Departement of Anasthesia Techniques

كلية المستقبل الجامعة
قسم تقنيات التخدير

المرحلة الاولى ٢٠٢٢-٢٠٢٣

Anatomy

Lecture :Human body tissue

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The fascia

Fasciae (figure 5).

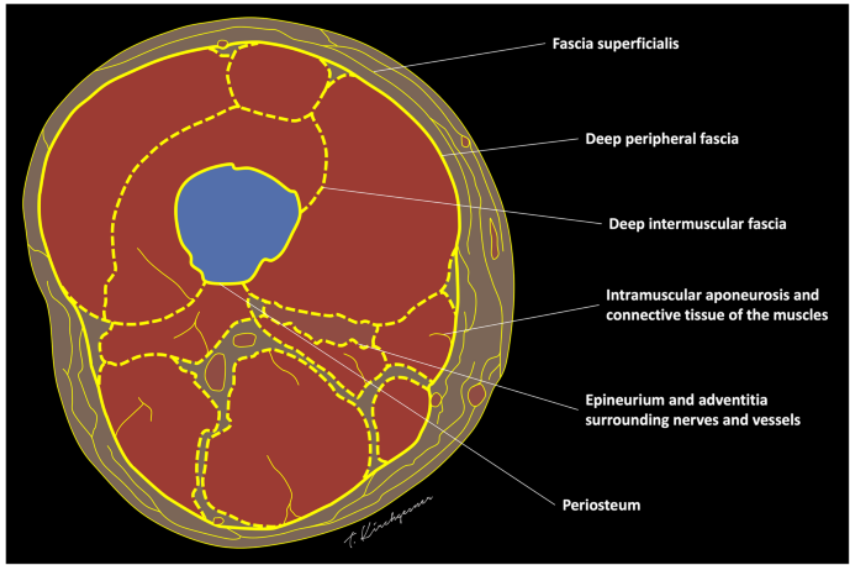
The fasciae is a membrane of connective tissue that invests the body organs and structures , and can be divided into two types;

superficial and **deep**, which lie between the skin and the

underlying muscles and bones. **The superficial fascia,** or subcutaneous tissue, is a mixture of loose areolar and adipose tissue that unites the Dermis of the skin to the underlying deep fascia.

The deep fascia is a membranous layer of connective tissue that invests the muscles and other deep structures.

Figure. 5



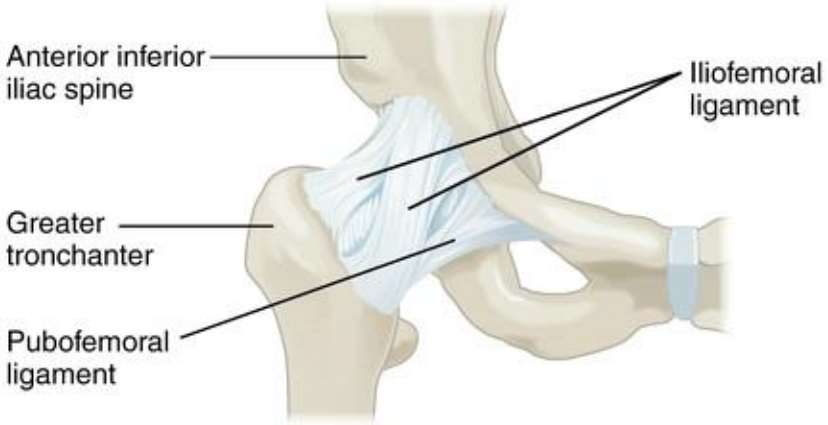
Ligaments

Ligaments

A ligament is a cord or band of fibrous connective tissue uniting two or more structures. In the context of the musculoskeletal system, ligaments typically bind bones at joints. **The two types of ligaments are fibrous (figure.6) and elastic.**

Most **fibrous ligaments** are composed of dense bundles of collagen fibers and are not stretchable under normal conditions.

figure6



(b) Anterior view of right hip joint, capsule in place

Ligaments

e.g., **the iliofemoral ligament of the hip joint** and the collateral ligaments of the elbow joint).

Elastic ligaments

are composed largely of elastic tissues and can therefore regain their original length after stretching (e.g., the **ligamentum flavum** of the **vertebral column(figure.7)**

and the calcaneonavicular ligament of the foot).

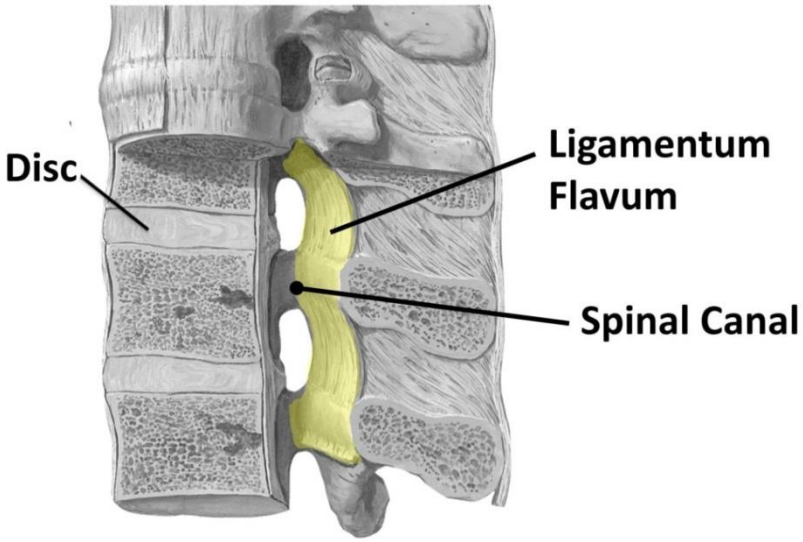


Figure.7

Human body tissues , types and characteristics

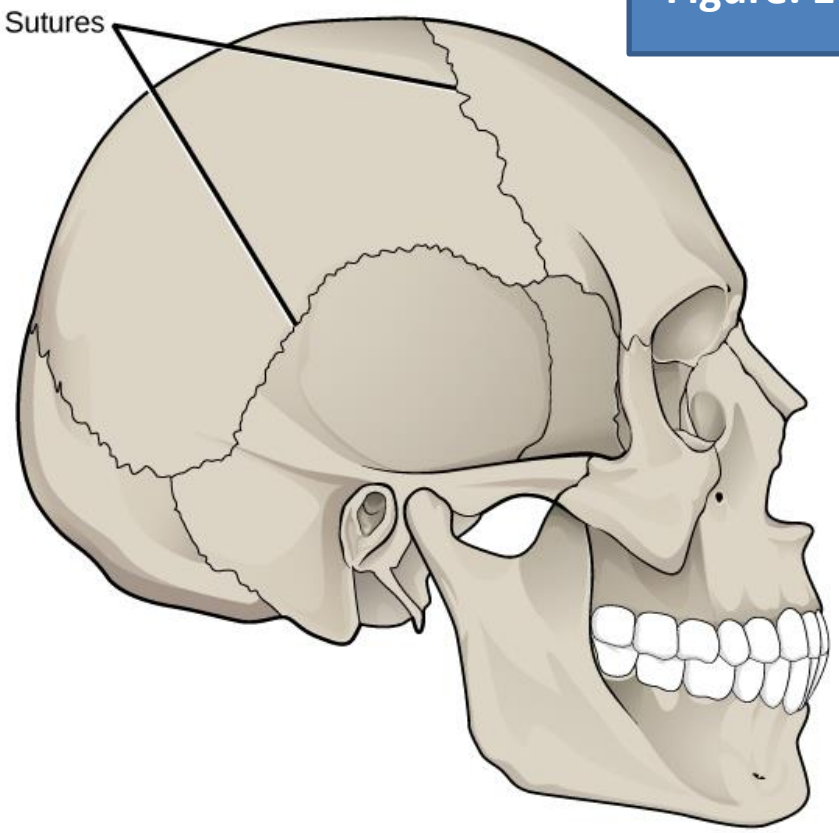
Joints

A site where two or more bones come together is called a **joint. The ends of the bones sharing the joint are called articulating surface.** Joints are classified according to the tissues that lie between the articulating ends: **fibrous joints, cartilaginous joints, and synovial joints.**

Fibrous Joints

The articulating surfaces of the bones are joined by fibrous tissue and thus very little movement is possible. The sutures of the **vault of the skull (figure .1) and the inferior tibiofibular joints** are examples of fibrous joints.

Figure. 1



Human body tissues , types and characteristics

Cartilaginous Joints

Cartilaginous joints can be divided into two types: **primary and secondary.**

A **primary cartilaginous joint (figure. 2)** is one in which the bones are united by a plate or a bar of hyaline cartilage. Thus, the union between the 1st rib and the manubrium sterni is an example of such a joint. No movement is possible.

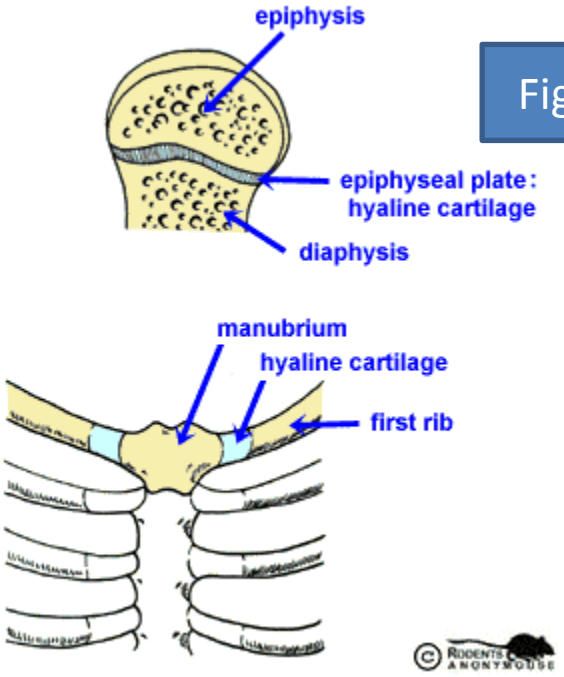
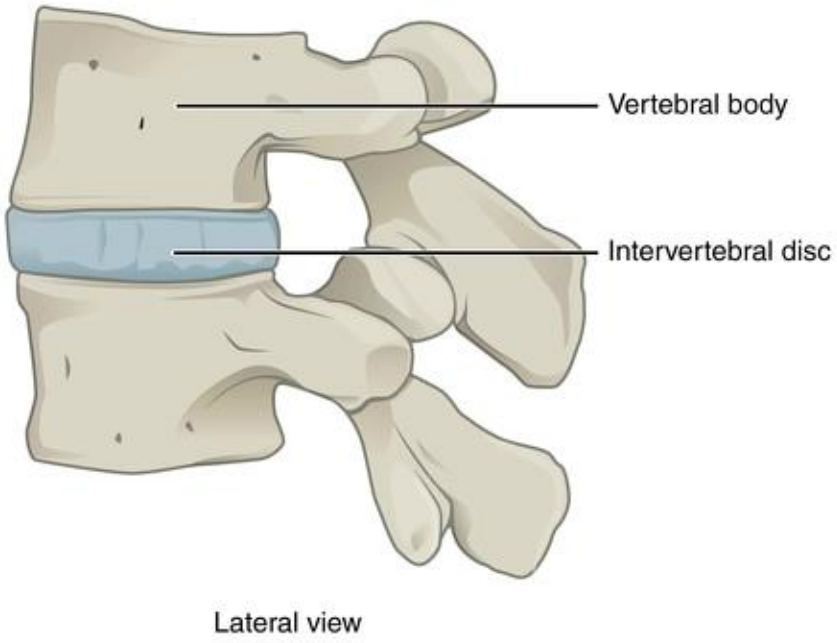


Figure 2

Human body tissues , types and characteristics

Secondary cartilaginous joint is one in which the bones are united by a plate of fibrocartilage and the articular surfaces of the bones are covered by a thin layer of hyaline cartilage. Examples are the joints between the vertebral bodies (see Fig. 3) and the **symphysis pubis.** A small amount of movement is possible.

Figure.3



Joints

Synovial Joints

In synovial joints, the articular surfaces of the bones are covered by a thin layer of hyaline cartilage and separated by a **joint cavity.** This arrangement permits a great degree of freedom of movement. The cavity of the joint is lined by **synovial membrane,** which extends from the margins of one articular surface to those of the other. The synovial membrane is protected on the outside by a tough fibrous membrane called the **capsule.(figure.4)**

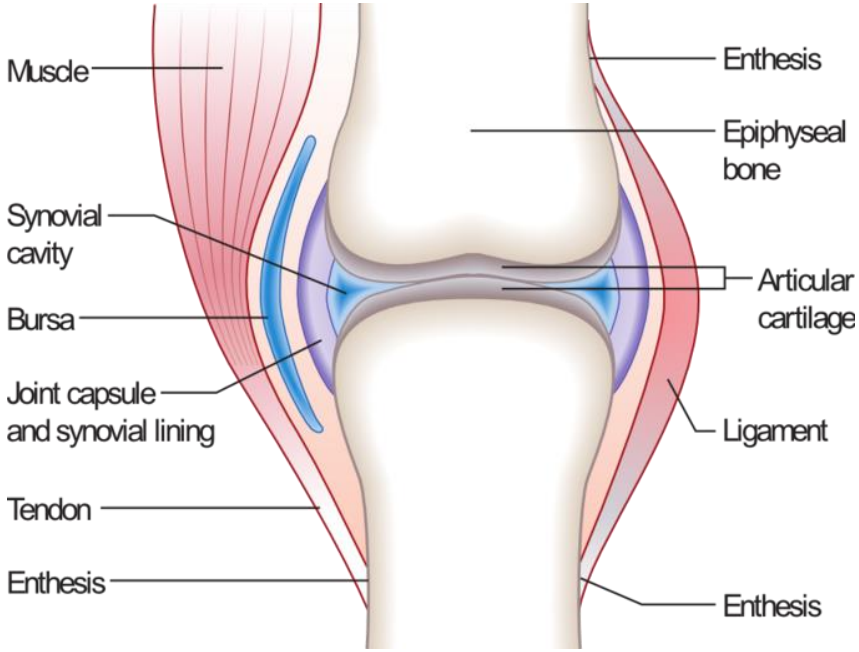


Figure 4

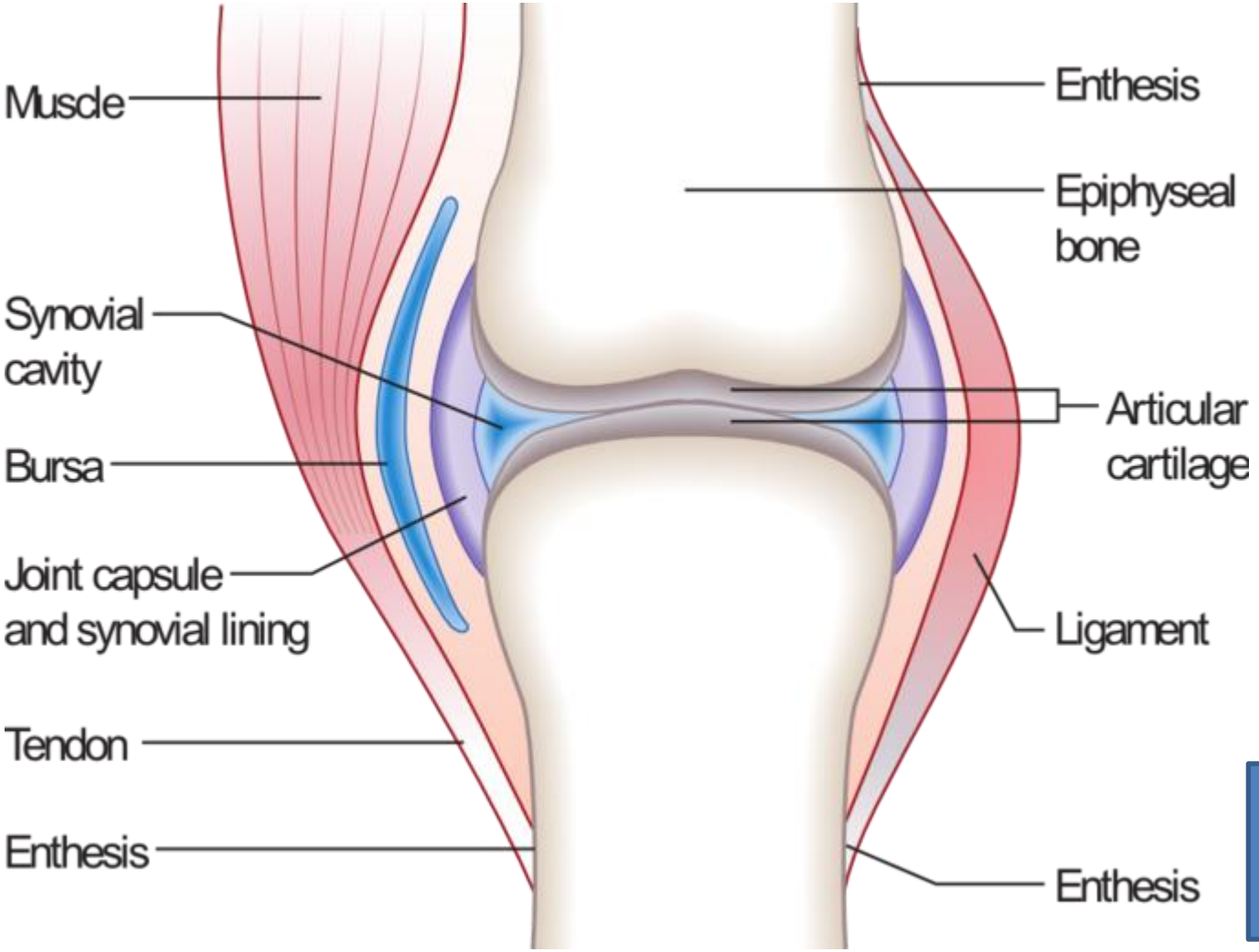

Muscle
Enthesis
Epiphyseal bone
Synovial cavity
Articular cartilage
Bursa
Joint capsule and synovial lining
Ligament
Tendon
Enthesis
Enthesis

Figure 4

Types of synovial joints

A. Plane joints (sternoclavicular and acromioclavicular joints).

B. Hinge joint (humero ulnar part of the elbow joint).

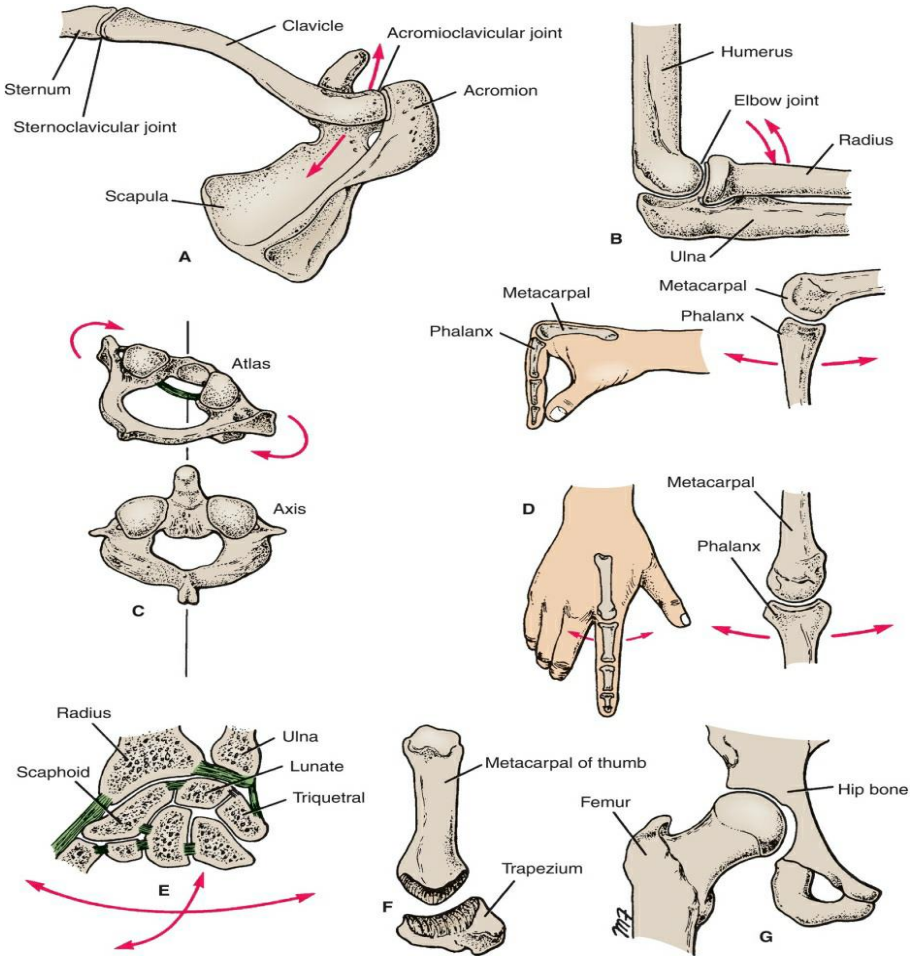
C. Pivot joint (medial atlantoaxial joint).

D. Condyloid joint (metacarpophalangeal joint).

E. Ellipsoid joint (radiocarpal part of the wrist joint).

F. Saddle joint (carpometacarpal joint of the thumb).

G. Ball-and-socket joint (hip joint).



Types of synovial joints

JOINT TYPE	MORPHOLOGY	EXAMPLE(S)
Plane joint	The apposed articular surfaces are flat or almost flat, permitting the bones to slide on one another in multiple directions.	Joints between the articular processes of the vertebrae Sternoclavicular joint Acromioclavicular joint
Hinge joint	This resembles the hinge on a door, so that uniaxial flexion–extension movements are possible.	Humeroulnar joint in the elbow Interphalangeal joints in the hands and feet Ankle (talocrural) joint
Pivot joint	A central bony pivot is surrounded by a bony–ligamentous ring. Rotation is the only movement possible.	Median atlantoaxial joint Superior radioulnar joint
Condyloid joint	Two distinct convex surfaces that articulate with two concave surfaces. Biaxial movements (movements in two planes) are typical.	Metacarpophalangeal joints in the hands (knuckle joints) and feet
Ellipsoid joint	An elliptical convex articular surface fits into an elliptical concave articular surface. Mainly biaxial movements are allowed.	Radiocarpal (wrist) joint
Saddle joint	The articular surfaces are reciprocally concave–convex and resemble a saddle on a horse's back. Multiaxial movement allowance.	Carpometacarpal joint of the thumb
Ball-and-socket joint	A ball-shaped head of one bone fits into a socket-like concavity of another, allowing multiaxial movement.	Glenohumeral (shoulder) joint Hip joint

Blood vessels

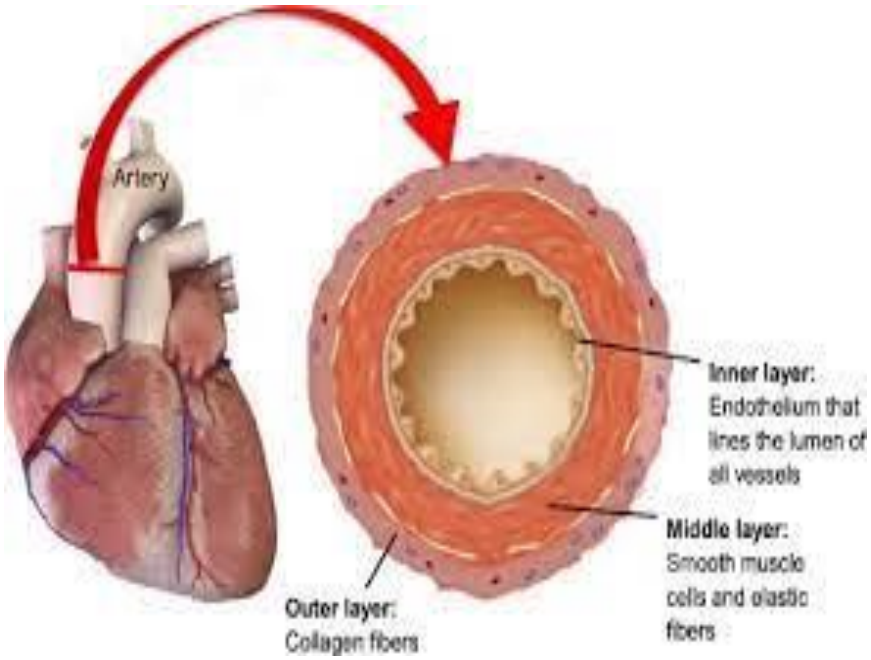
Blood vessels are of three types:
arteries, veins, and capillaries

Arteries transport blood from the heart and distribute it to the various tissues of the body by means of their **branches** .

Arteries have an outer layer called **adventitia,** a thick muscular layer consist of smooth muscles arranged circularly called **media** and inner layer, **the intima lined by endothelium**.(**figure.8**)

The smallest arteries, <0.1 mm in diameter, are referred to as **arterioles.** The joining of branches of arteries is called an **anastomosis. (figure .9).**

Figure. 8



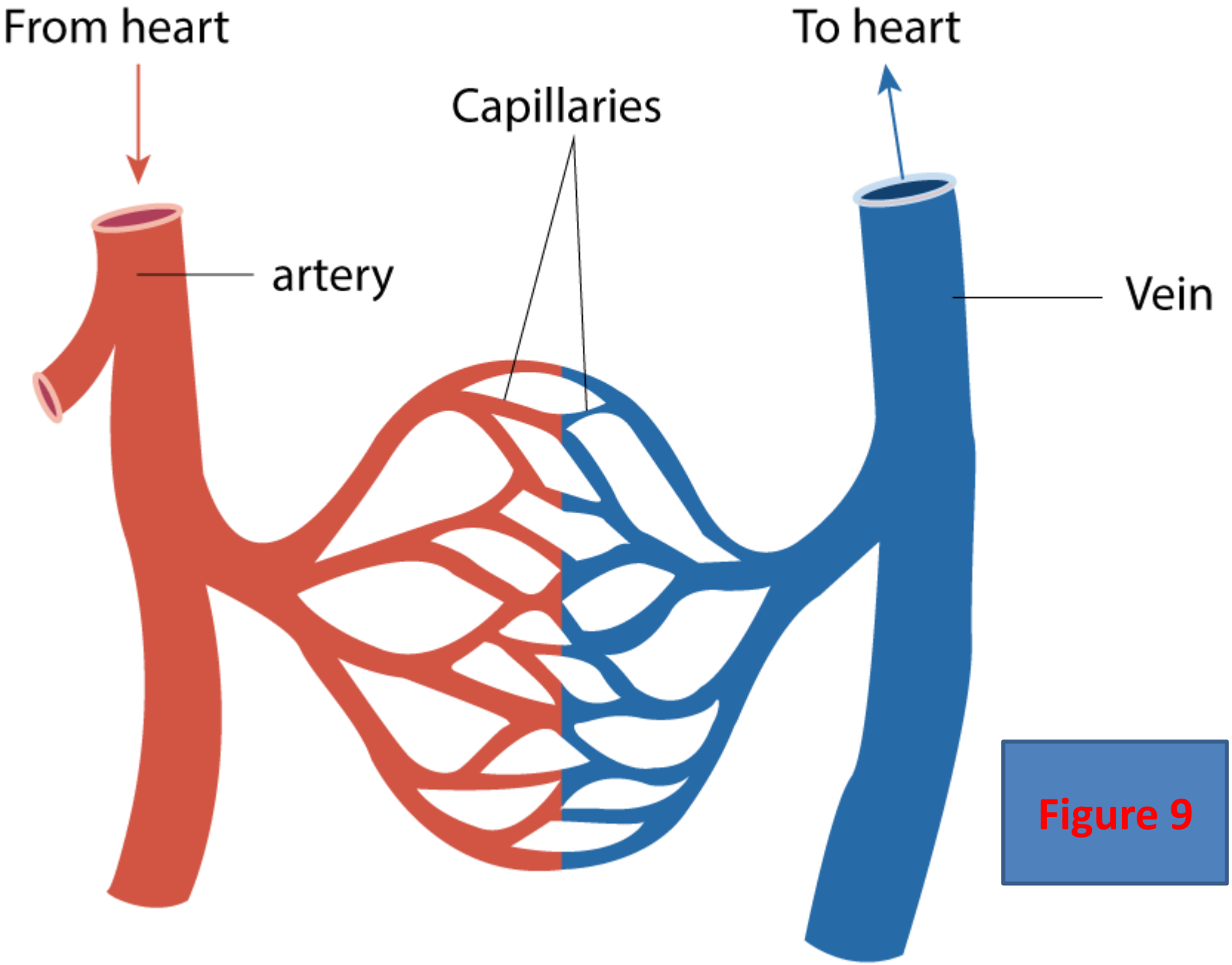
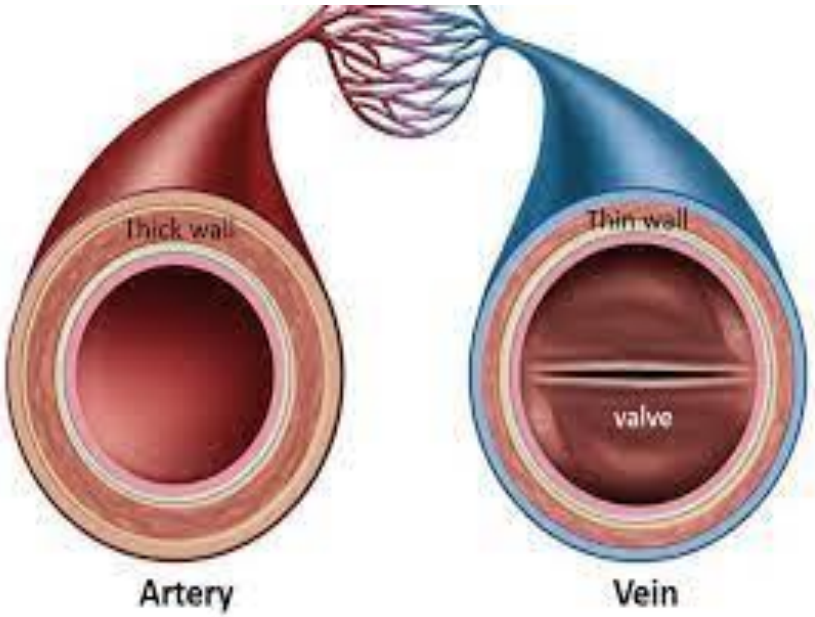


Figure 9

Blood vessels

Veins are vessels that transport blood back to the heart; many of them possess valves. The smallest veins are called **venules**. **Veins have a thinner muscular wall than arteries (figure.10). Veins leaving the gastrointestinal tract do not go directly to the heart** but converge on the **portal vein**, **forming the portal system**. A **portal system** is thus **a system of vessels interposed between two capillary beds.**

Figure. 10

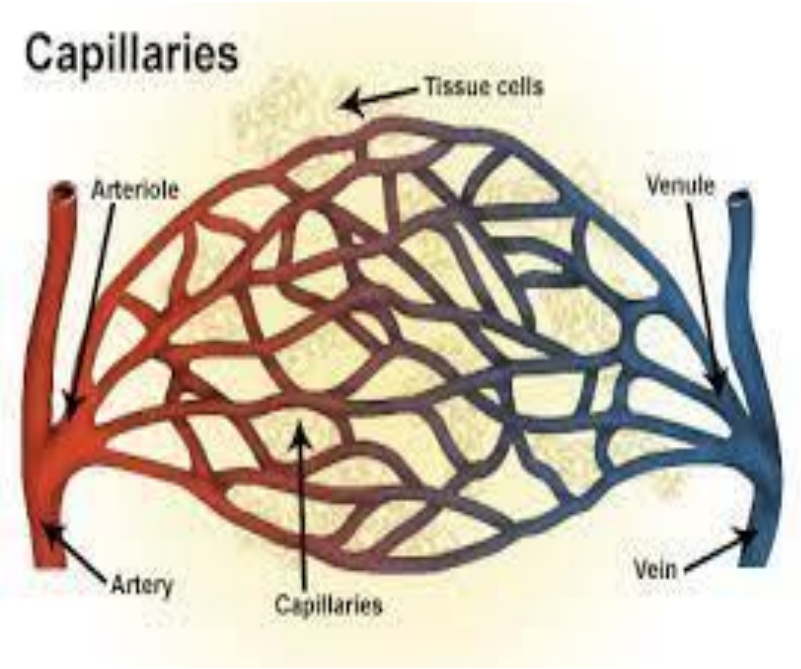


Blood vessels

Capillaries are microscopic vessels in the form of a network connecting the arterioles to the venules (figure.11) .

Sinusoids resemble capillaries in that they have a thin wall, an irregular cross section, and are wider than capillaries. They are found in the bone marrow, the spleen, the liver, and some endocrine glands.

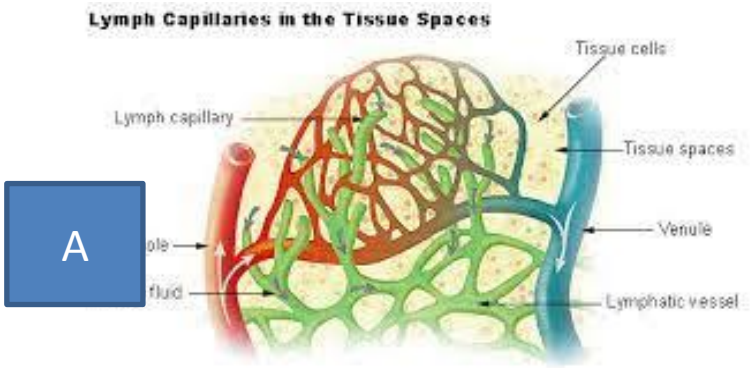
Figure.11



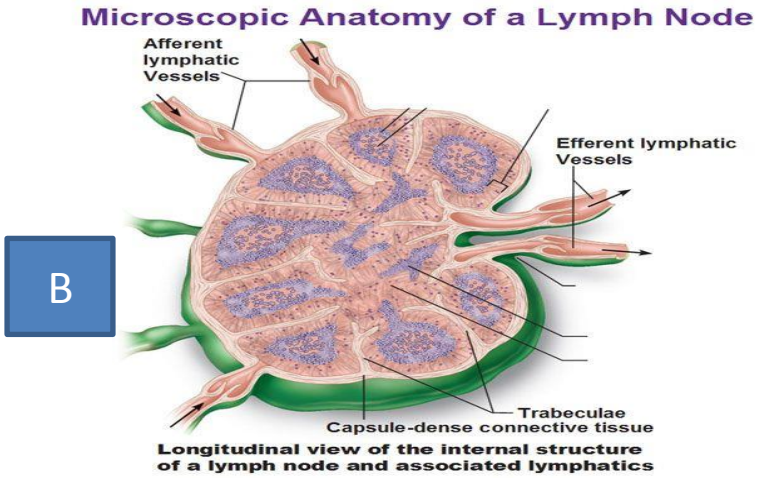
Lymphatic vessels

Lymphatic vessels (figure.12 a) are found in all tissues and organs of the body except the central nervous system, the eyeball, the internal ear, the epidermis of the skin, the cartilage, and the bone. **The** lymph vessels that carry lymph to a lymph node are referred to as **afferent** vessels, those that transport it away from a node are **efferent** vessels (figure.12b).

A



B

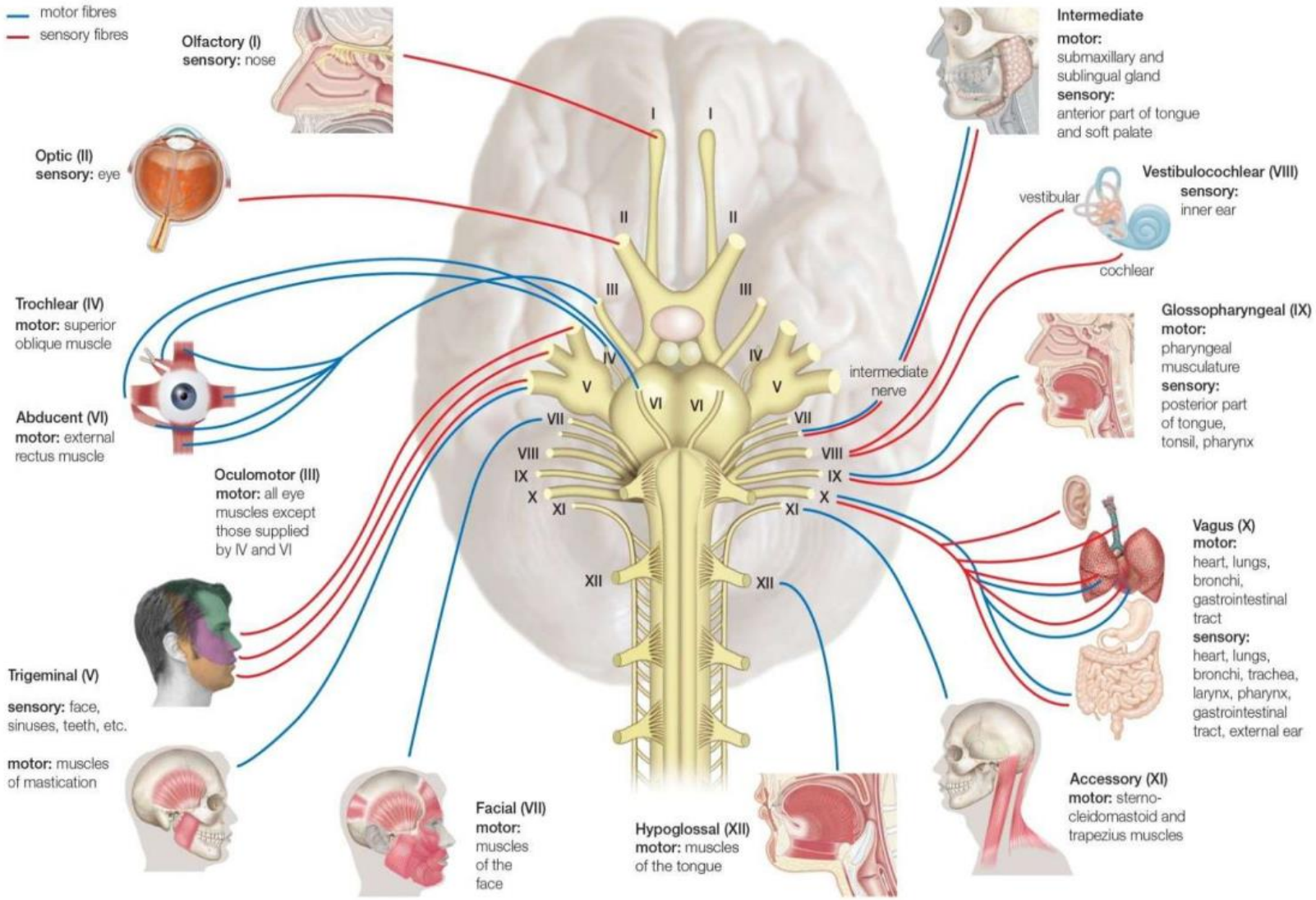


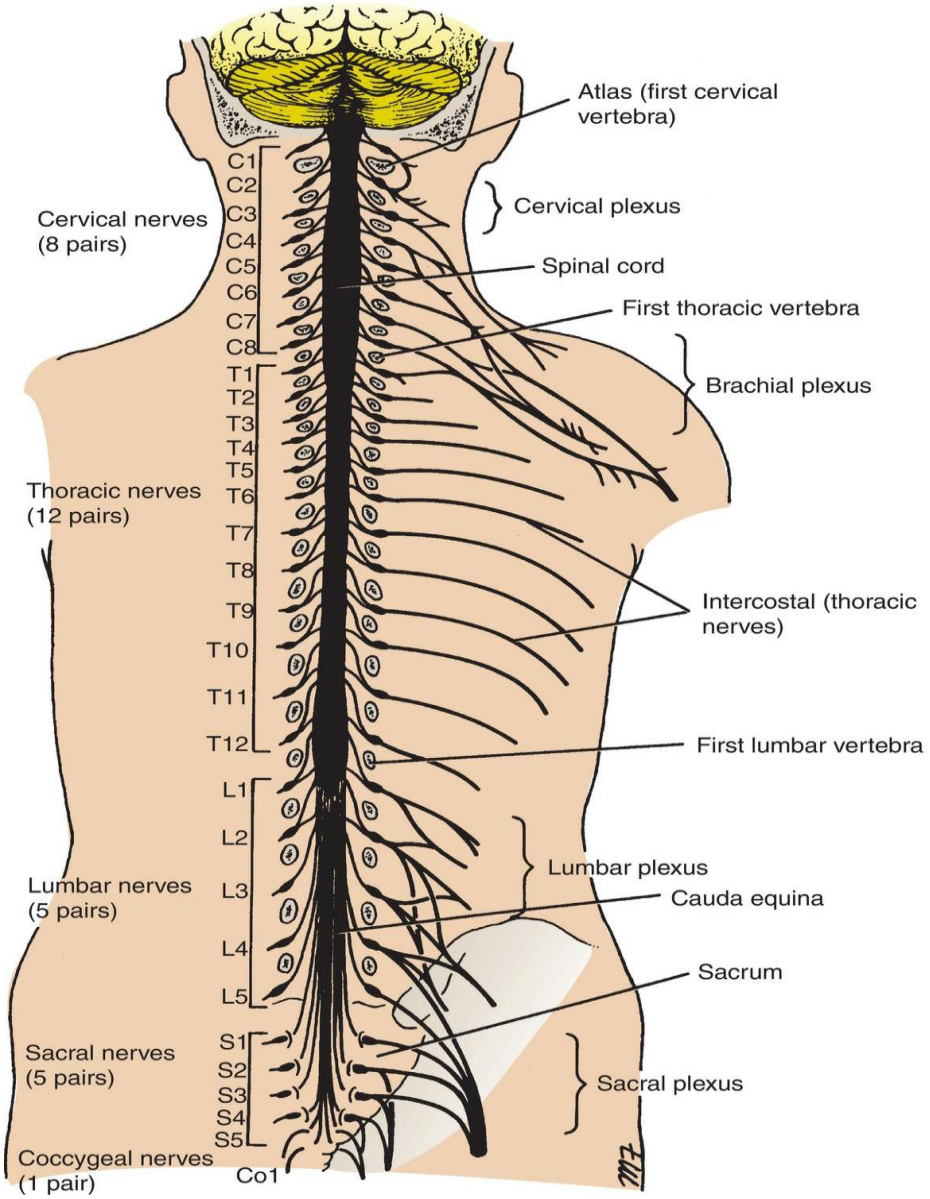
Body tissues, types and characteristics

Nervous system.

The nervous system is divided into two main parts: the **central nervous system,** which consists of the brain and spinal cord, and the **peripheral nervous system,** which consists of **12 pairs of cranial nerves and 31 pairs of spinal nerves.**

Functionally, the nervous system can be further divided into the **somatic nervous system,** which controls voluntary activities, and the **autonomic nervous system,** which controls involuntary activities.


motor fibres
sensory fibres
Olfactory (I)
sensory: nose
Optic (II)
sensory: eye
Trochlear (IV)
motor: superior oblique muscle
Abducent (VI)
motor: external rectus muscle
Oculomotor (III)
motor: all eye muscles except those supplied by IV and VI
Trigeminal (V)
sensory: face, sinuses, teeth, etc.
motor: muscles of mastication
Facial (VII)
motor: muscles of the face
Hypoglossal (XII)
motor: muscles of the tongue
Accessory (XI)
motor: sterno-cleidomastoid and trapezius muscles
Vagus (X)
motor: heart, lungs, bronchi, gastrointestinal tract
sensory: heart, lungs, bronchi, trachea, larynx, pharynx, gastrointestinal tract, external ear
Glossopharyngeal (IX)
motor: pharyngeal musculature
sensory: posterior part of tongue, tonsil, pharynx
Vestibulocochlear (VIII)
sensory: inner ear
vestibular
cochlear
Intermediate
motor: submaxillary and sublingual gland
sensory: anterior part of tongue and soft palate
intermediate nerve
I
II
III
IV
V
VI
VII
VIII
IX
X
XI
XII


Atlas (first cervical vertebra)
C1
C2
C3
C4
C5
C6
C7
C8
Cervical nerves (8 pairs)
Cervical plexus
Spinal cord
First thoracic vertebra
Brachial plexus
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
Thoracic nerves (12 pairs)
Intercostal (thoracic nerves)
First lumbar vertebra
L1
L2
L3
L4
L5
Lumbar nerves (5 pairs)
Lumbar plexus
Cauda equina
Sacrum
S1
S2
S3
S4
S5
Sacral nerves (5 pairs)
Sacral plexus
Coccygeal nerves (1 pair)
Co1

Body tissues, types and characteristics

Central Nervous System

The central nervous system (CNS) is composed of large numbers of nerve cells and their processes, supported by specialized tissue called **neuroglia**.

A **neuron (figure.13)** is an individual nerve cell, including all its processes. Each neuron has three main components: the **cell body** and two types of processes termed **dendrites and an axon**. Dendrites typically conduct nerve impulses toward the cell body and are the short processes of the cell body.

Parts of a Neuron with Functions

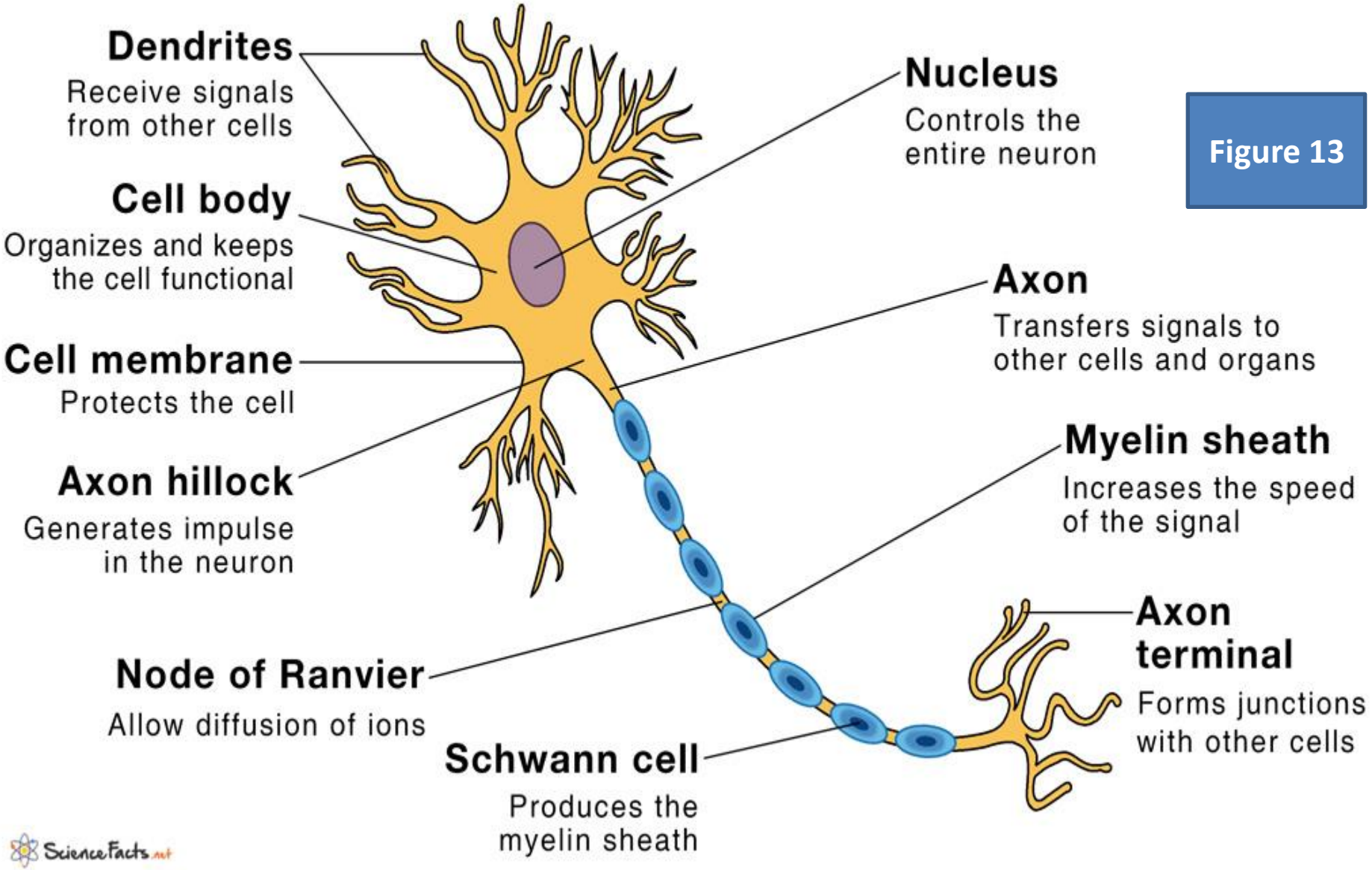


Figure 13

Body tissues, types and characteristics

The axon usually conducts impulses away from the cell body and dendrites and is the longest process of the cell body . Cell bodies within the CNS are mostly located in clusters termed **nuclei**. The interior of the CNS is organized into gray and white matter (figure.14). **Gray matter** consists largely of nerve cell bodies embedded in neuroglia. **White matter** consists largely of nerve processes (axons) and blood vessels

embedded in neuroglia.

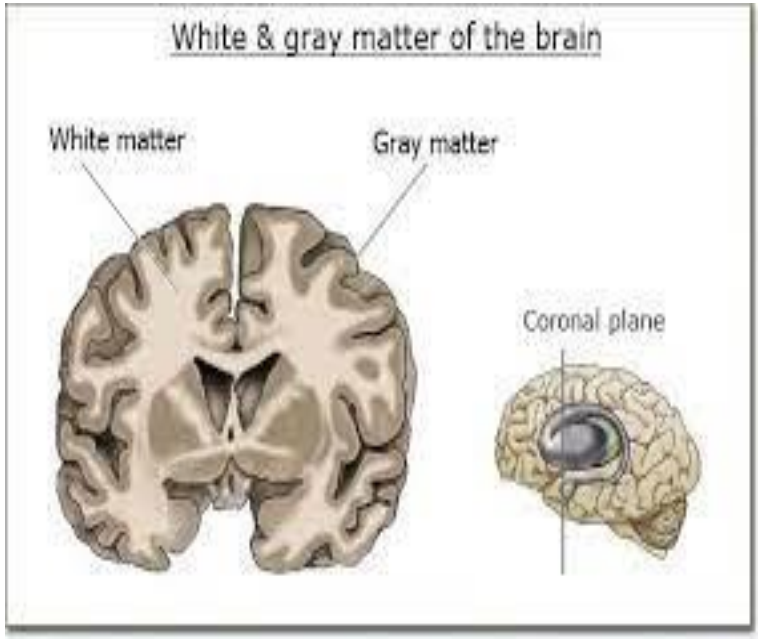


Figure 14

Body tissues, types and characteristics

In the spinal cord, the gray matter is organized in a characteristic **H-shaped** (or butterfly-shaped) pattern **(figure.15)** . The spinal cord has two **posterior** (**dorsal**) and **anterior** (**ventral**) **gray horns** extend along the length of the cord. Two **lateral gray horns** only in the thoracic and upper lumbar portions of the cord. There is a **central canal** containing **cerebrospinal fluid** runs the internal length of the CNS.

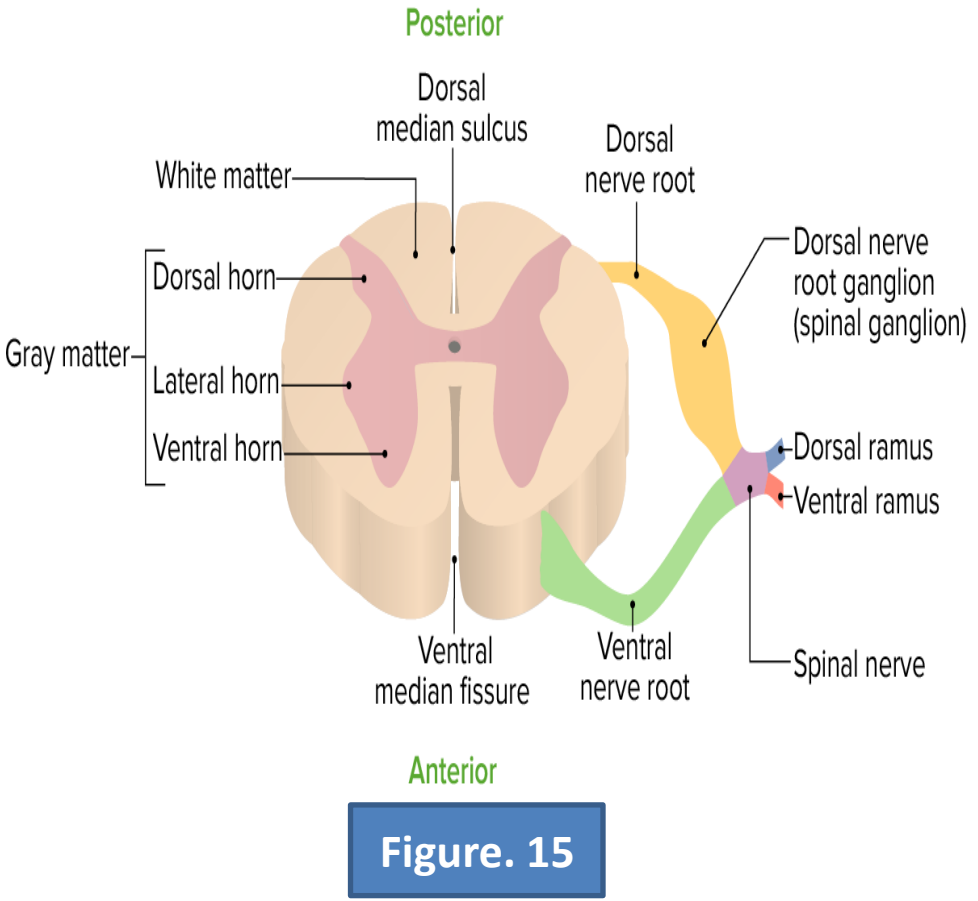


Figure. 15

Body tissues, types and characteristics

There are three membranes **(meninges) (figure.16)** surround the entire CNS (brain plus spinal cord): the **dura mater** is the most external membrane; the **arachnoid mater** is the middle membrane; and the **pia mater** is the innermost layer. The meninges serve to protect, anchor, and stabilize the CNS also contain a surrounding sac of **cerebrospinal fluid, CSF.**

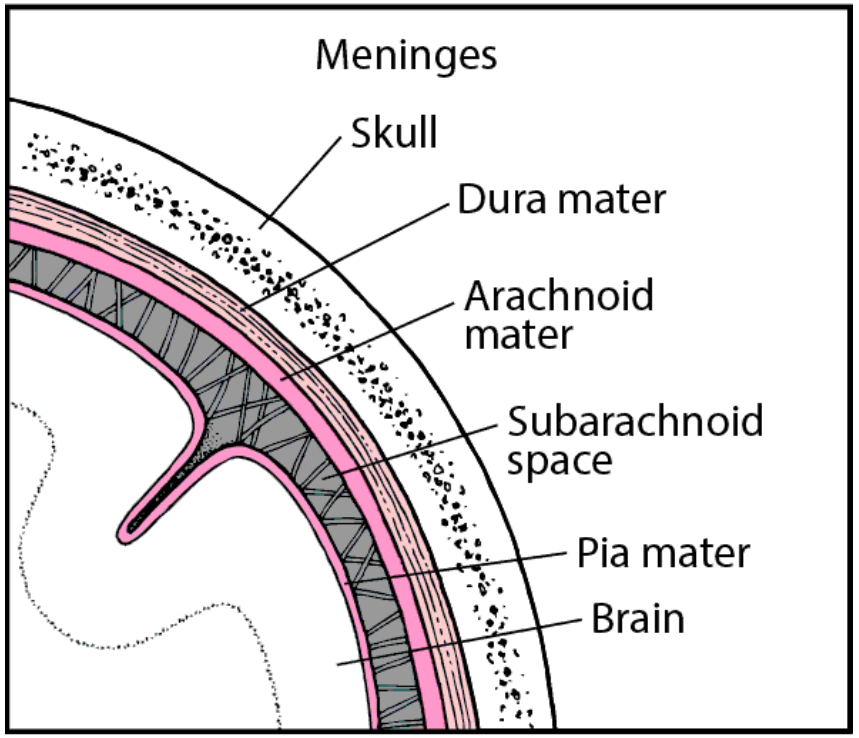


Figure.16

Body tissues, types and characteristics

Peripheral Nervous System

The peripheral nervous system consists of the **cranial and spinal nerves and their associated ganglia.** The cranial and spinal nerves appear as grayish white cords. They are made up of bundles of neuron processes

(axons) supported by delicate areolar tissue (figure.17) .

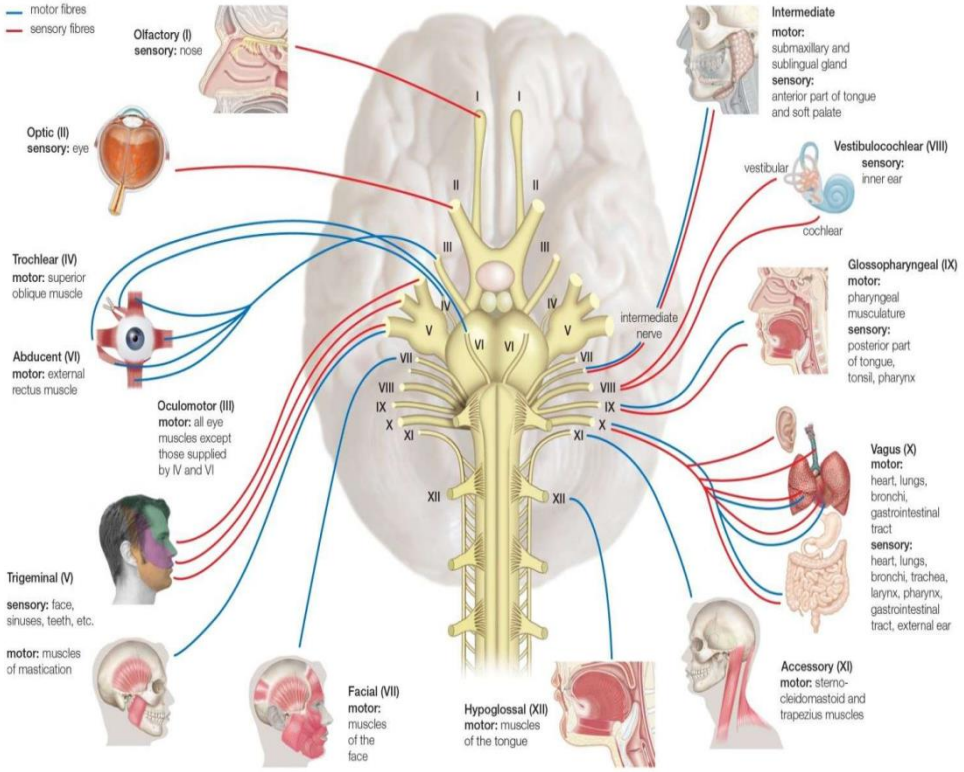
Figure. 17

Body tissues, types and characteristics

Cranial Nerves

There are 12 pairs of cranial nerves that leave the brain and pass through **foramina in the skull (figure.18)**. All the nerves are distributed in the head and neck except the Xth (vagus), which also supplies structures in the thorax and abdomen

Figure. 18



Body tissues, types and characteristics

Spinal Nerves

A total of 31 pairs of spinal nerves leave the spinal cord and pass through intervertebral foramina in the vertebral column . The spinal nerves are named according to the region of the vertebral column with which they are associated: 8 **cervical,** 12 **thoracic,** 5 **lumbar,** 5 **sacral,** and 1 **coccygeal.** Each spinal nerve is connected to the spinal cord by two roots: **the anterior root and the posterior root.(figure.19)**

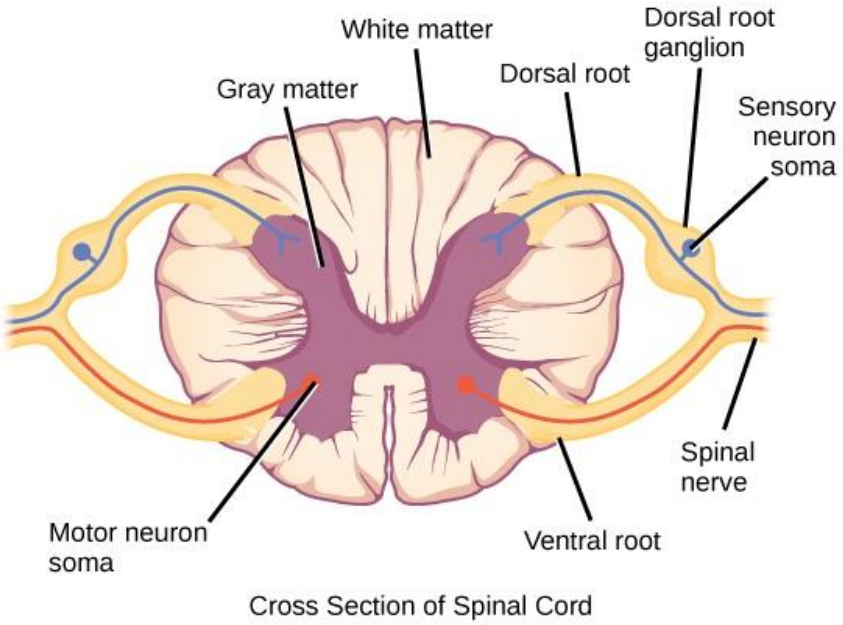


Figure. 19

Body tissues, types and characteristics

Each anterior and posterior root merges within an intervertebral foramen (IVF) and forms an individual **spinal nerve**. Each posterior root possesses a posterior root ganglion, which is located at the IVF. The spinal nerve passes through the IVF and immediately divides into a smaller **posterior ramus** and a larger **anterior ramus (figure.20)**.

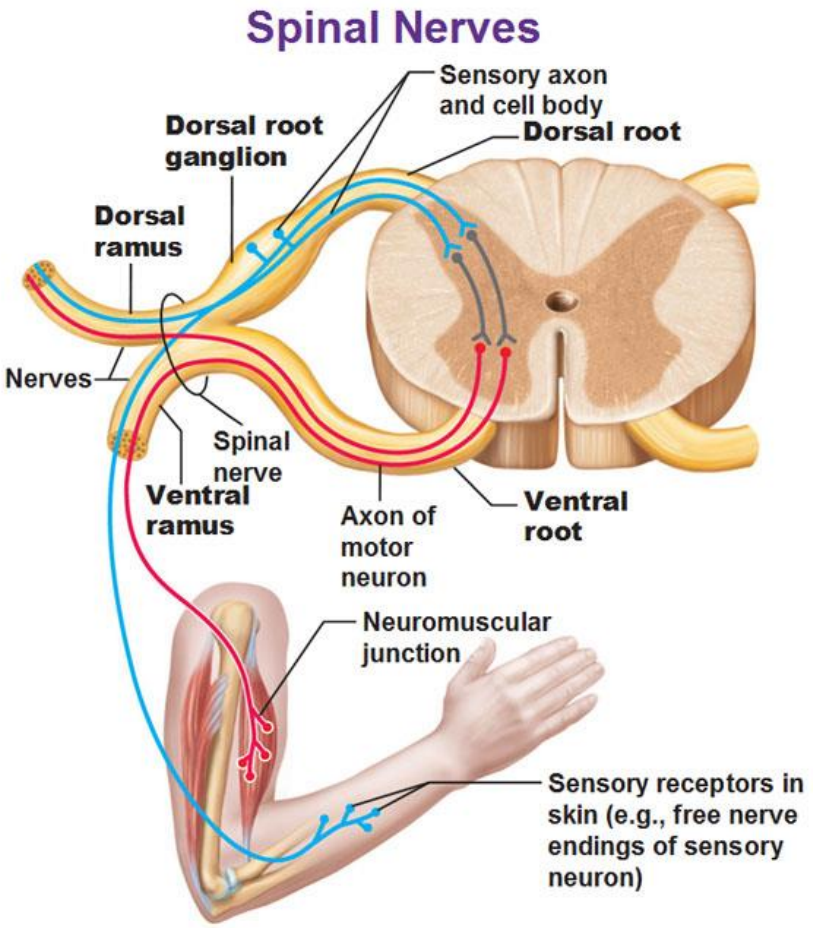


Figure.20

Body tissues, types and characteristics

Autonomic Nervous System

The **autonomic nervous system** (**ANS**) is the part of the nervous system concerned with motor control of **smooth muscle, cardiac muscle, and glands throughout the body.**

The hypothalamus of the brain controls the ANS and integrates the activities of the autonomic and neuroendocrine systems. The ANS is distributed throughout the central and peripheral nervous systems. The somatic and ANS differ in several significant ways.(figure.21)

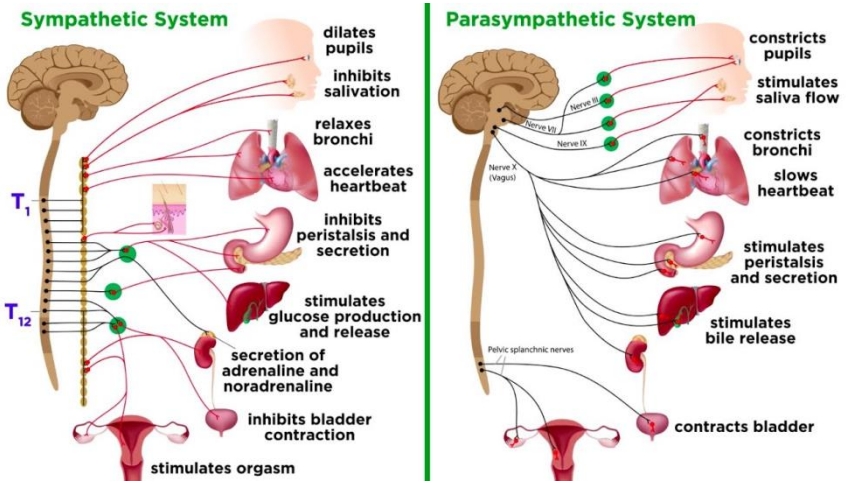


Figure. 21

Body tissues, types and characteristics

Bone

Bone is a living tissue capable of supporting other body structures. bone is hard because of the calcification of its extracellular matrix and possesses a degree of elasticity because of the presence of organic fibers.

Bone exists in two forms: **compact and cancellous.**

Compact bone appears as a solid mass; cancellous bone consists of a branching network of **trabeculae (figure.22). The trabeculae are filled with blood-forming cells.**

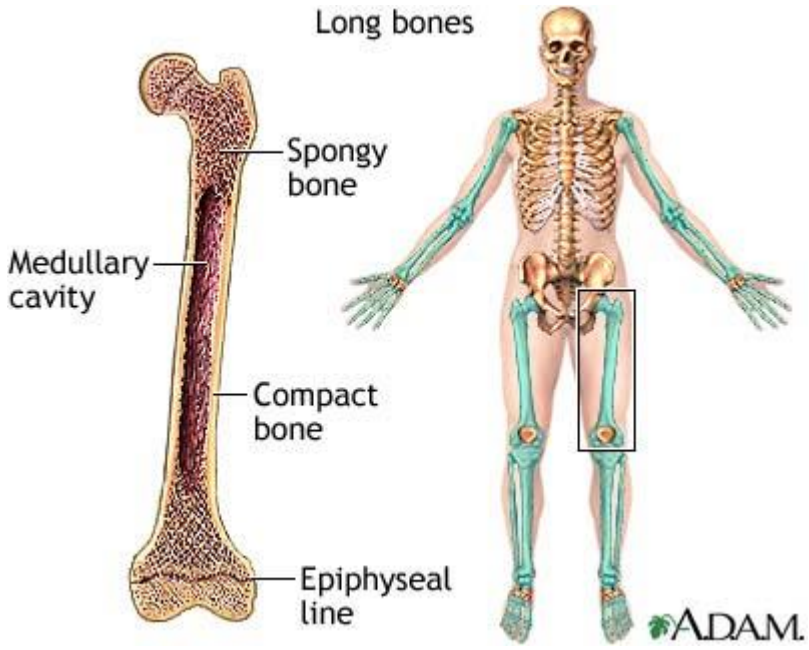


Figure. 22

Body tissues, types and characteristics

The trabeculae are arranged in such a manner as to resist the stresses and strains to which the bone is exposed.

Classification of Bones

Bones may be classified regionally or according to their general shape. Bones are grouped as follows based on their general shape: **long bones, short bones, flat bones, irregular** bones, and **sesamoid** bones. (**Figure 23)**

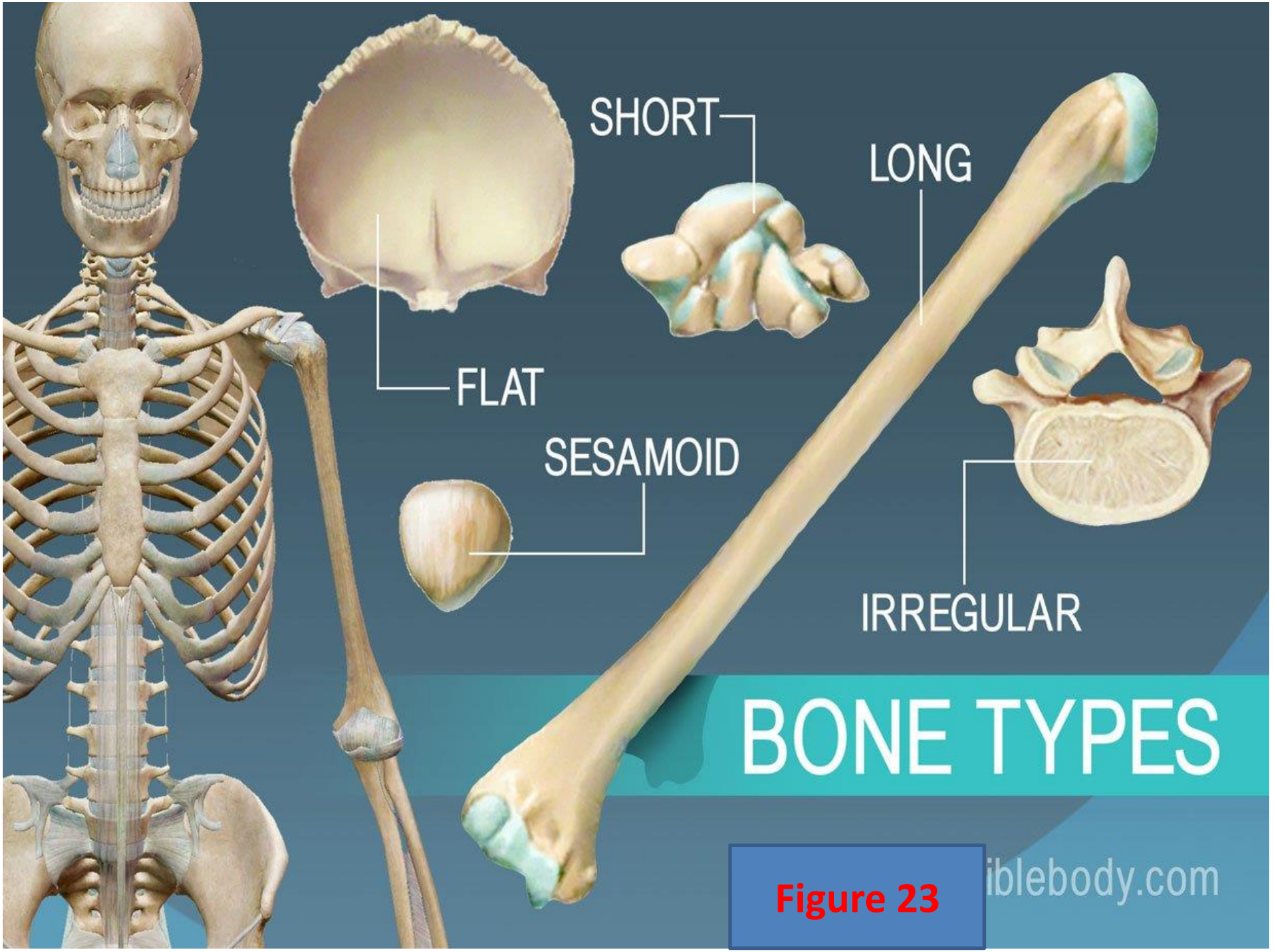

SHORT
LONG
FLAT
SESAMOID
IRREGULAR
BONE TYPES
iblebody.com

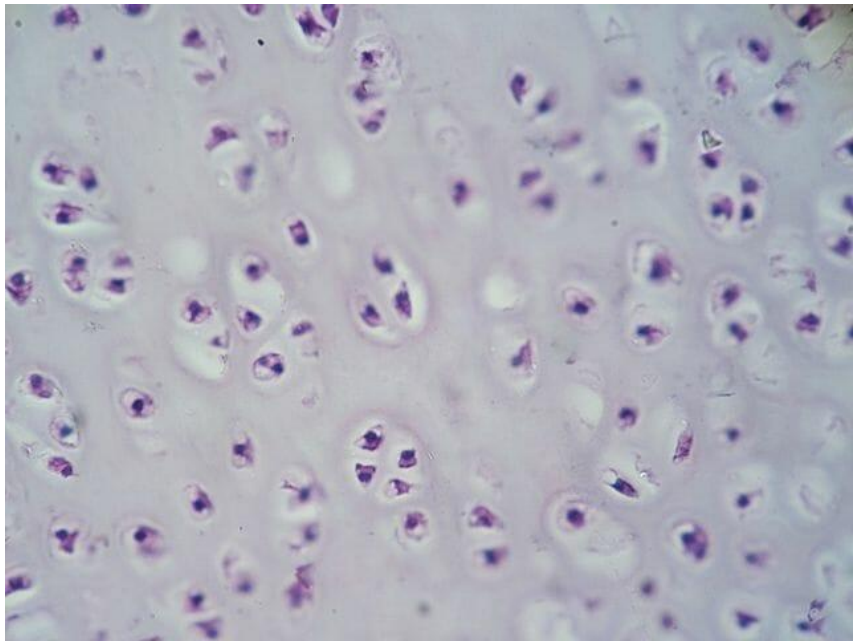
Figure 23

Body tissues, types and characteristics

Cartilage.

Cartilage is a form of connective tissue in which the cells and fibers are embedded in a gel-like matrix. There are three types of cartilage:

■■ **Hyaline cartilage (figure.24)**has a high proportion of amorphous hyaline matrix. it plays an important role in the growth in length of long bones. It covers the articular surfaces of nearly all synovial joints. Hyaline cartilage is incapable of repair.



Figure,24

Body tissues, types and characteristics

Fibrocartilage

(figure.25)has many collagen fibers embedded in a small amount of matrix and is found in the discs joints (e.g., the temporomandibular joint, sternoclavicular joint, and knee joint) . Fibrocartilage, if damaged, repairs itself slowly in a manner similar to fibrous tissue elsewhere.

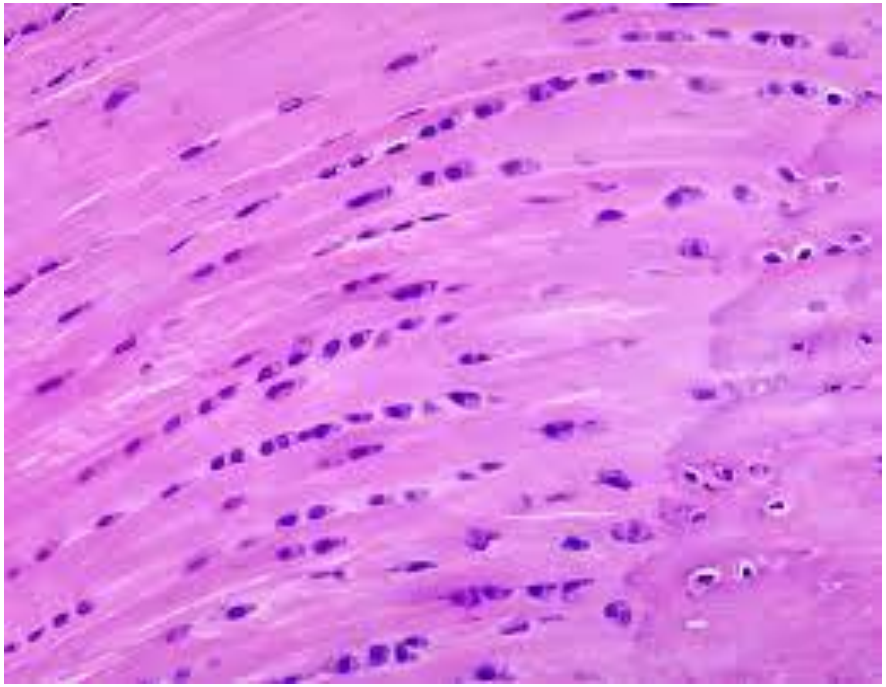


Figure 25

Body tissues, types and characteristics

■■ **Elastic cartilage** possesses large numbers of elastic fibers embedded in matrix (figure.26) .It is flexible and is found in the auricle of the ear,. Elastic cartilage, if damaged, repairs itself with fibrous tissue. Hyaline cartilage and fibrocartilage tend to calcify or even ossify in later life.

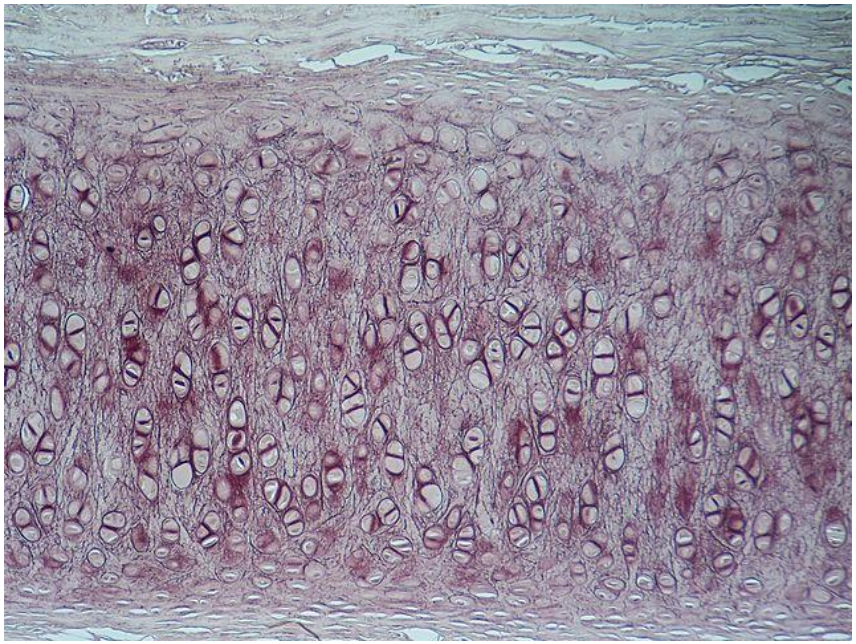


Figure.26