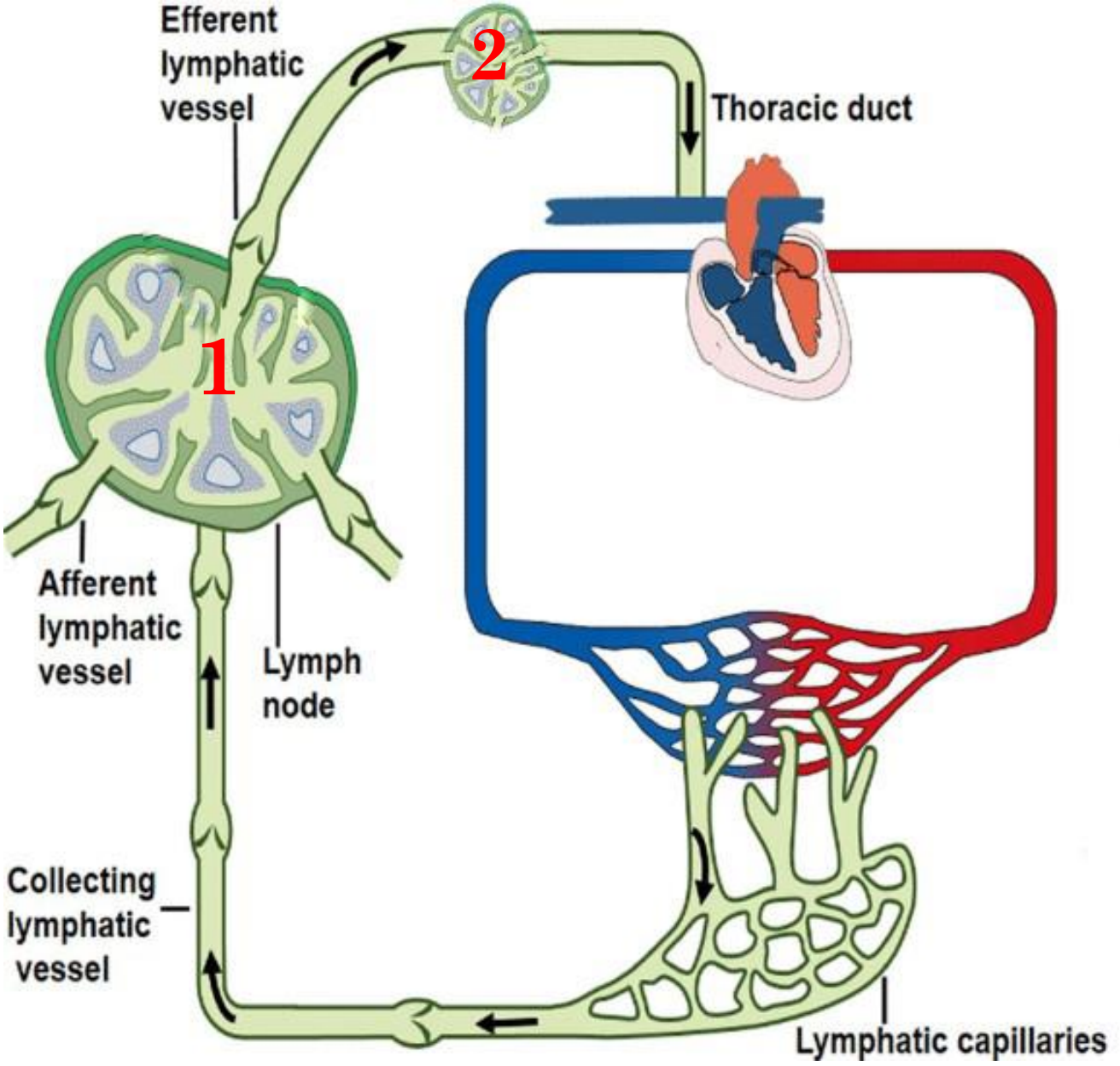
Course & tributaries

Starting point

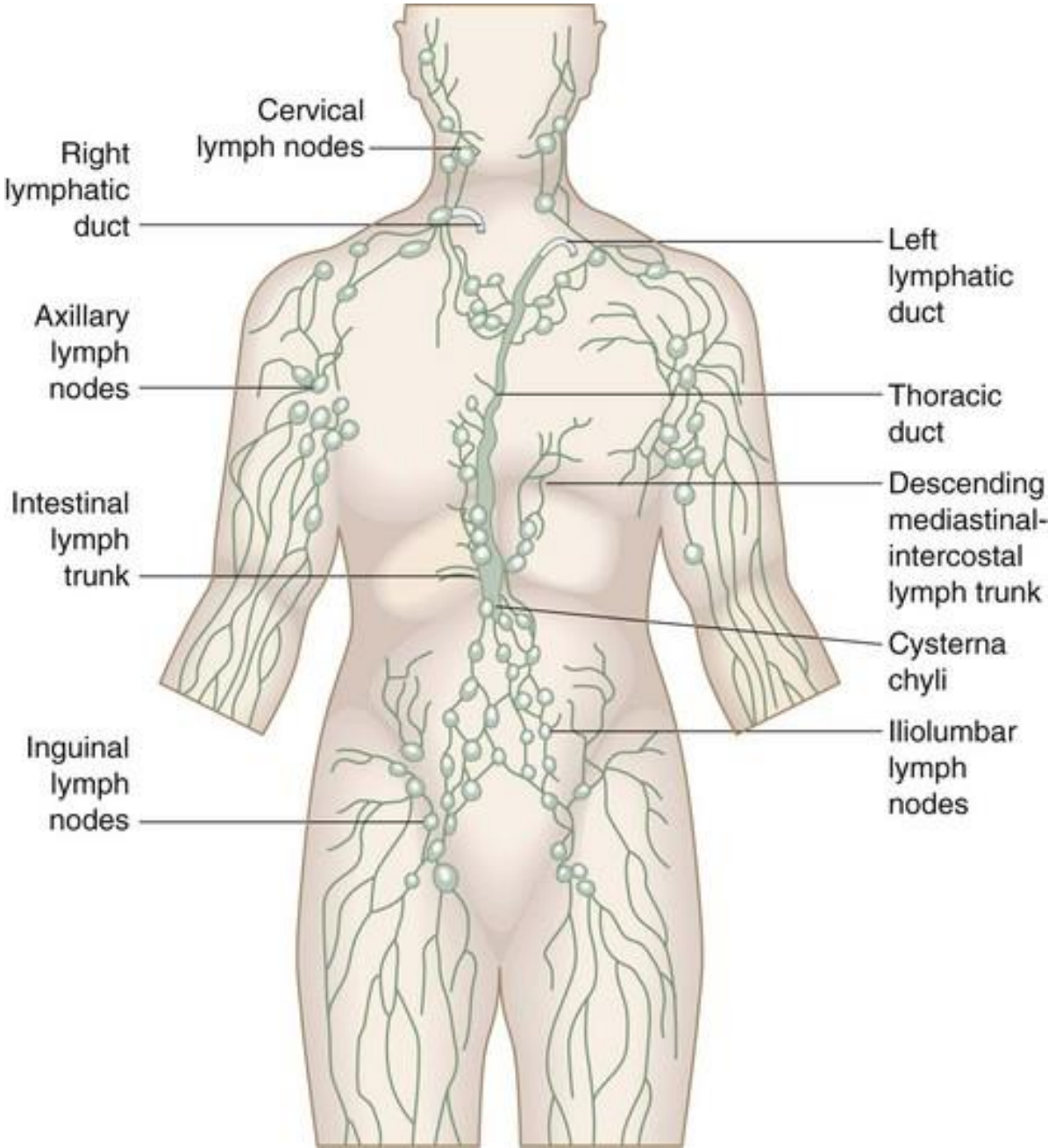
# Interstitial fluid & lymph



# Lymphatic circulation



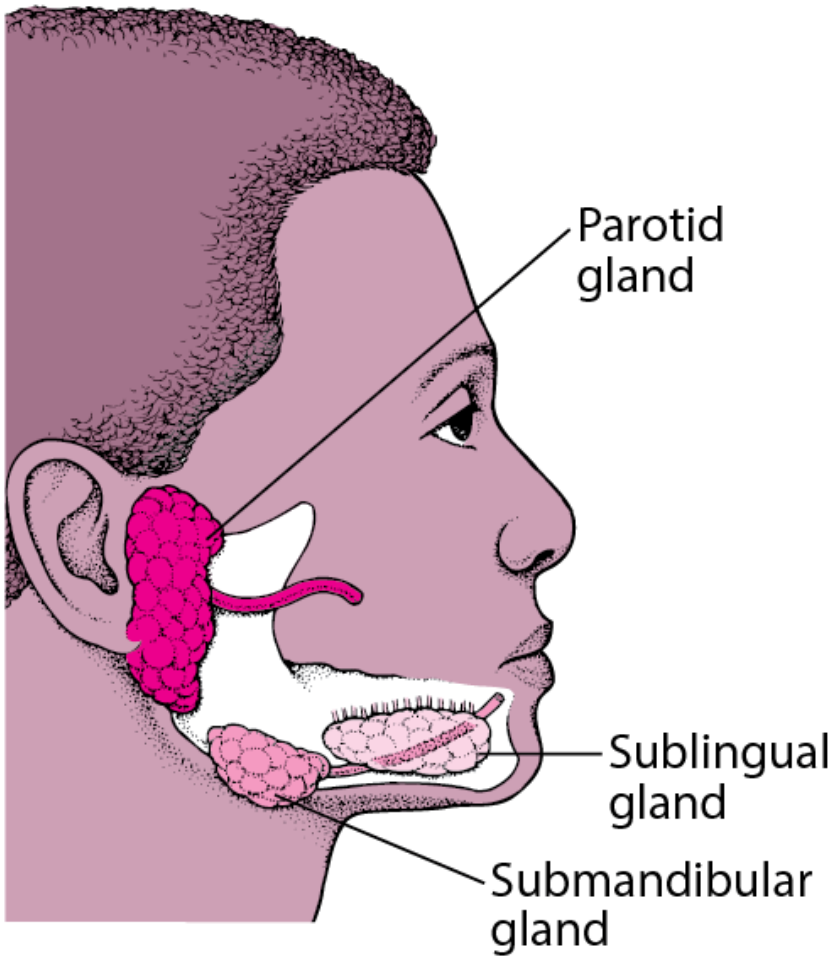
# Lymph node groups



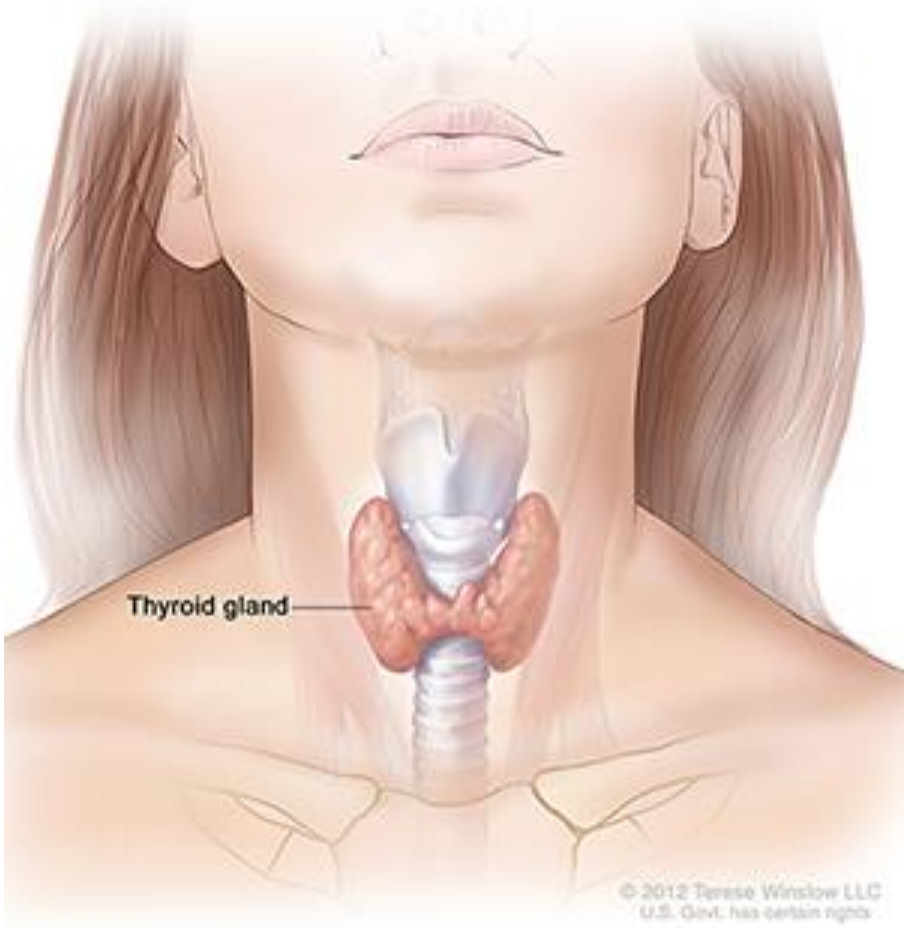
# Lymphadenopathy (enlarged lymph node)

# Glands

## Exocrine




## Endocrine



# TEST YOUR KNOWLEDGE

## Fill in the blanks:

- As veins travel through the body, they receive…….. and they …….. in diameter.
- Arteries that do not communicate with each other via anastomosing channels are called……. arteries. An example is……. arteries.
- The lymphatic vessels carrying lymph away from a lymph node is called……. lymphatic.
- Exocrine glands secrete their products via…… while endocrine glands secrete their hormones directly into……

Al-Mustansiriyah University
College of medicine
Dept. of anatomy, Histology & embryology

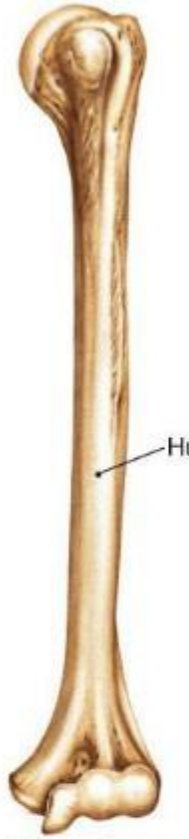
# Basic anatomical structures

## Bones, Cartilage & Joints

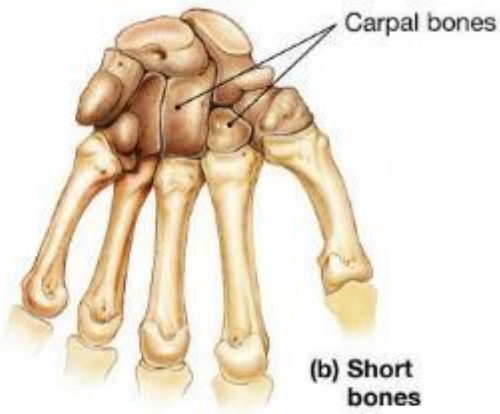
**Objectives:**

- Identify the anatomical & histological types of bone & cartilage
- Identify the parts of the human skeleton
- Define joints and differentiate their types

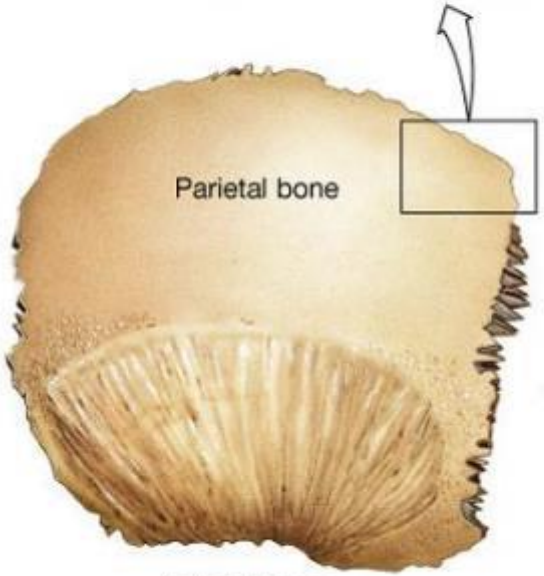
# BONES: ANATOMICAL TYPES



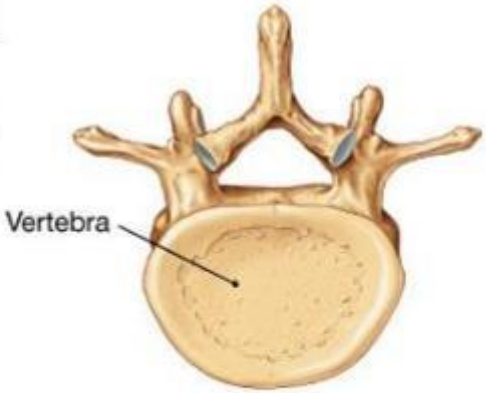

(a) Long bone




(b) Short bones

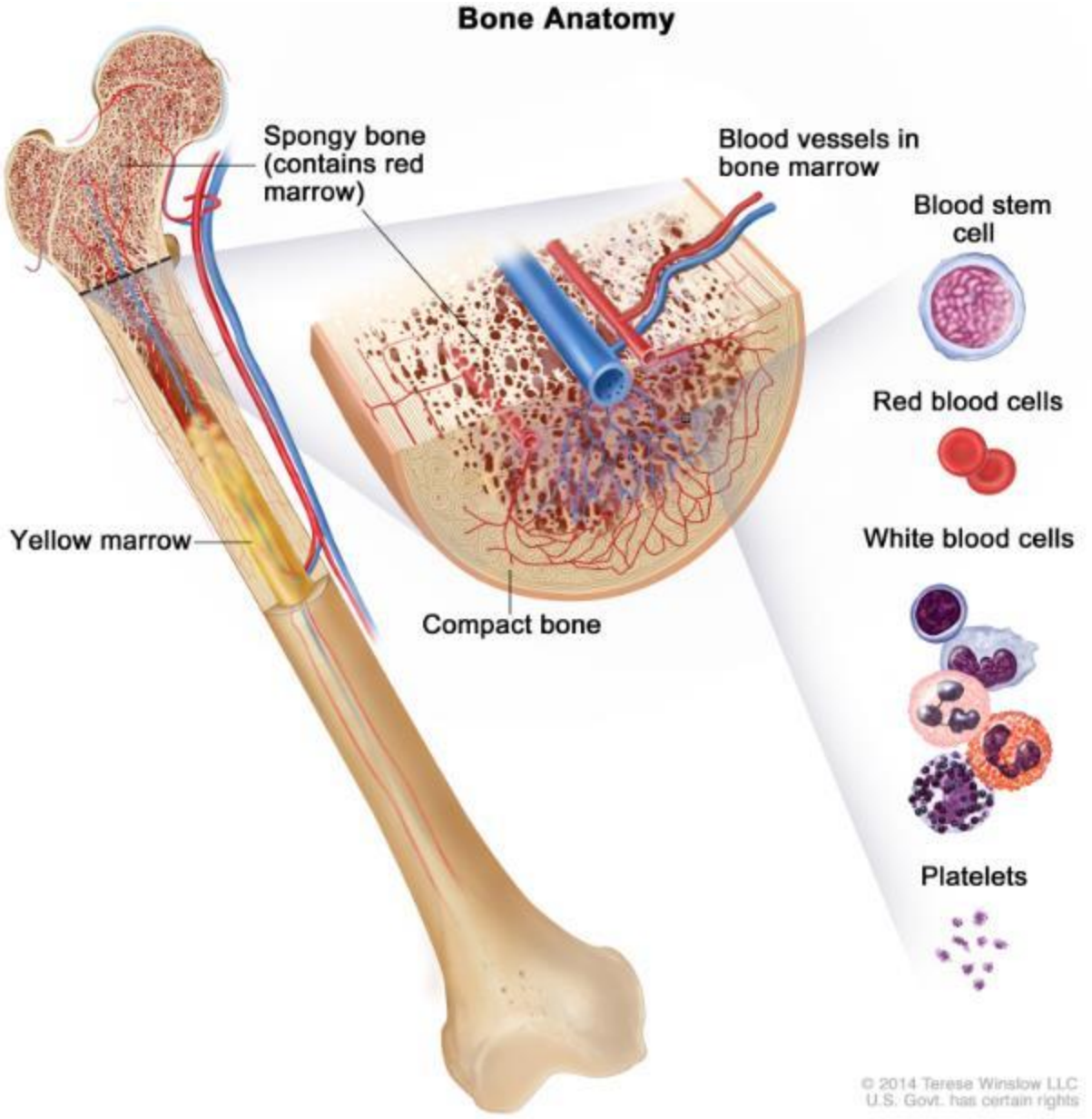



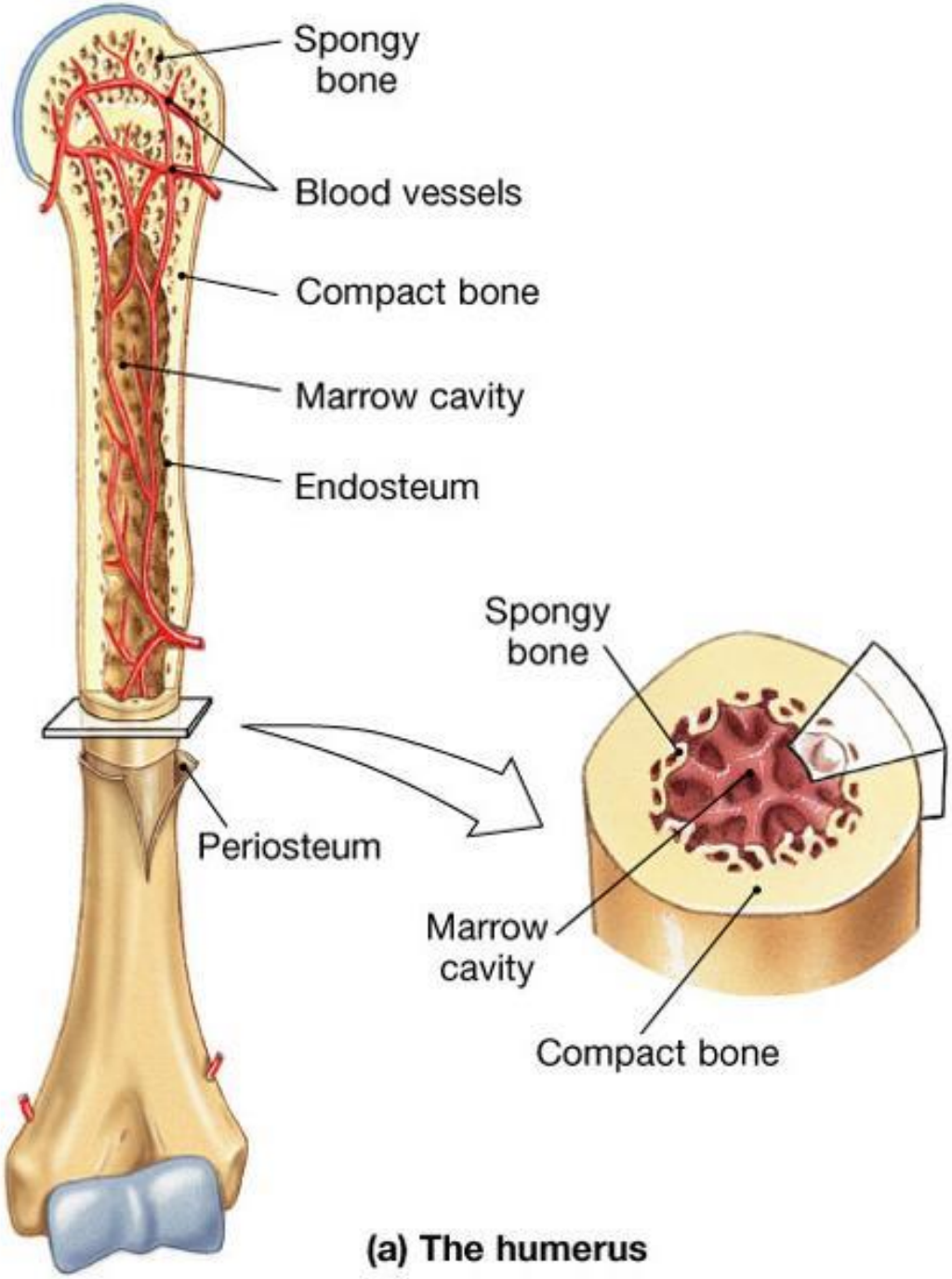

(c) Flat bone




(d) Irregular bone

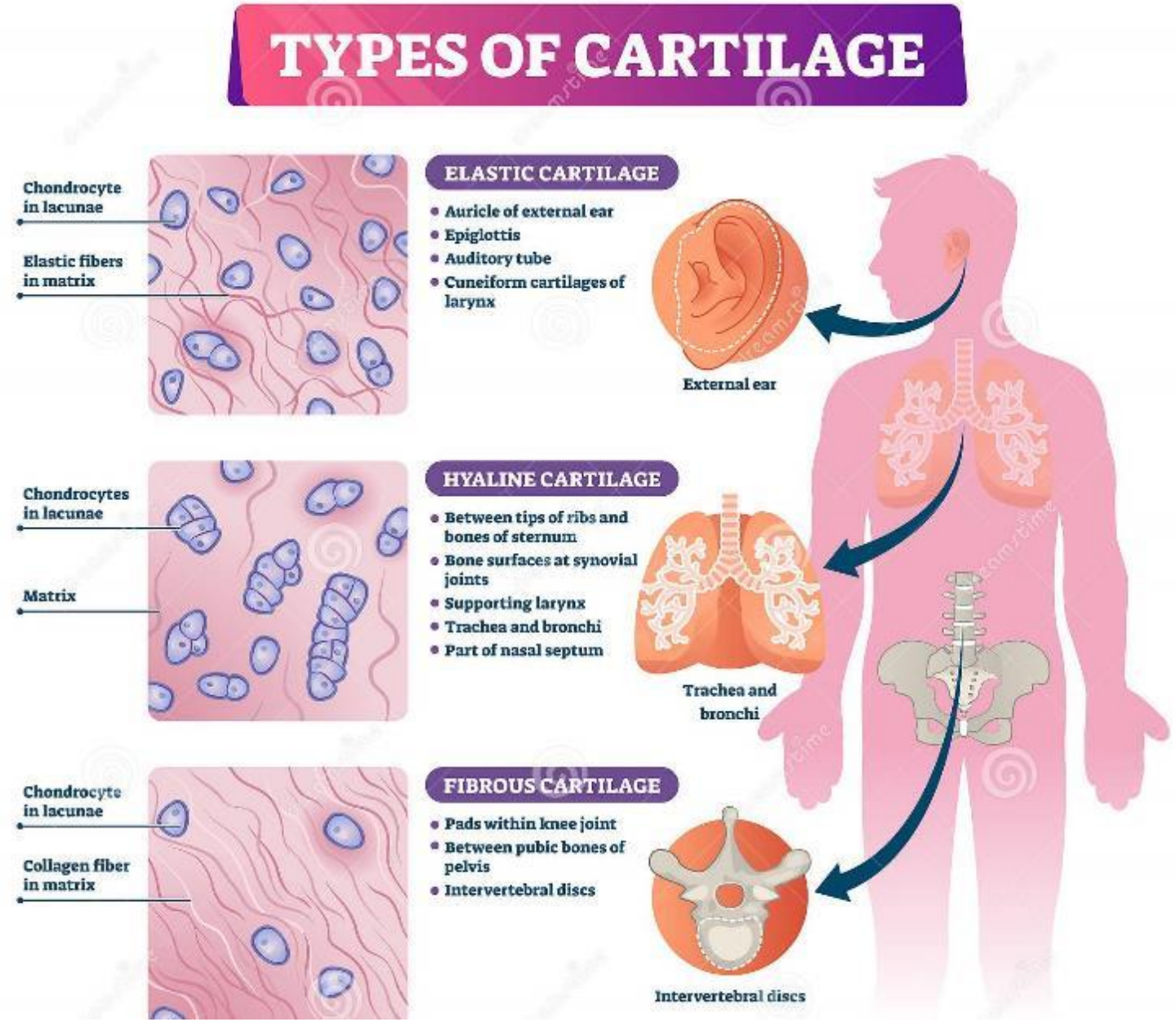
# BONES: HISTOLOGICAL TYPES



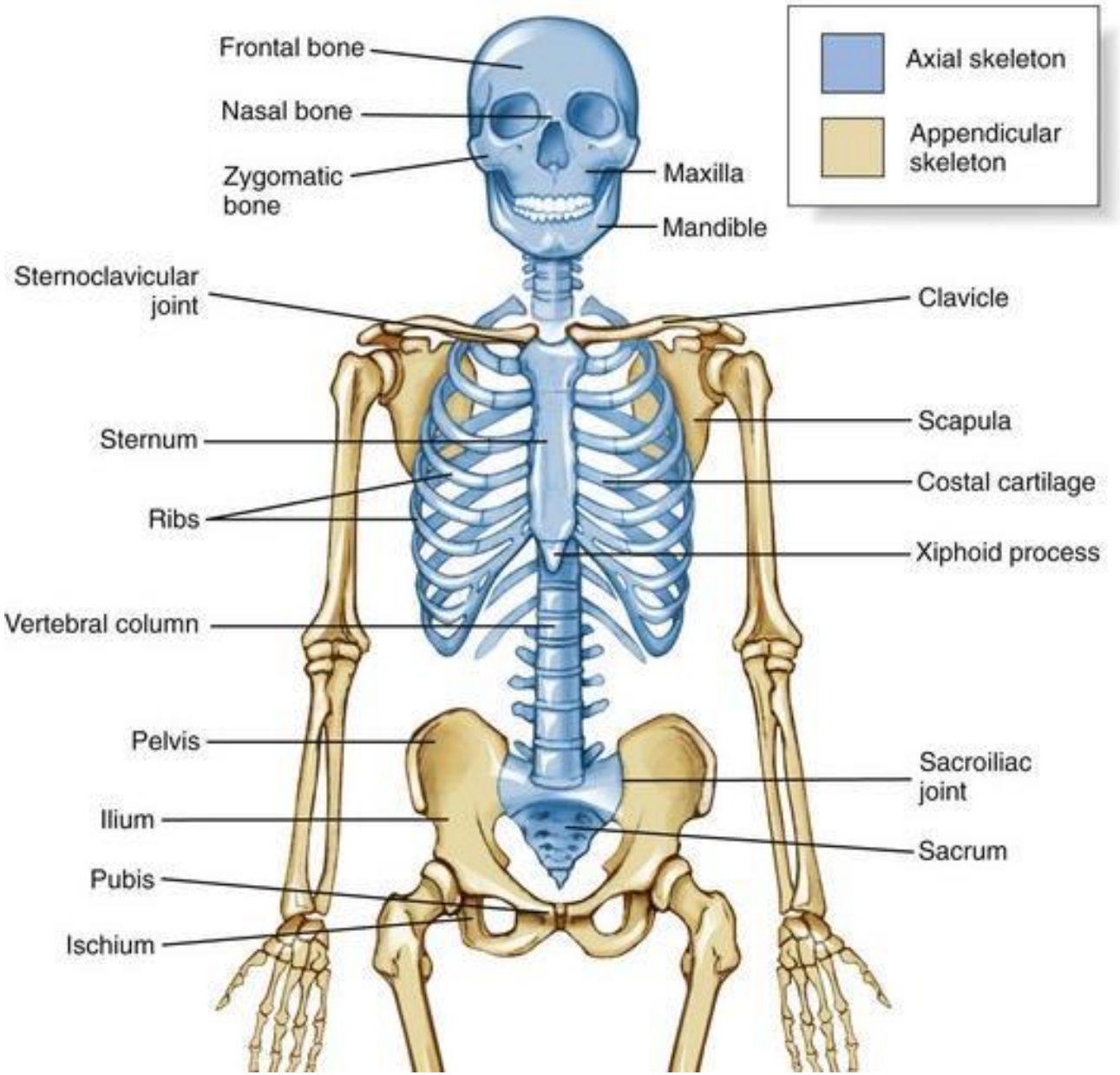



(a) The humerus

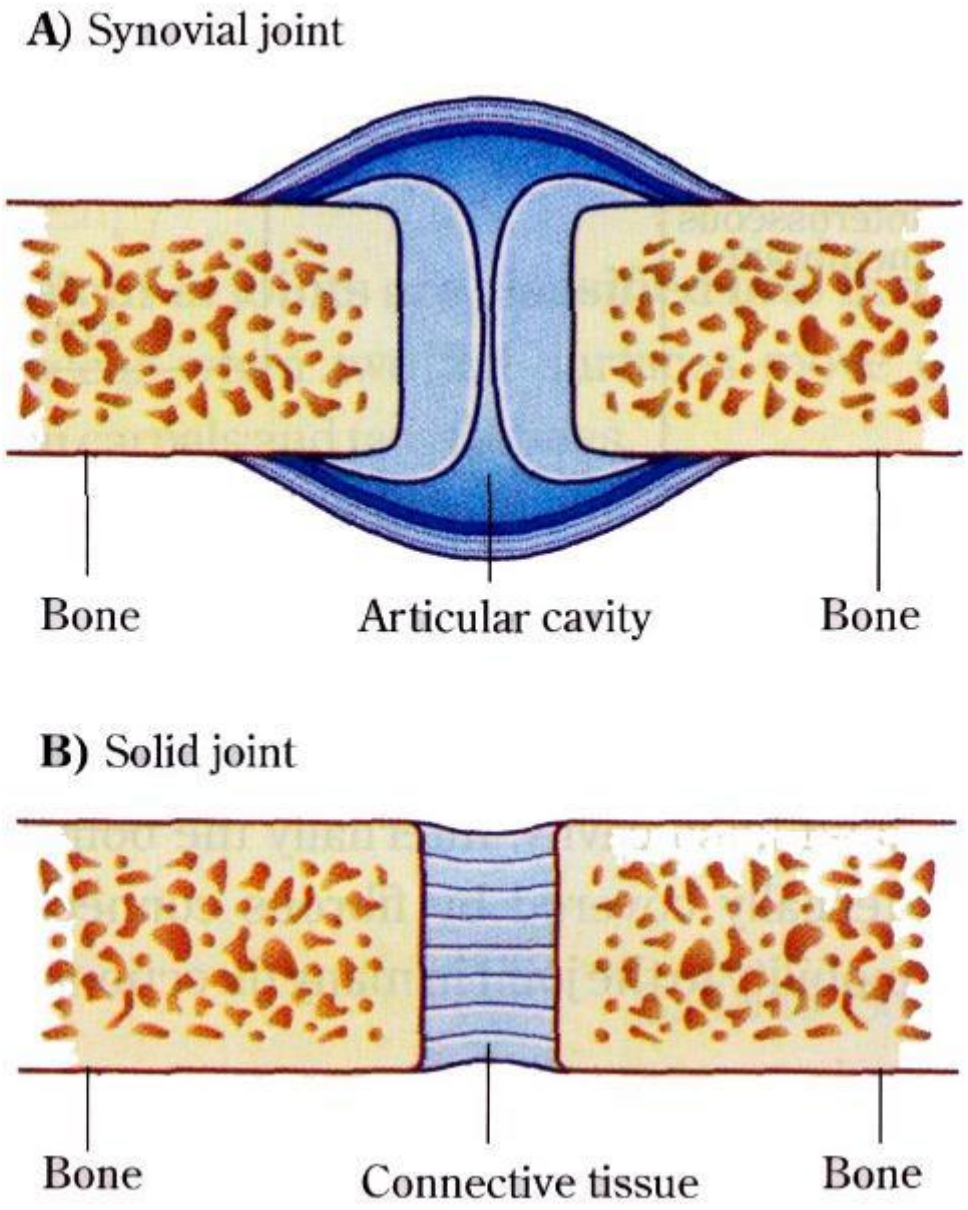
# CARTILAGE


TYPES OF CARTILAGE
Chondrocyte in lacunae
Elastic fibers in matrix
ELASTIC CARTILAGE
Auricle of external ear
Epiglottis
Auditory tube
Cuneiform cartilages of larynx
External ear
Chondrocytes in lacunae
Matrix
HYALINE CARTILAGE
Between tips of ribs and bones of sternum
Bone surfaces at synovial joints
Supporting larynx
Trachea and bronchi
Part of nasal septum
Trachea and bronchi
Chondrocyte in lacunae
Collagen fiber in matrix
FIBROUS CARTILAGE
Pads within knee joint
Between pubic bones of pelvis
Intervertebral discs
Intervertebral discs

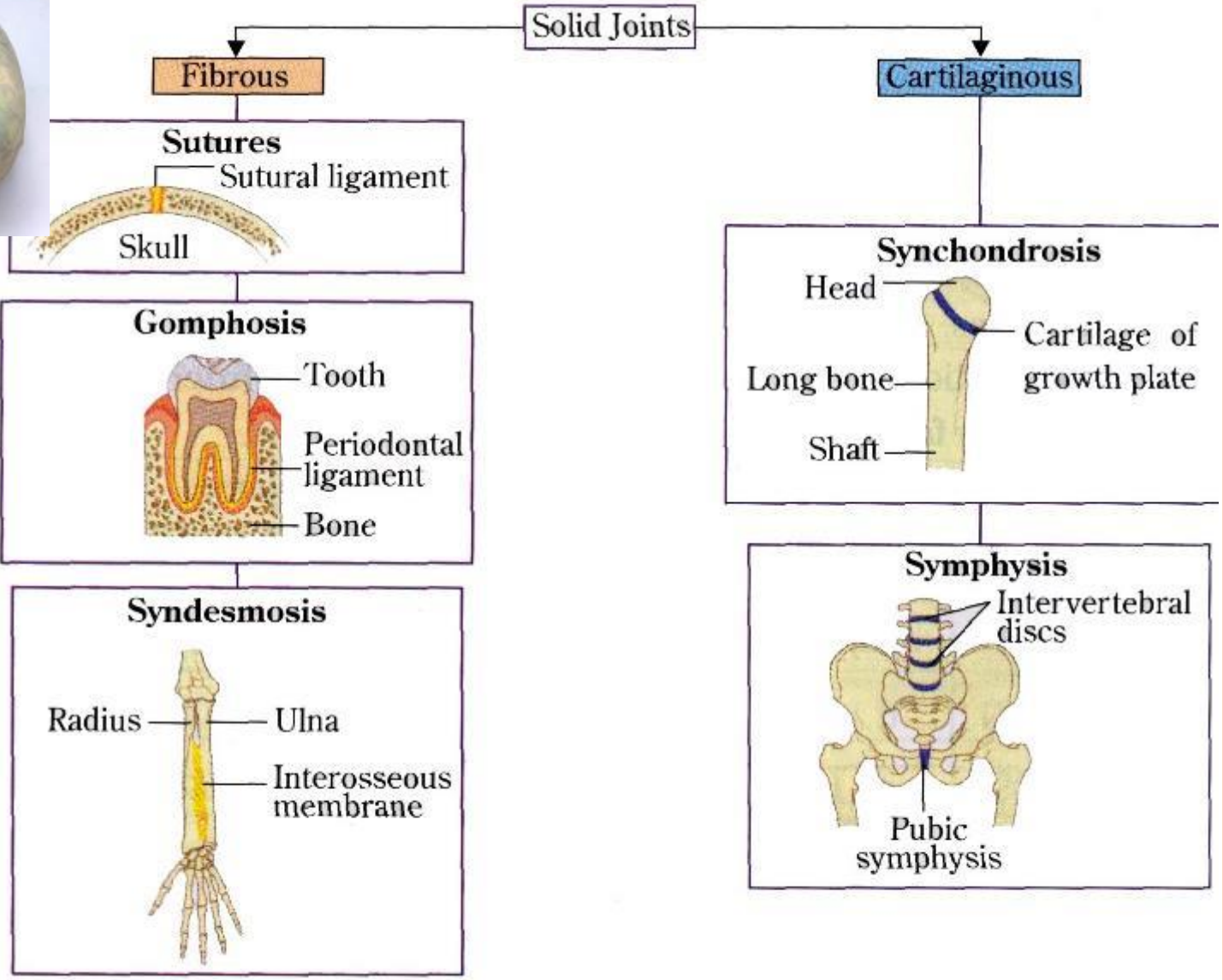
# The human skeleton



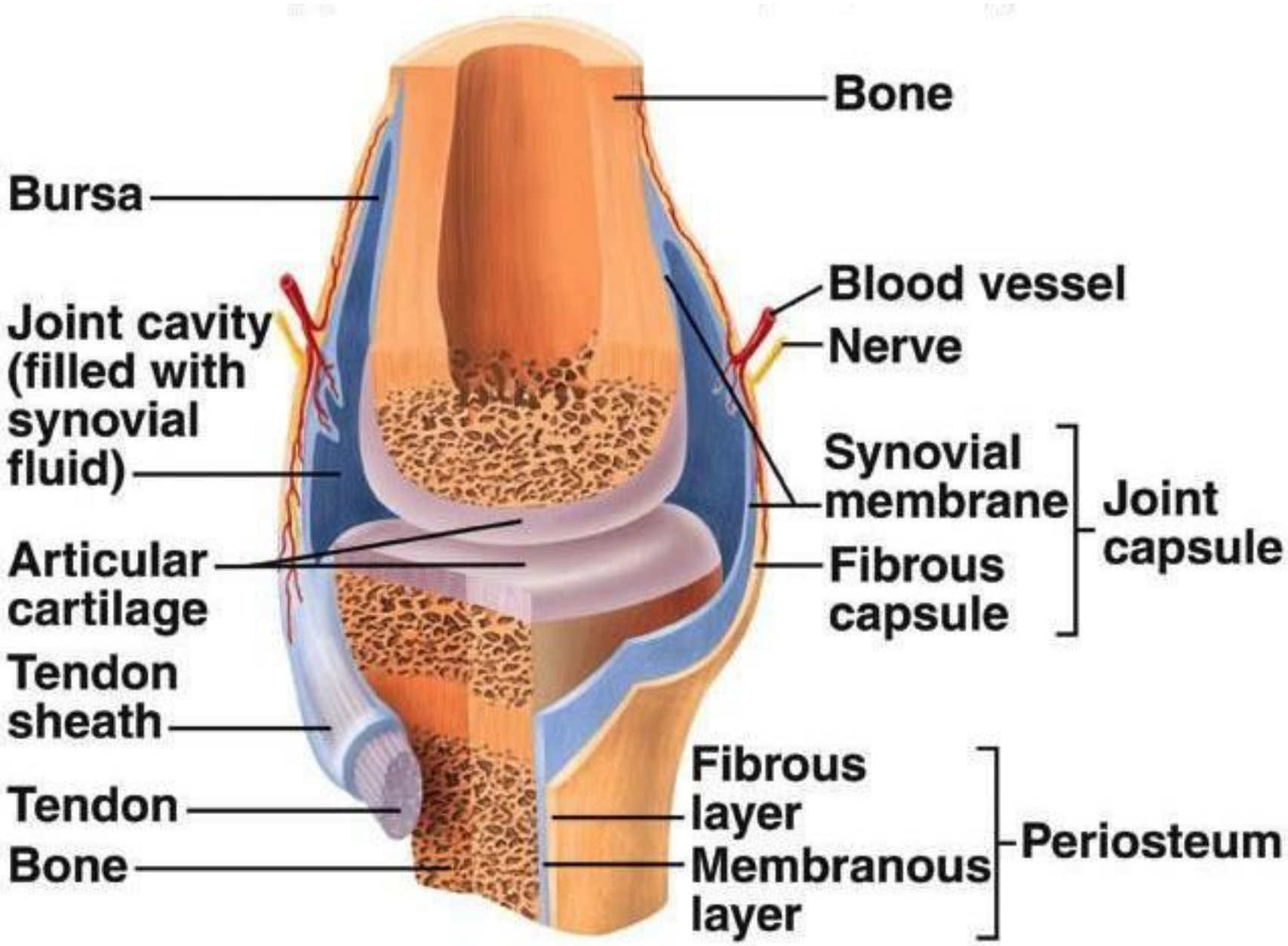
# Major types of joints



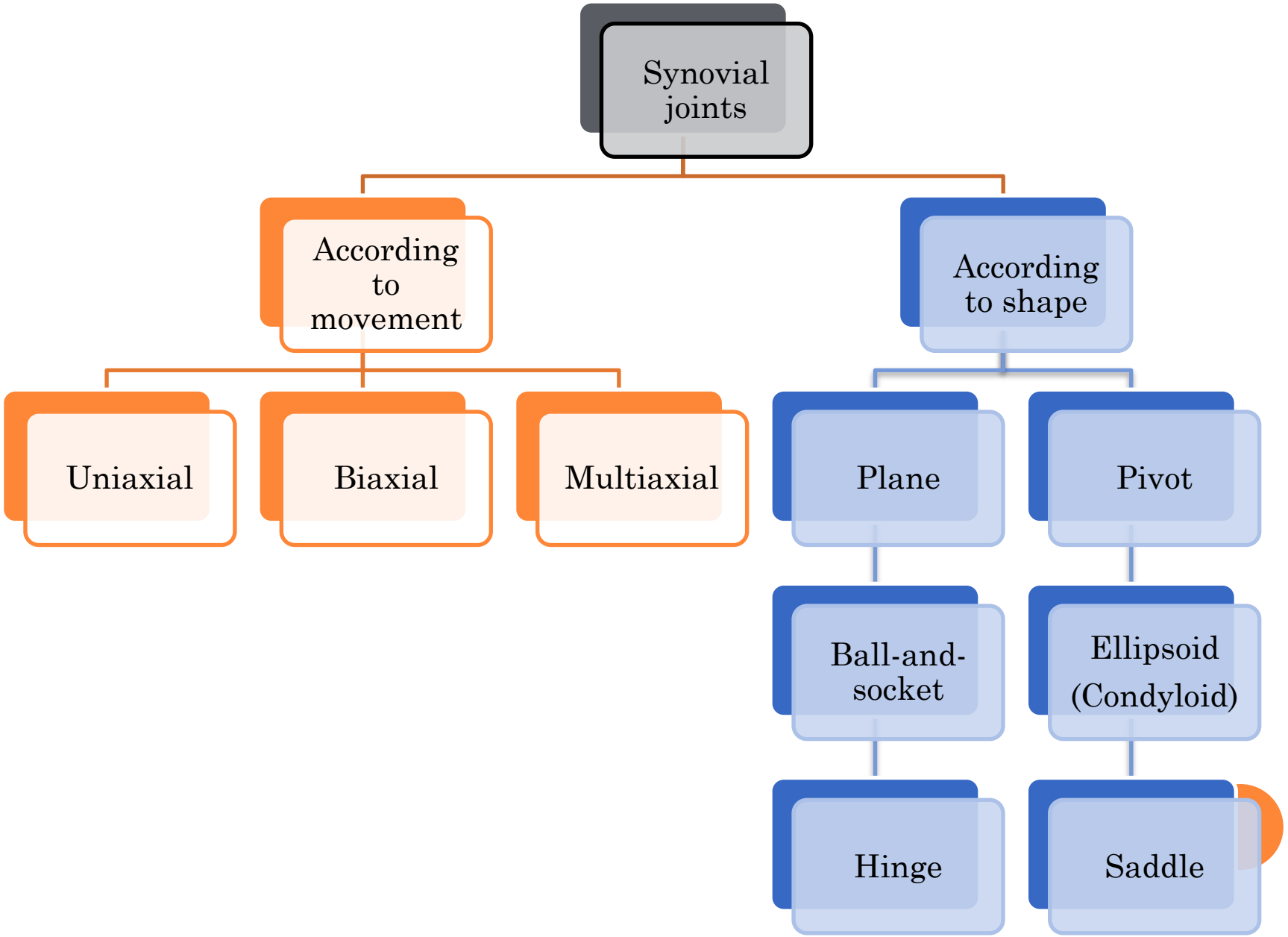
# Solid joints



# Synovial joint structure



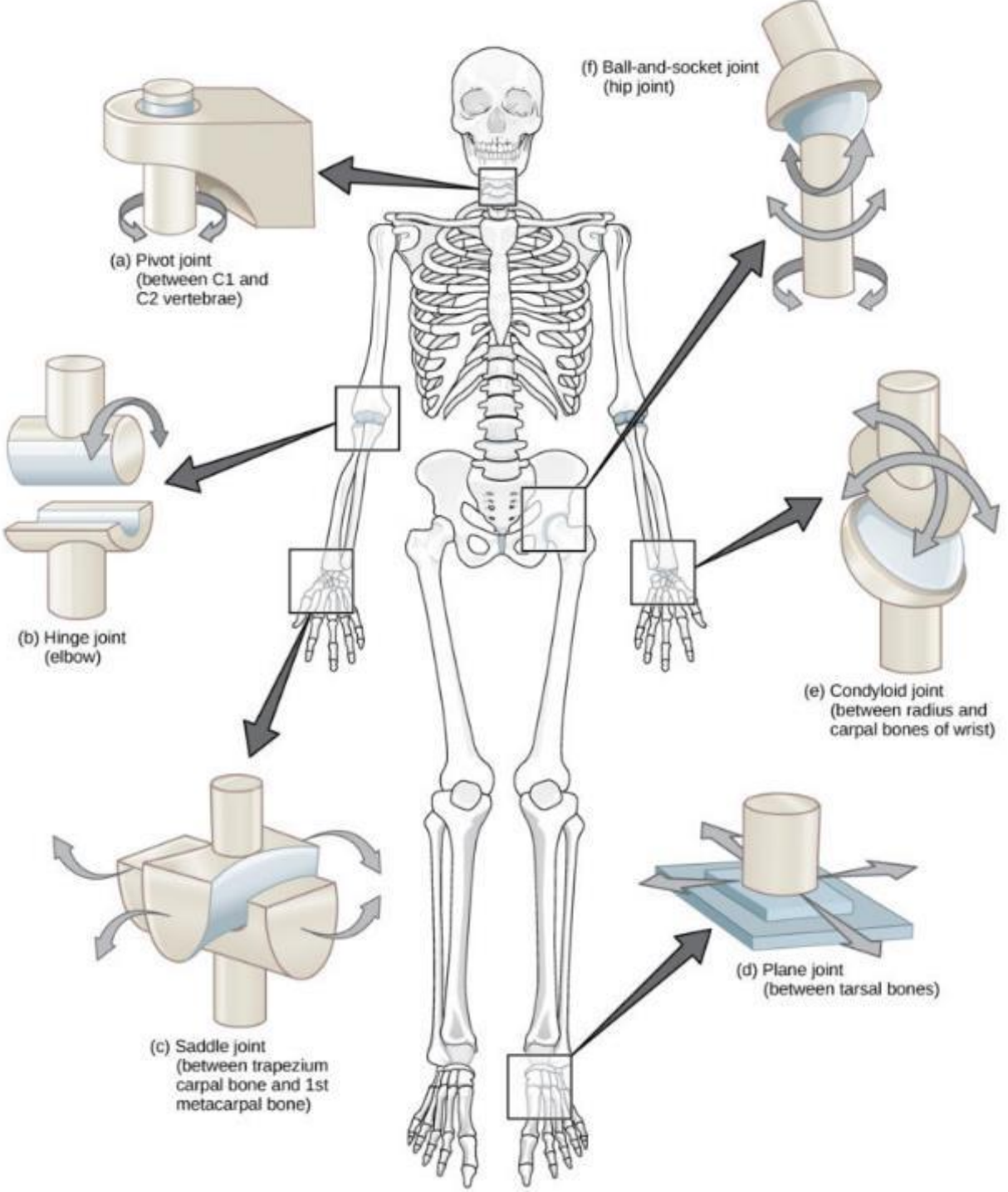
# Synovial joints types



# SYNOVIAL JOINTS TYPES

How to study joints:

1. Type
2. Articulating bones
3. Joint capsule attachments
4. Stabilizing factors (shape, ligaments, muscles)
5. Weakening factors
6. Neurovascular supply
7. Related bursae, sheaths …etc.
8. Clinical notes



# TEST YOUR KNOWLEDGE

## Fill in the blanks:

- Yellow bone marrow is found in the ……
- The thigh bone (femur) is an example of a …….. bone
- Cartilage of the auricle is …… cartilage
- The articulating bones of synovial joints are covered with…….. Cartilage
- A……. is a sac of synovial fluid separating the joint from adjacent structures.
- The knee is an example of a …….. synovial joint which is (according to movement) is……..
- A pivot joint allows …… movement

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DEPT. OF ANATOMY, HISTOLOGY & EMBRYOLOGY
ASSIST. PROF. DR. SAMEH SAMEER AKKILA

# BASIC ANATOMICAL STRUCTURES

## NERVES & THE NERVOUS SYSTEM

### OBJECTIVES:

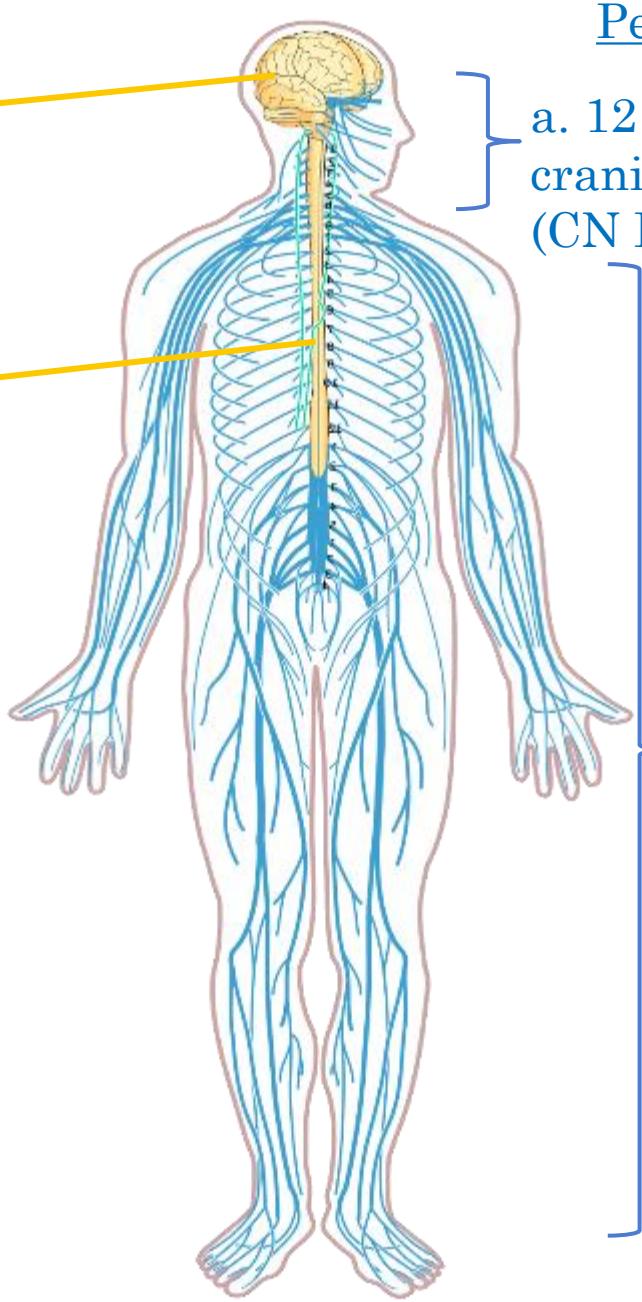
- Recognize the anatomical and functional divisions of the nervous system
- Define the nerve and study its components
- Study the structure of spinal nerves
- Understand the function and anatomical location of the autonomic nervous system

# Anatomical divisions of the NS

Central (CNS)

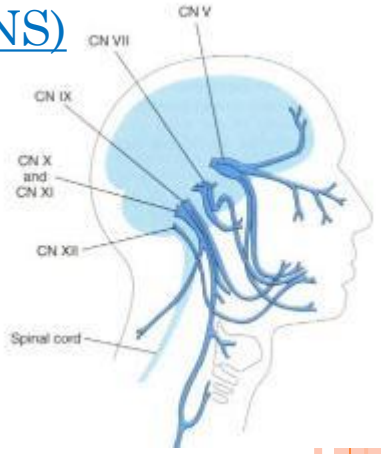
a. Brain (in skull)

b. Spinal cord (in vertebral column)

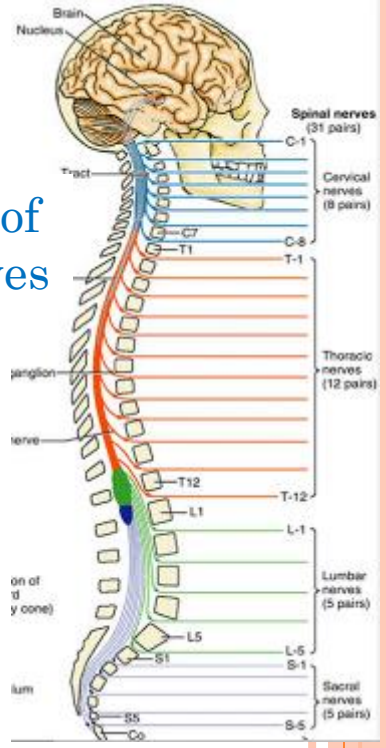


Peripheral (PNS)

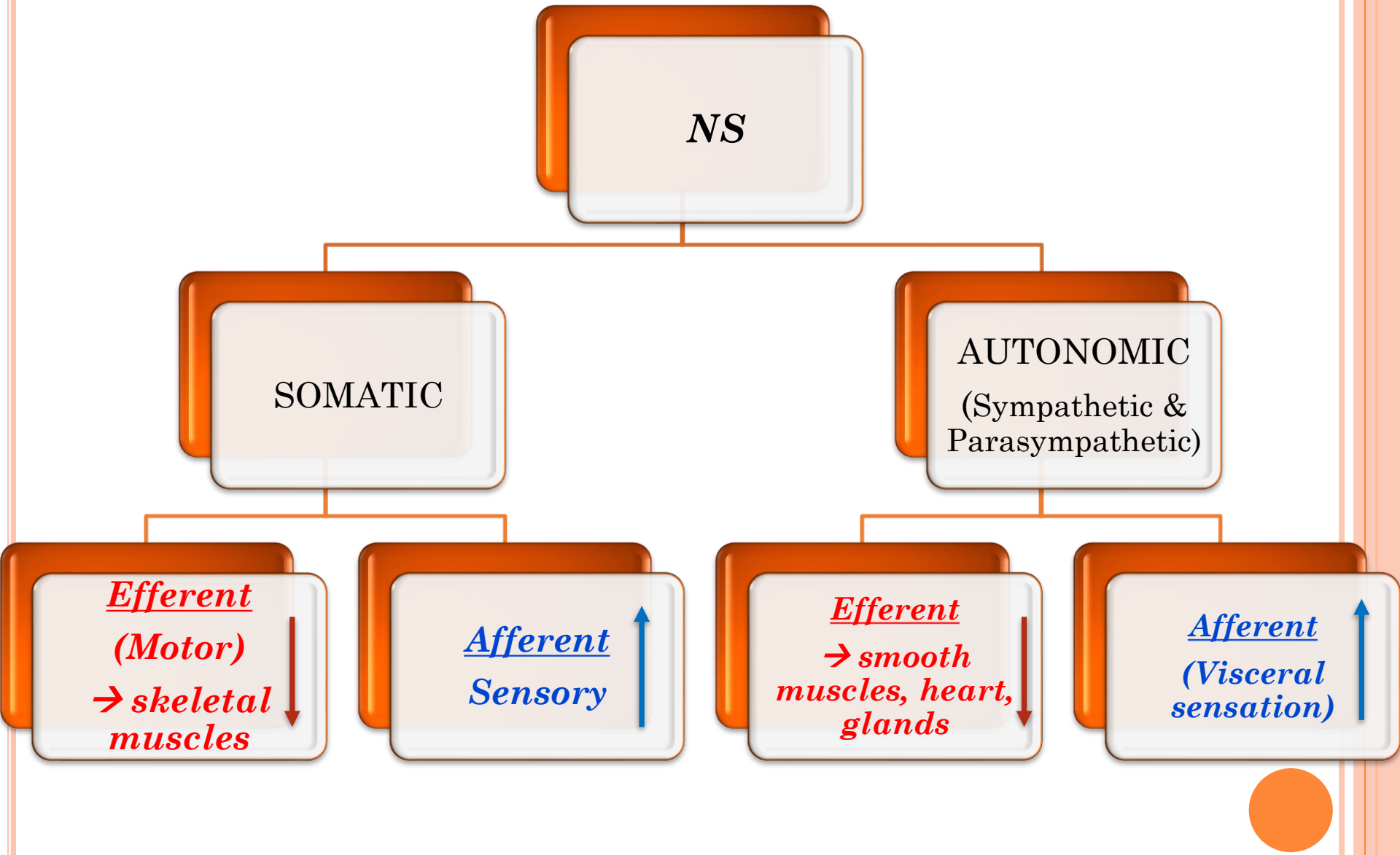
a. 12 pairs of cranial nerves (CN I-CN XII)



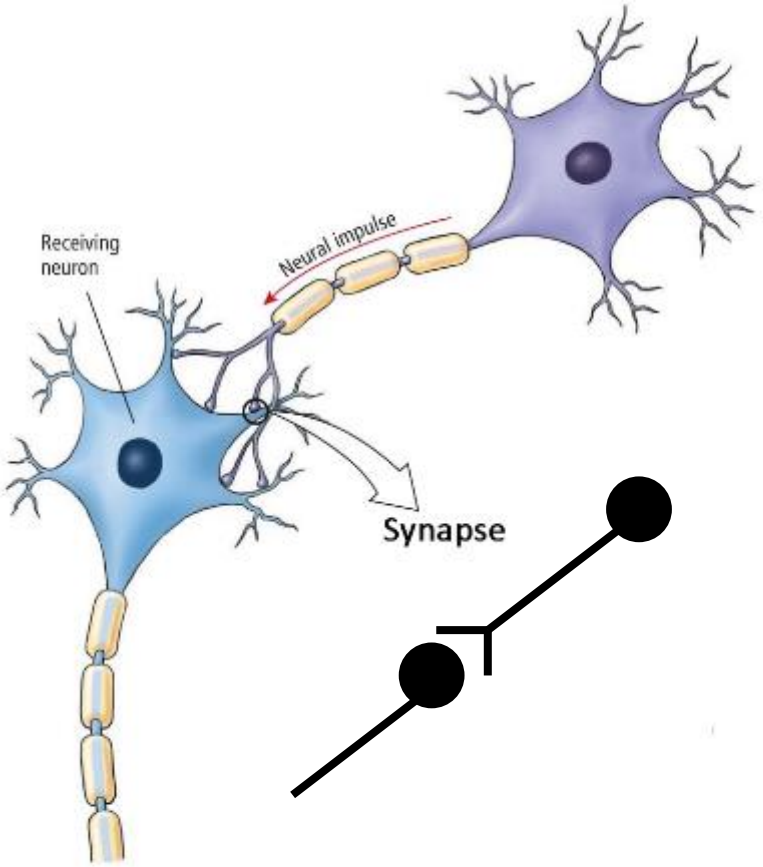

b. 31 pairs of spinal nerves



# FUNCTIONAL DIVISIONS OF THE NS

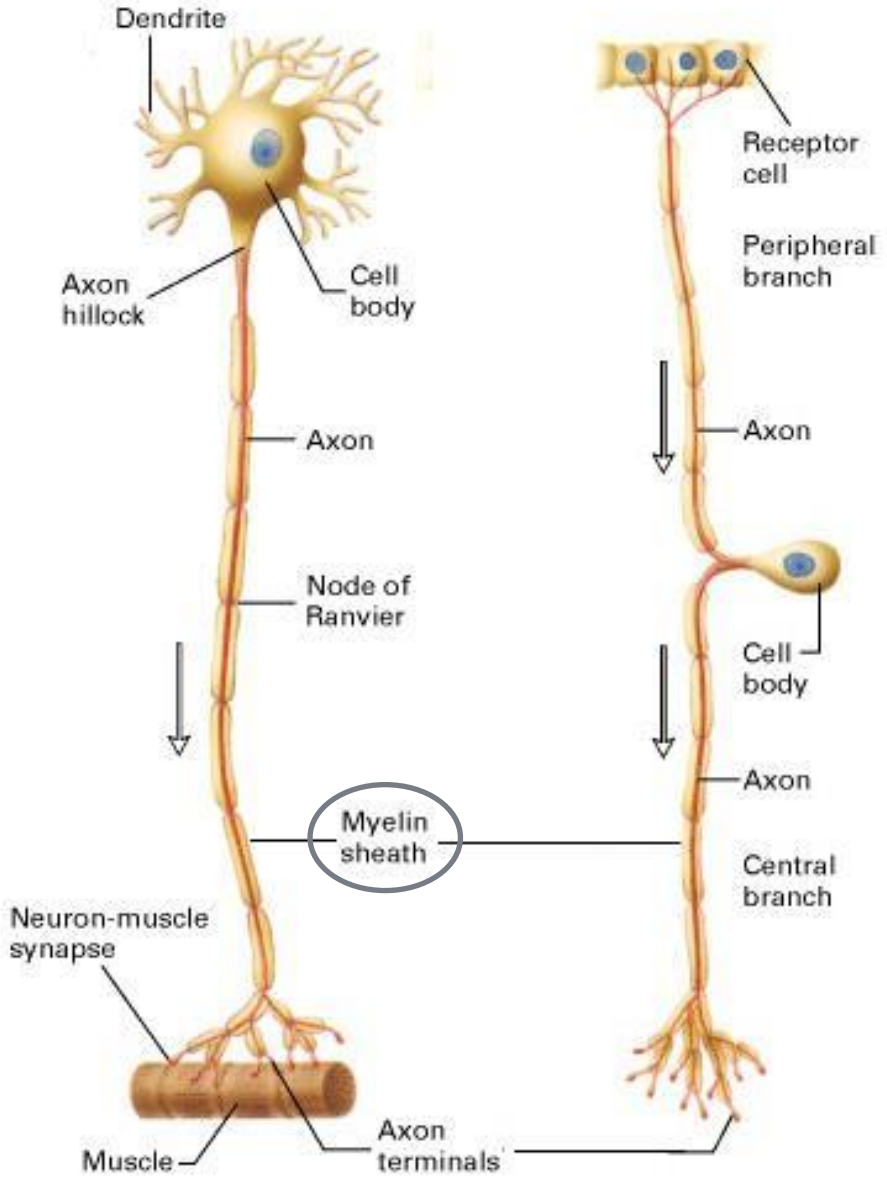


# THE NEURON

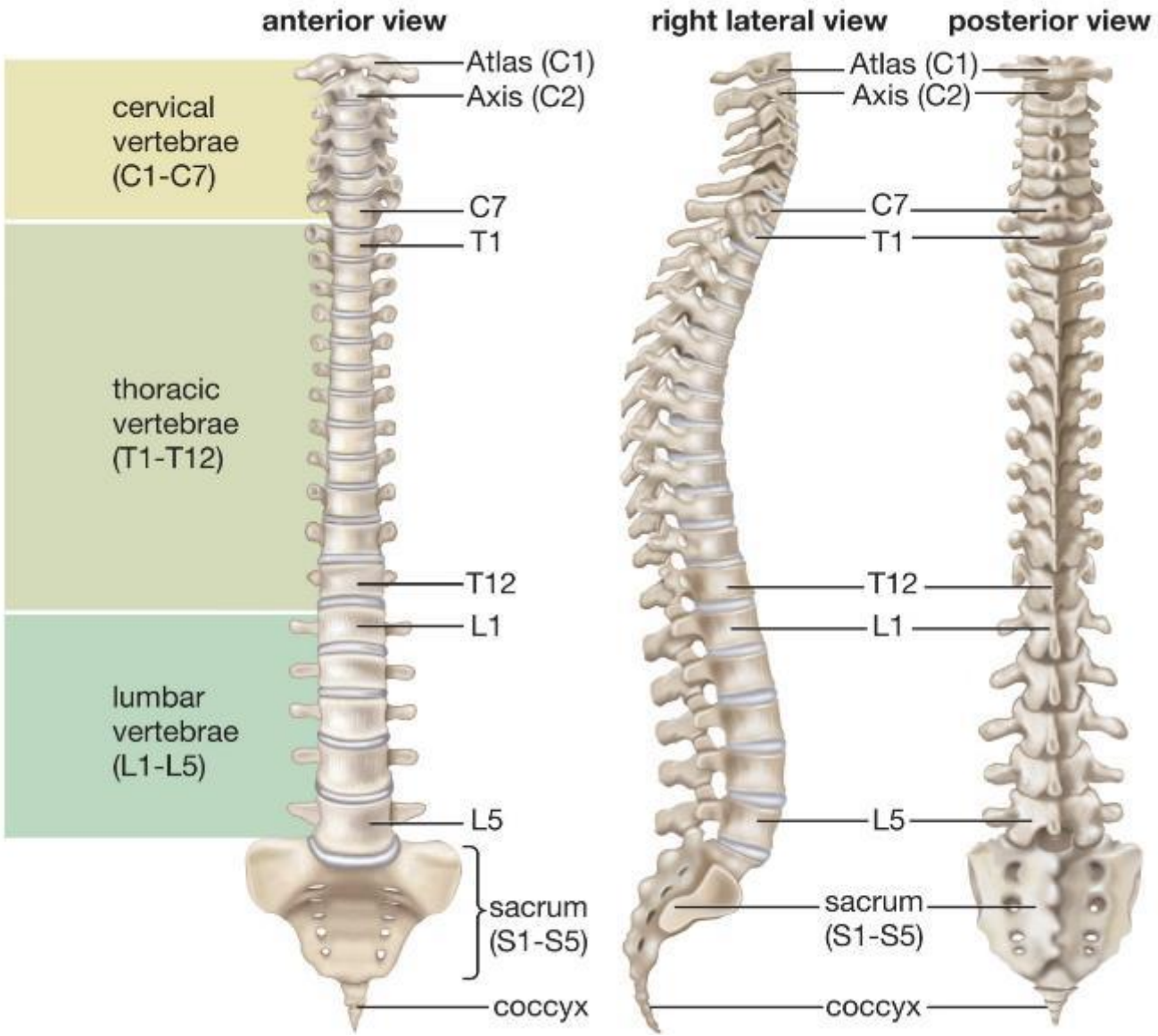



Motor (multipolar) neuron

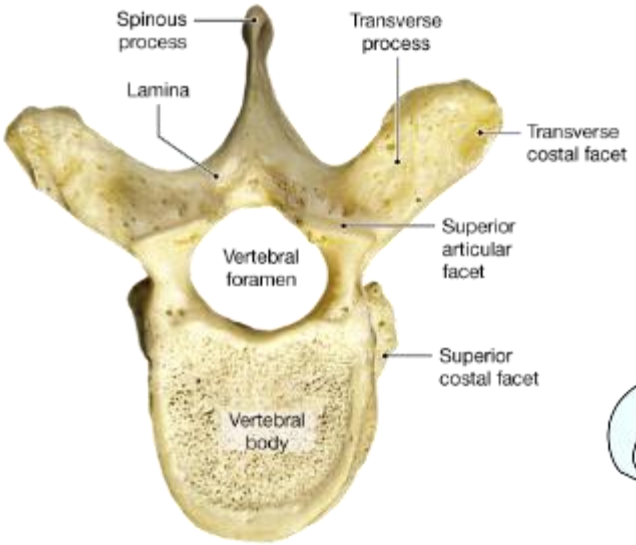
Sensory (Unipolar) neuron



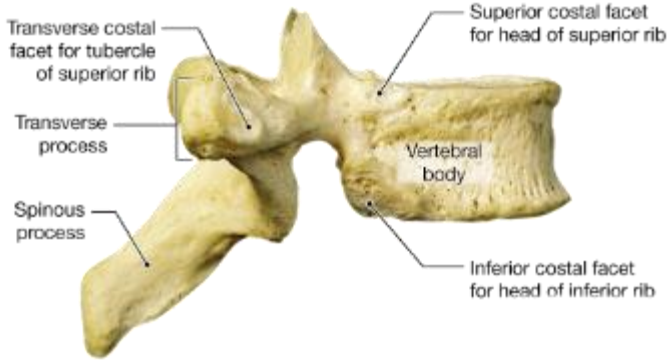
# Vertebral (spinal) column anatomy

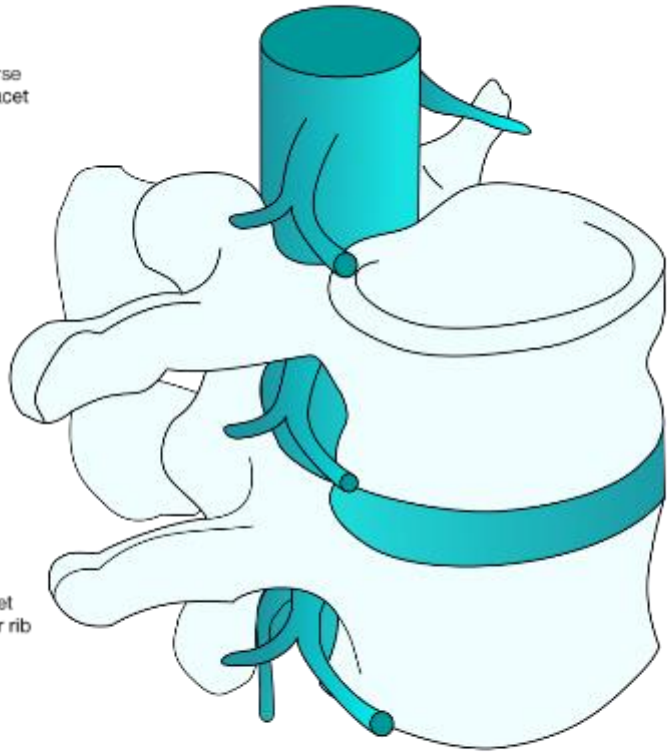


# The vertebral column, spinal cord & spinal nerves

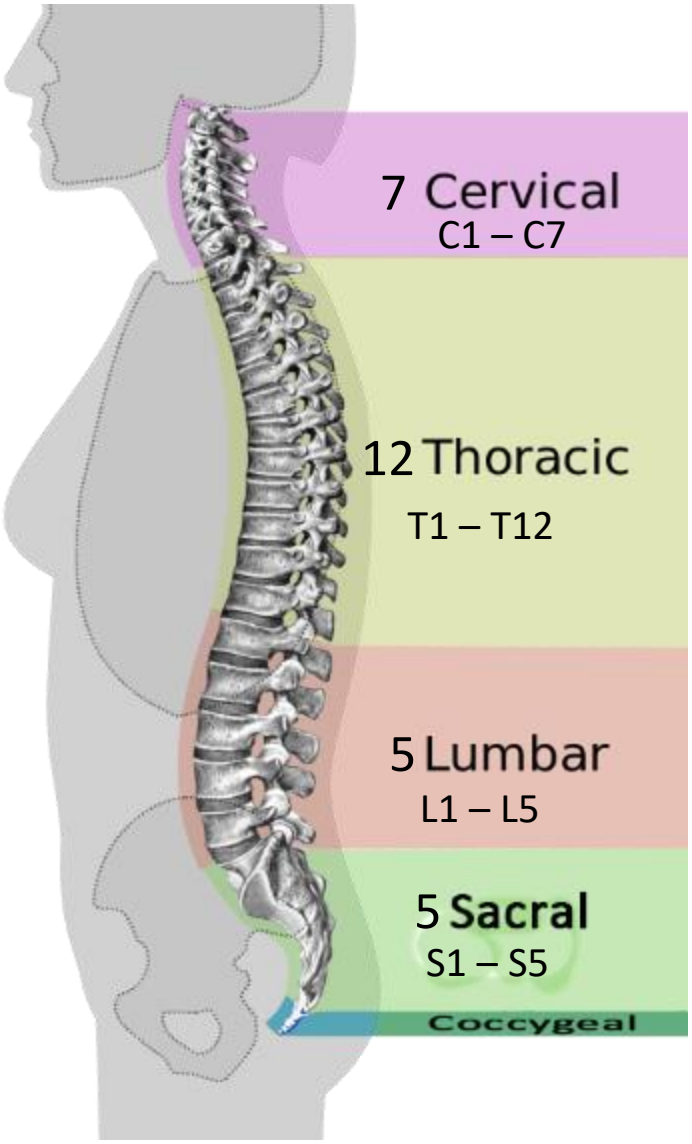



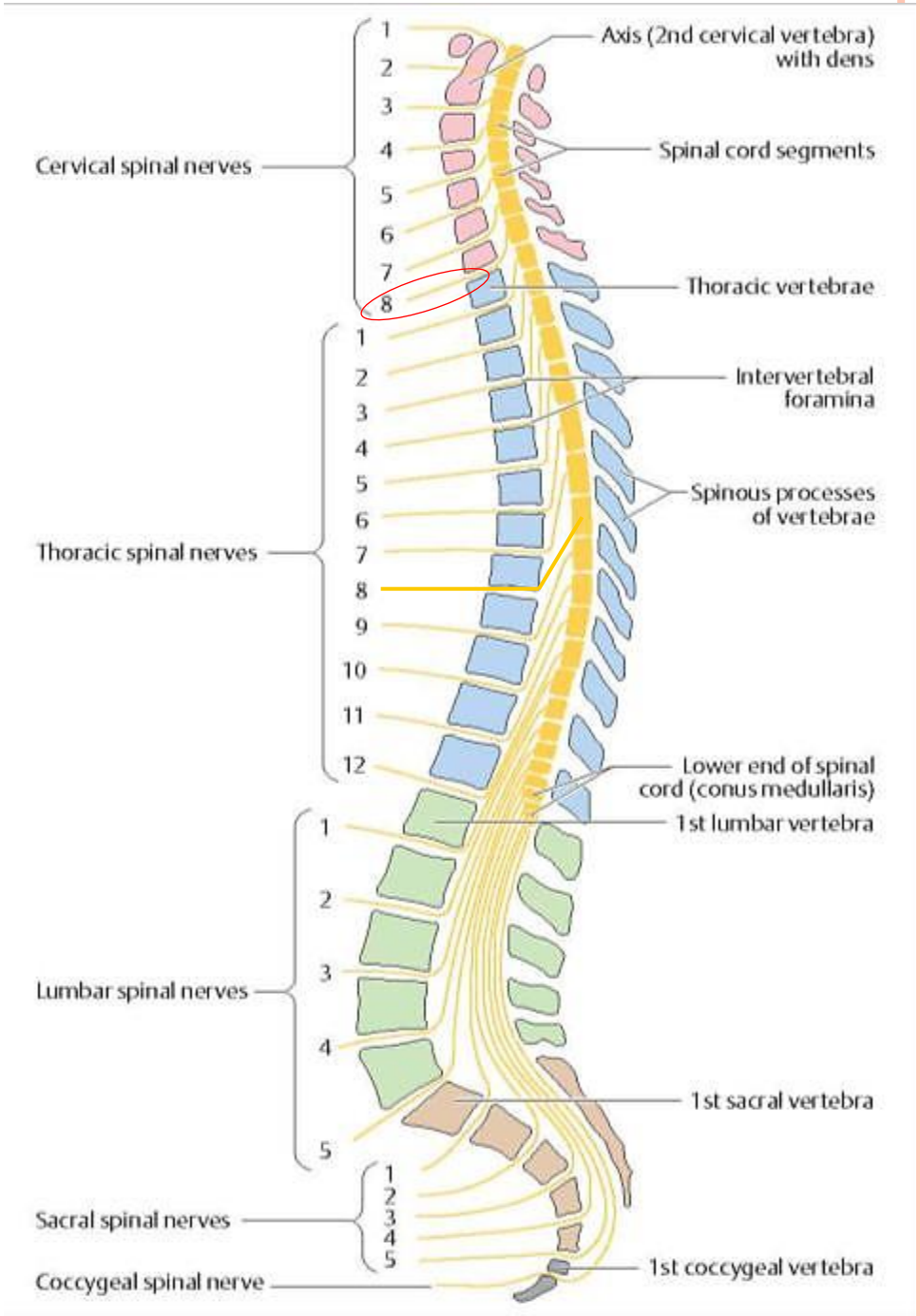

Thoracic vertebra, superior view.



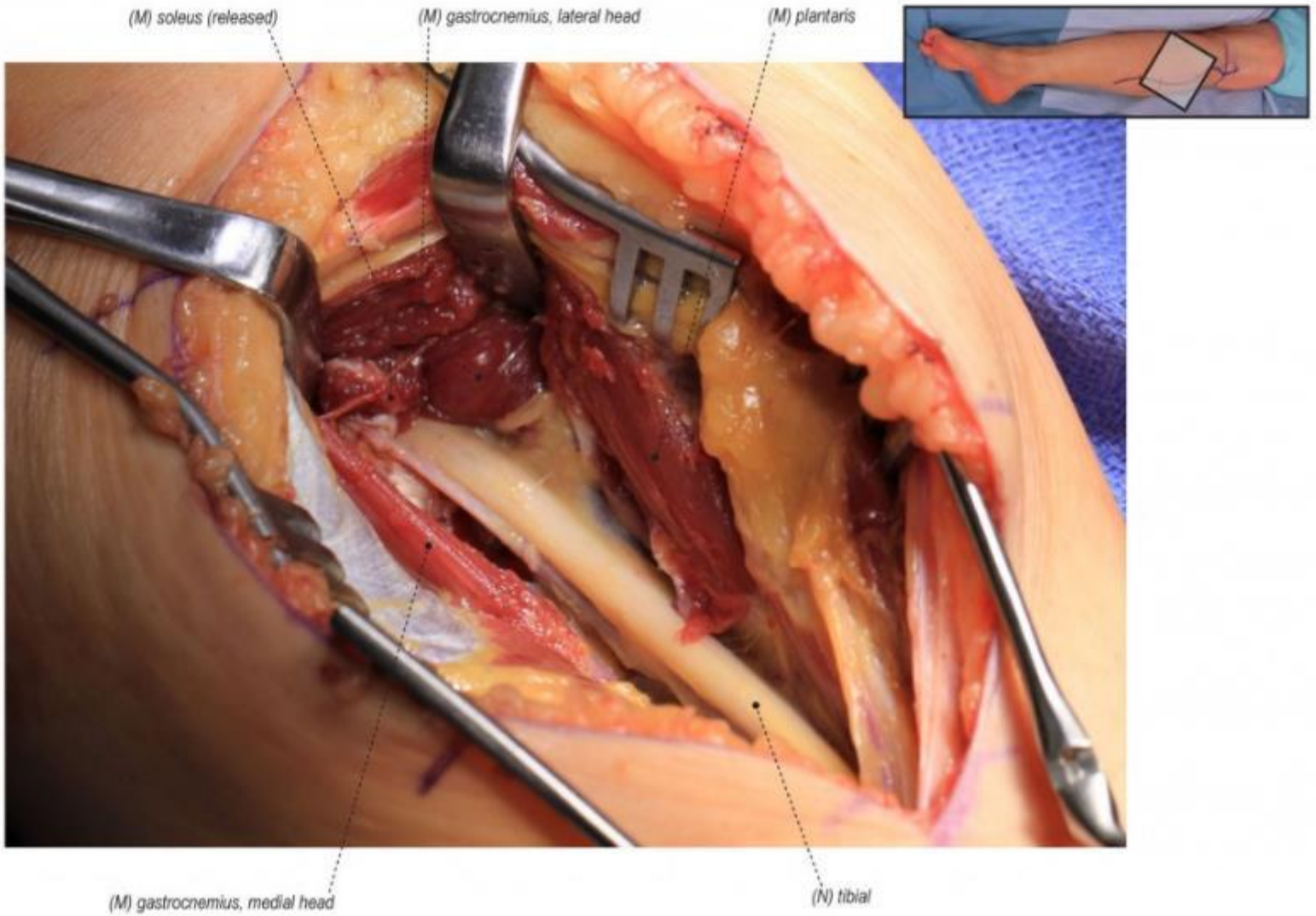



# 30 Vertebrae & 31 spinal nerves ?

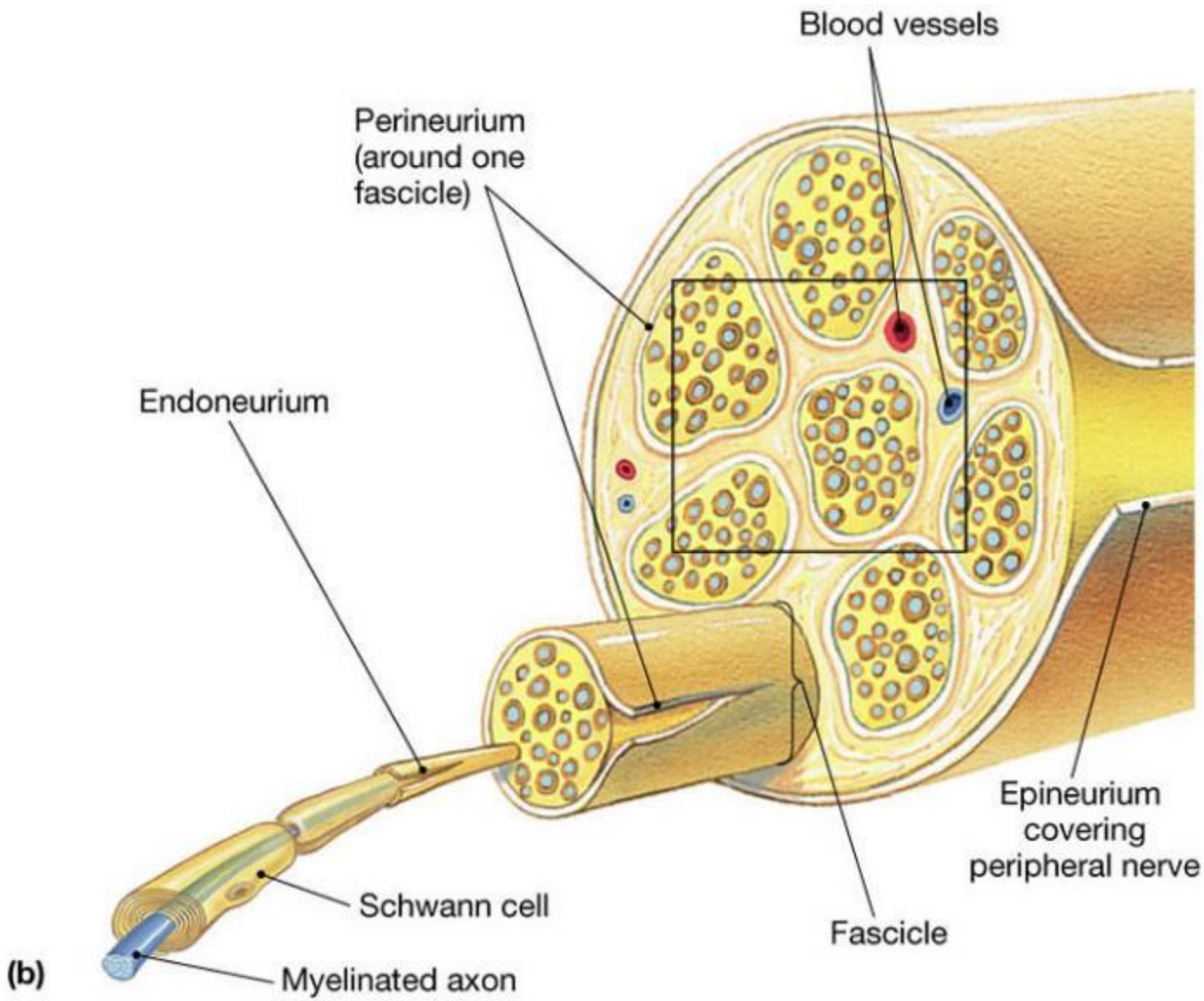


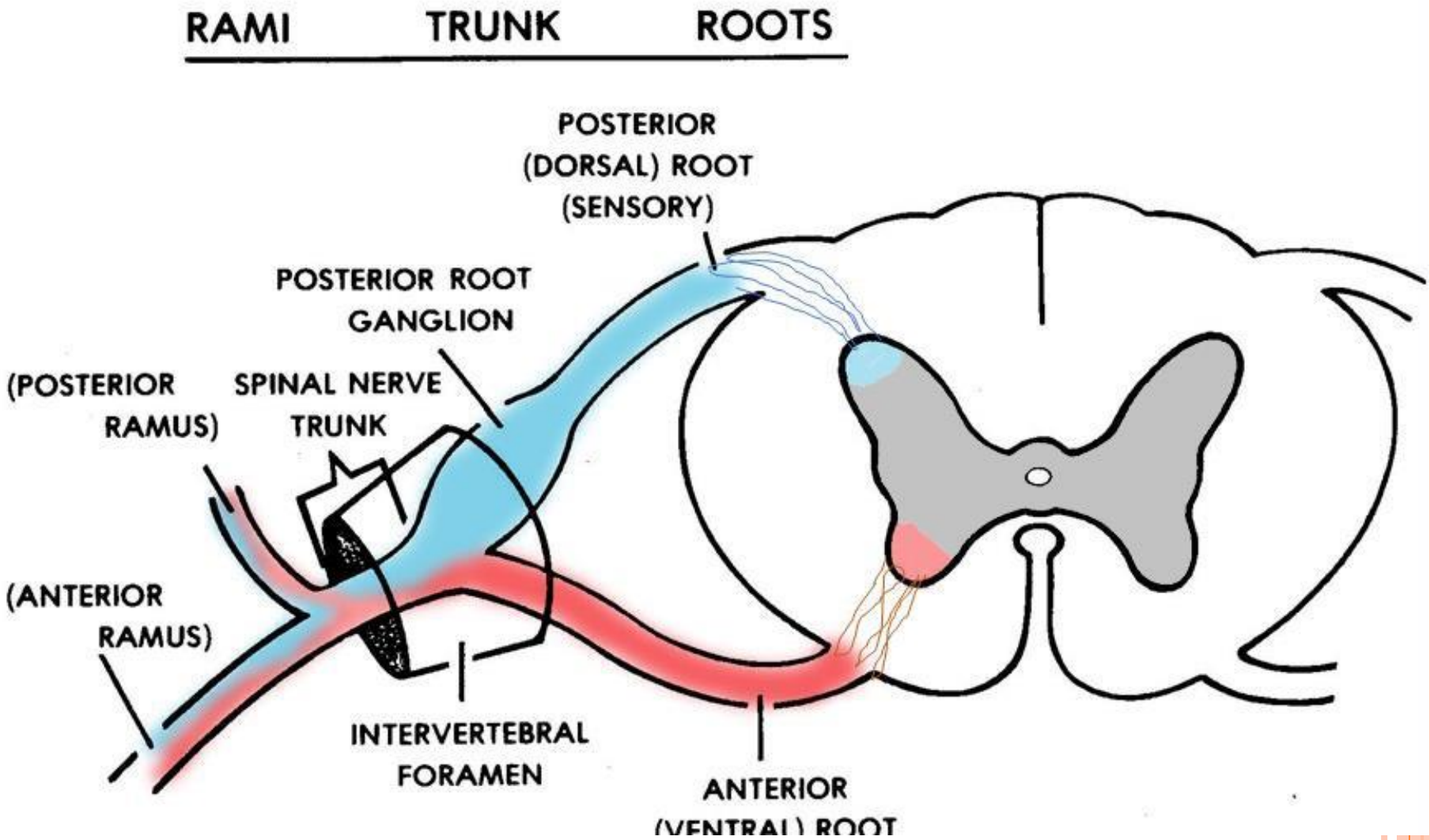
# The nerve


(M) soleus (released)
(M) gastrocnemius, lateral head
(M) plantaris
(M) gastrocnemius, medial head
(N) tibial

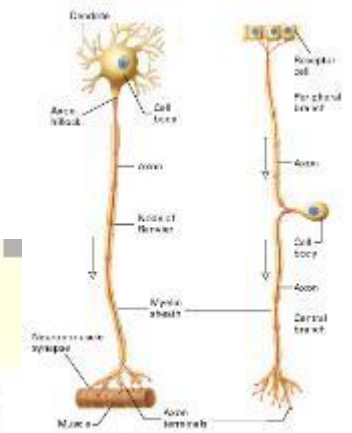
# The nerve


Blood vessels
Perineurium (around one fascicle)
Endoneurium
Epineurium covering peripheral nerve
Schwann cell
Fascicle
(b)
Myelinated axon

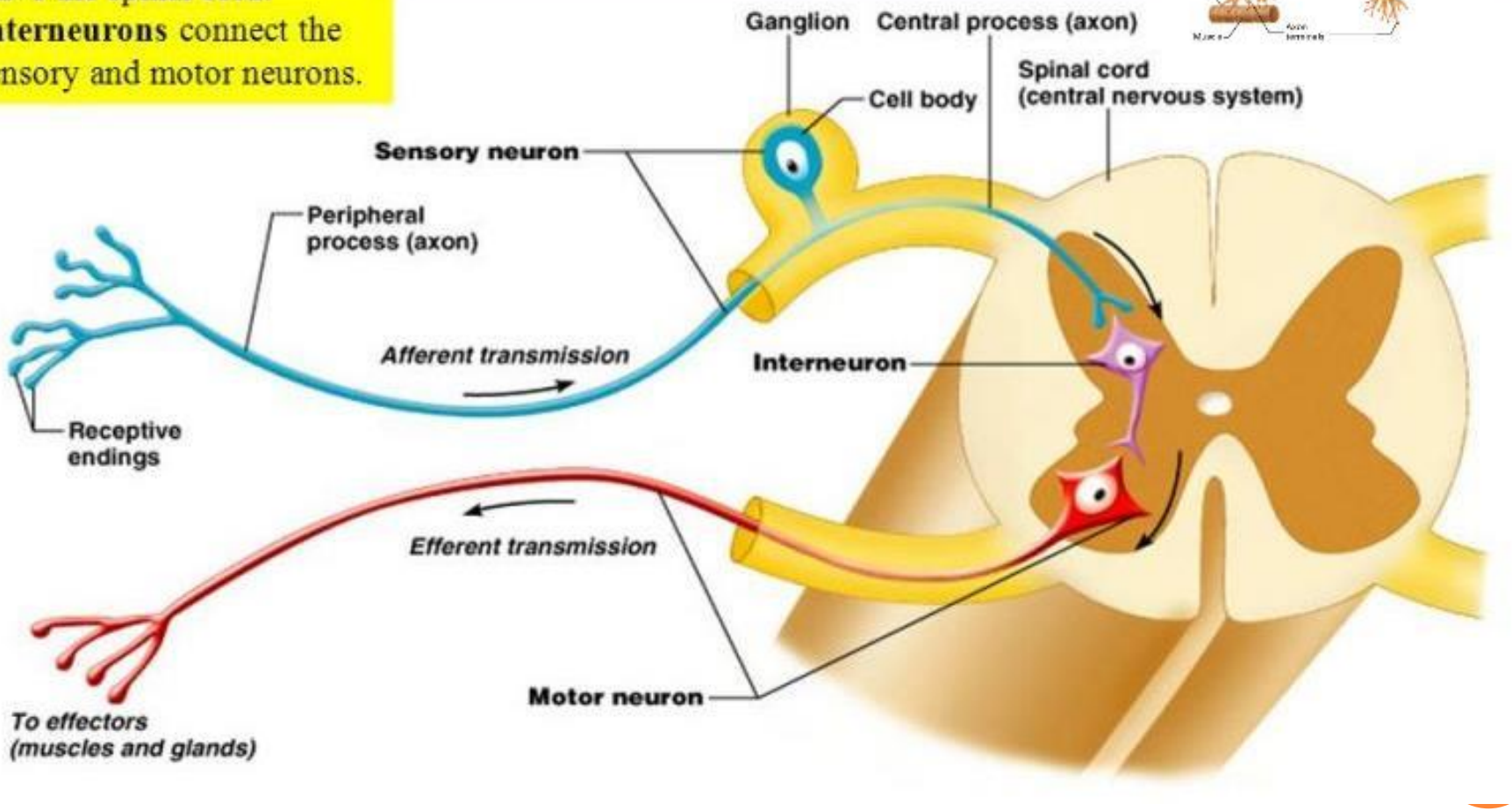
# The spinal nerve



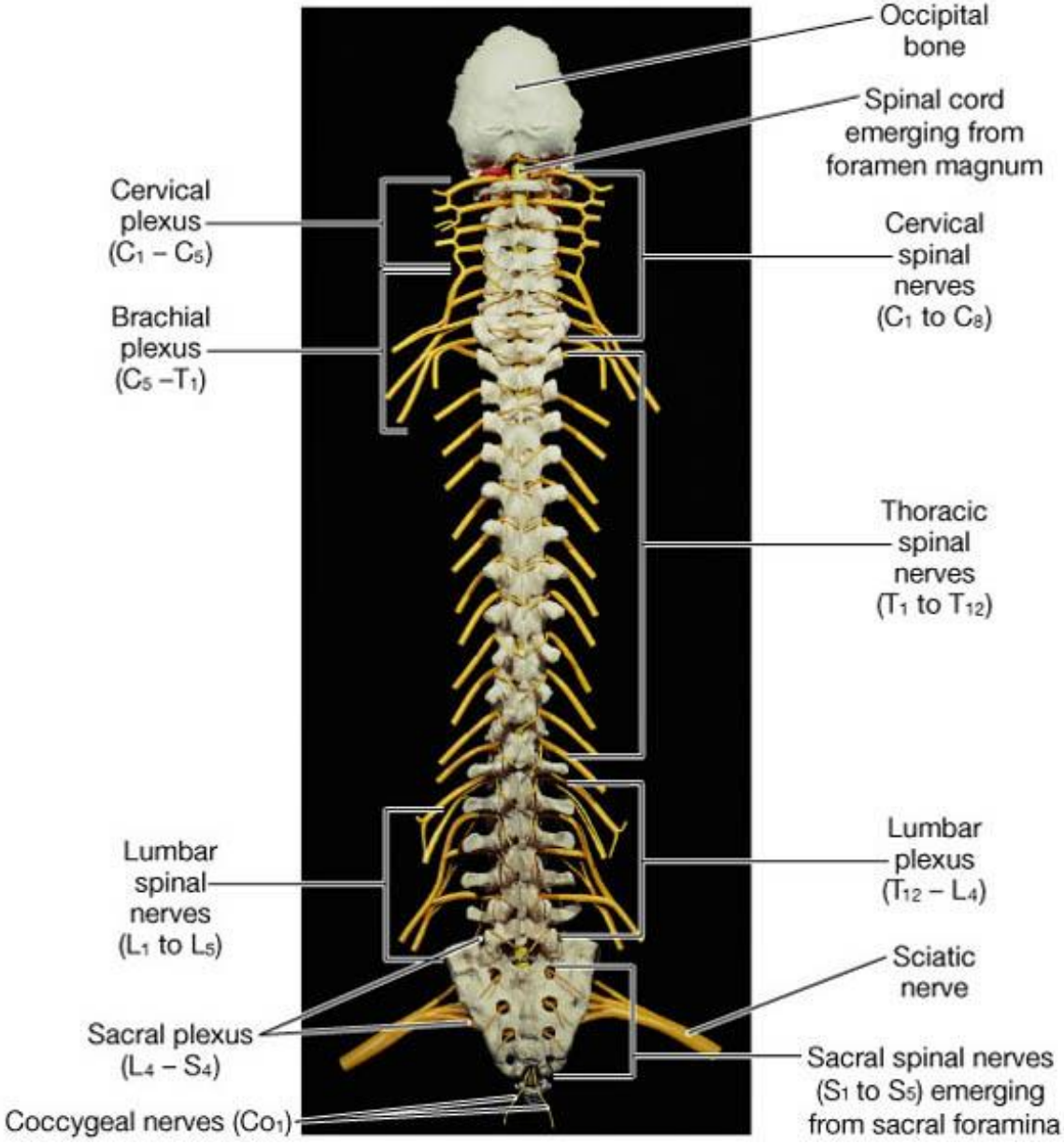
# The spinal nerve



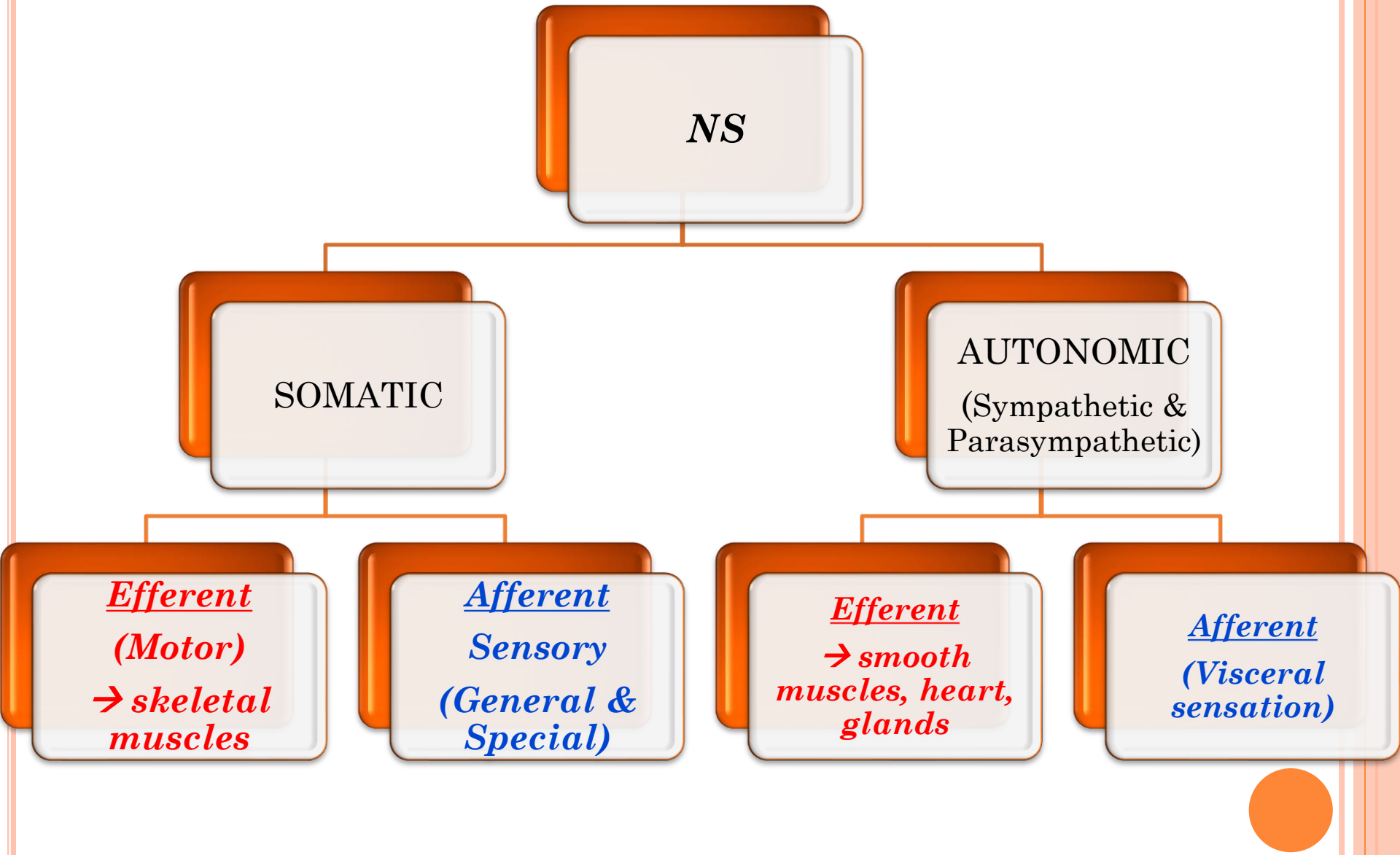
**Sensory** neurons enter the spinal cord. **Motor** neurons leave the spinal cord. **Interneurons** connect the sensory and motor neurons.



# Spinal nerve plexuses



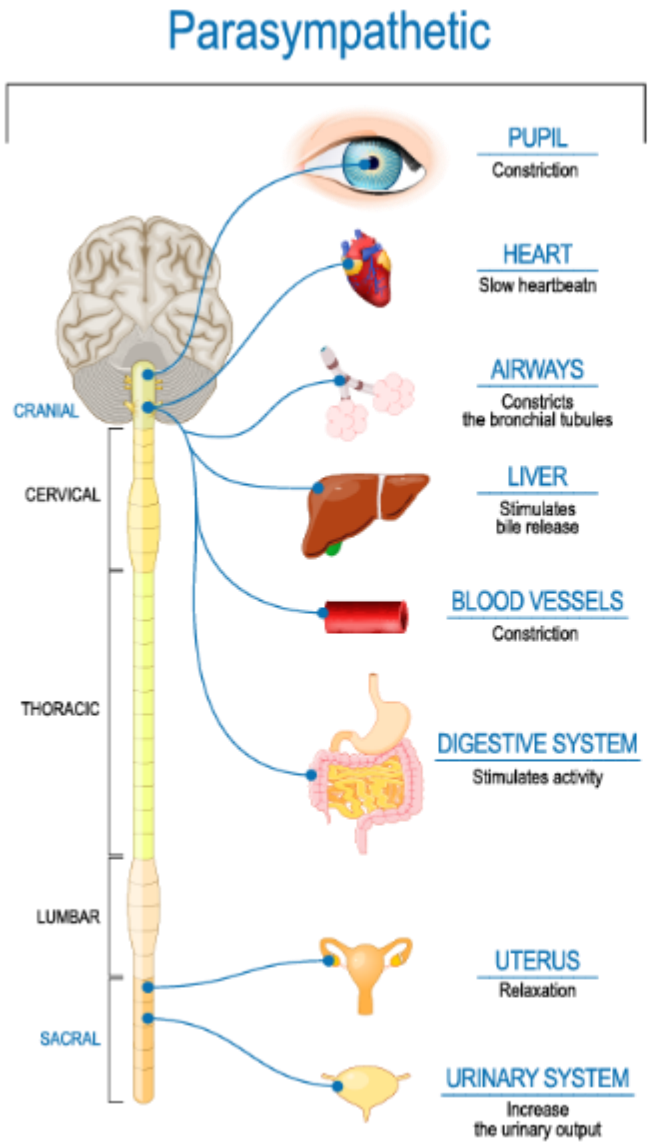
# FUNCTIONAL DIVISIONS OF THE NS

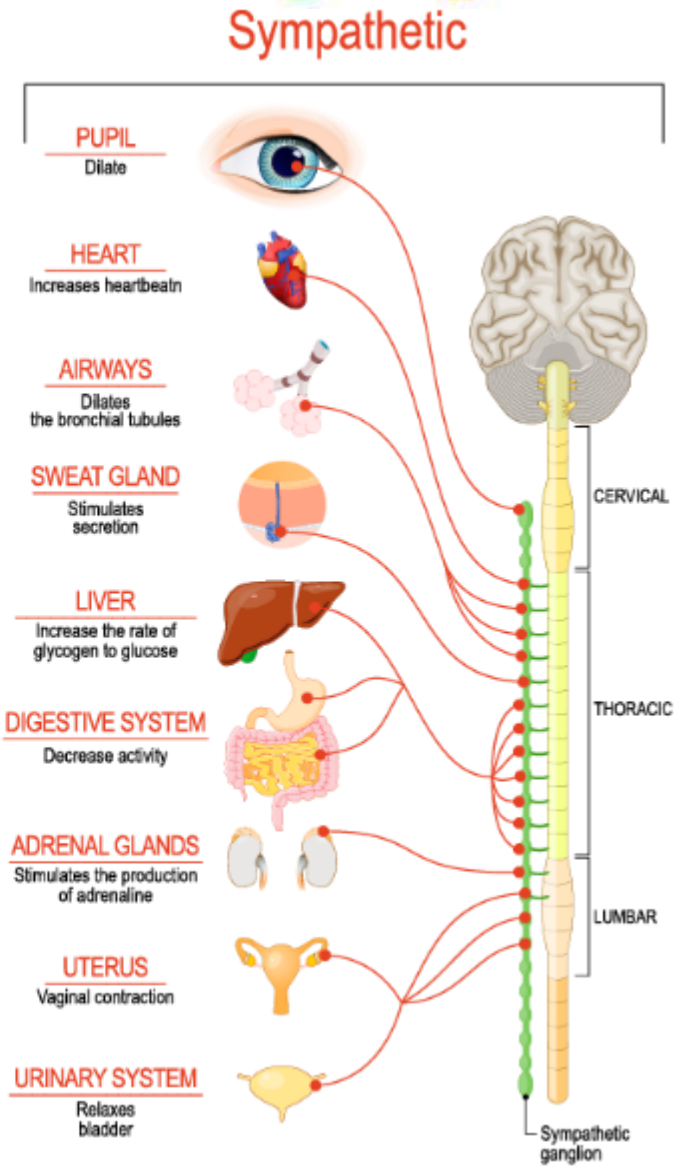


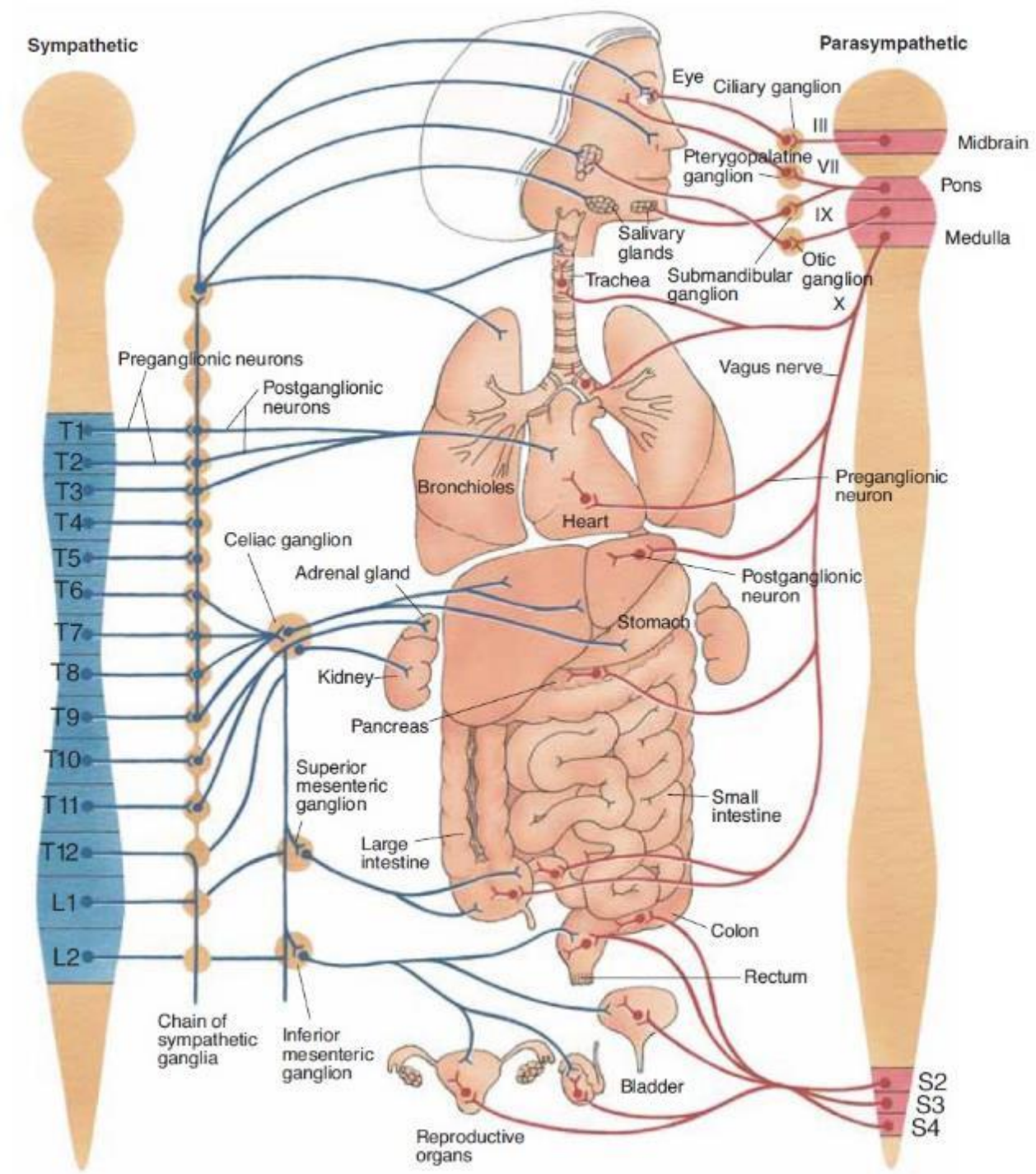
# The autonomic nervous system

- Sympathetic : fight or flight…..Danger/ Stress
- Parasympathetic: relax and maintain

# The fight or flight response vs Relaxation / maintenance






**<u>Sympathetic</u>** =
Thoracolumbar
[T1-L2 (L3)]
→ Sympathetic trunk
→ All Spinal nerves
→ CN IX, X, XII
→ Organs
→ Short pregagnglionic
→ Long postganglionic

**<u>Parasympathetic</u>** =
Craniosacral
[CN III, VII, IX, X
+ S2, S3, S4]
→ Ganglia
→ Organs
→ Long pregagnglionic
→ Short postganglionic

# TEST YOUR KNOWLEDGE

## Fill in the blanks:

- Bipolar neurons are…… neurons
- The nerve fiber is the……. of the nerve cell which is surrounded by deep fascial layer called the……
- The ventral root of spinal nerve contains pure…… fibers
- Spinal nerve trunks emerge from the vertebral canal via the…….. foramina
- C7 spinal nerve emerges…….. To C8 vertebra
- The sympathetic system arises from the…… region of the spinal cord
- The cranial nerves carrying parasympathetic fibers are....., ……., ……. & ……