جامعة المستقبل

كلية التقنيات الصحية والطبية

قسم تقنيات البصريات

First Stage 2024-2025

# Anatomy of the Head and Neck

Lecture Title

## Bones of Skeleton
## Brain

Lecture Number: 4 / course 1

Prepared by

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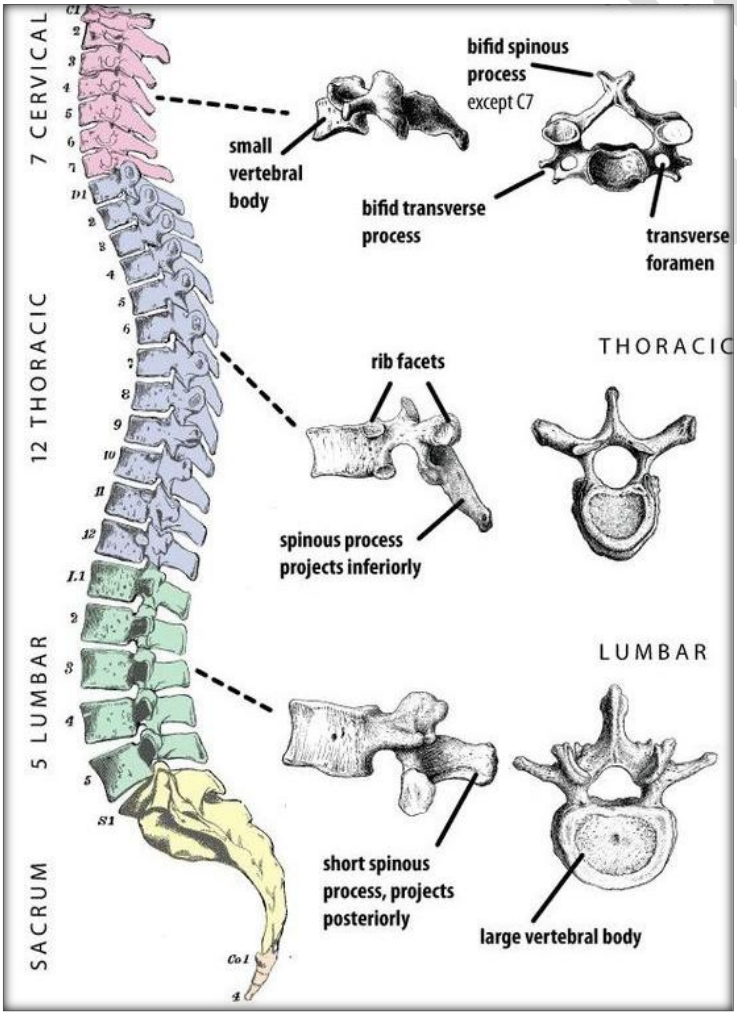
OPTOMETRIST

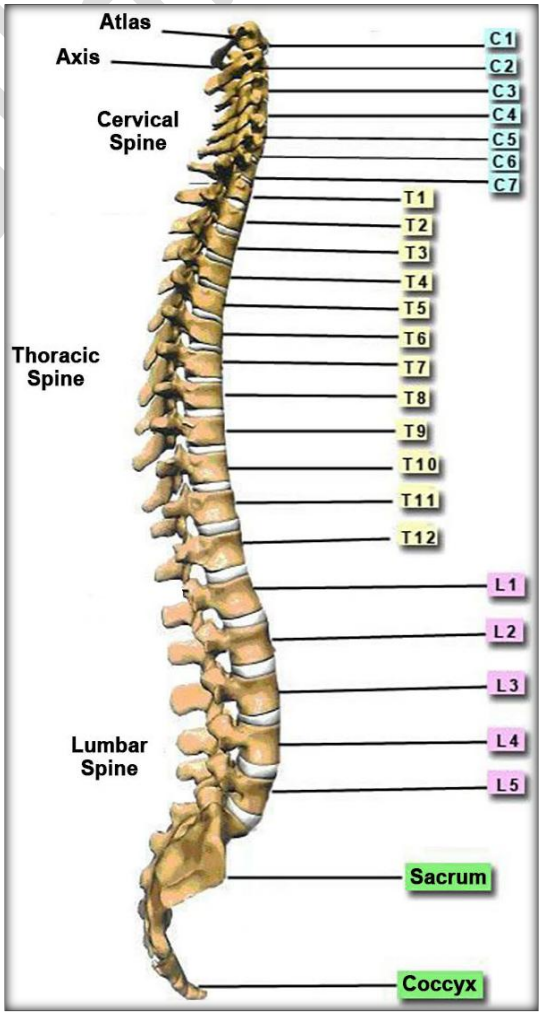
# Bones of Skeleton عظام الهيكل العظمي

The human skeleton is composed of 206 bones.

تم شرح skull bones في المحاضرة السابقة

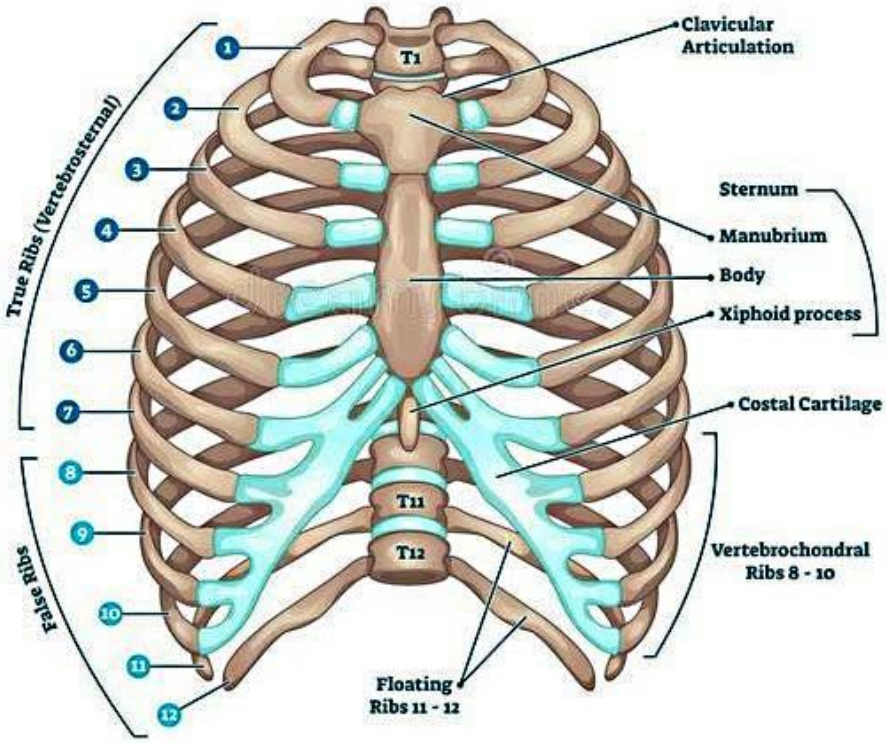
- Skull - Made up of 22 bones that protect the brain and give structure to the face.
- Vertebral column – consist of 26 bones called vertebrae that surround and protect the spinal cord: العمود الفقري
  - ✓ cervical (7 bones) عنقية
  - ✓ thoracic (12 bones) صدرية
  - ✓ lumbar (5 bones) قطنية
  - ✓ sacrum (1 bone) عجزية
  - ✓ coccyx (1 bone) عصعصية



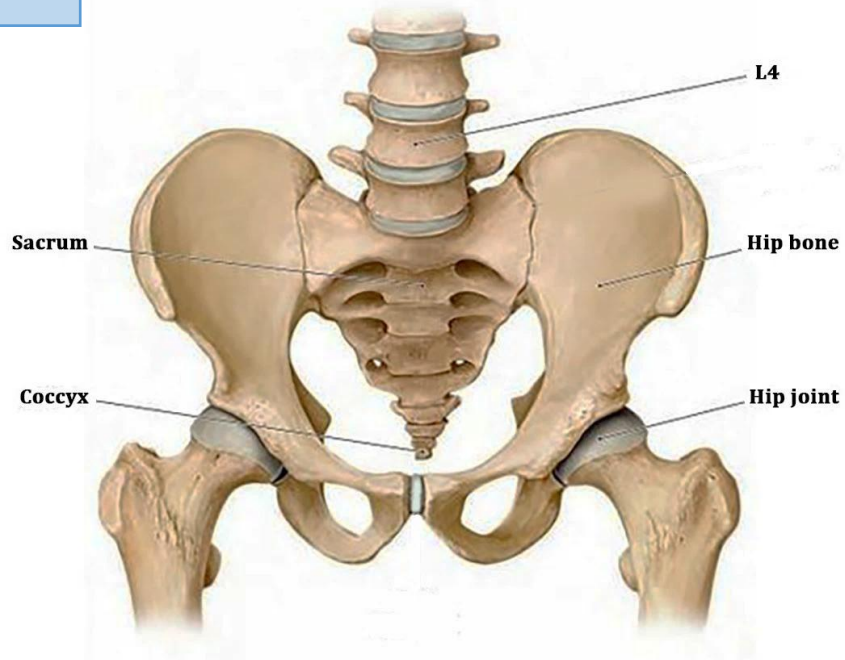
- **Ribs** - There are 12 pairs of ribs that form a protective cage around vital organs like the heart and lungs. They attach to the thoracic vertebrae.

الاضلاع



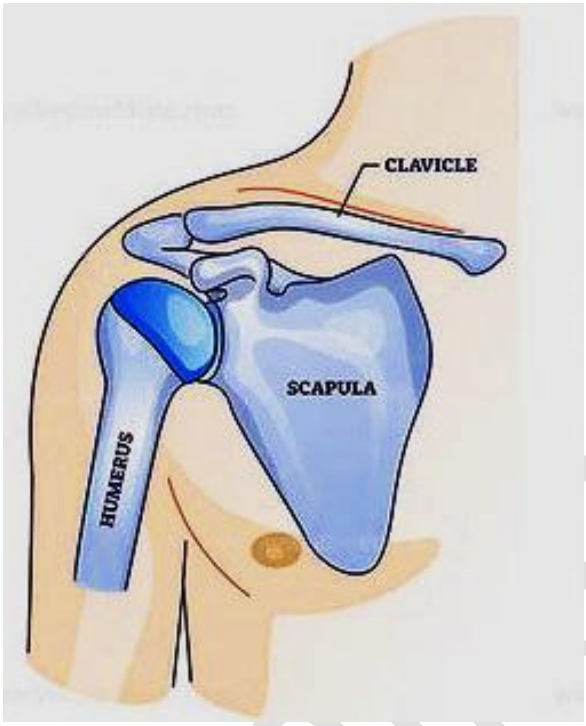

- **Pelvis** - Formed by the hip bones, sacrum and coccyx. Important in bearing weight, locomotion and childbirth.

الحوض



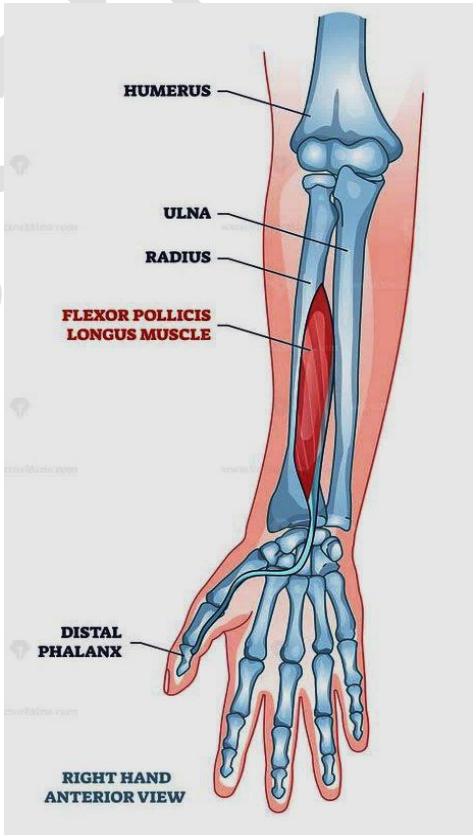
- **Shoulder** - Composed of the clavicle (collarbone) and scapula (shoulder blade). Important for upper limb movement.

الكتف



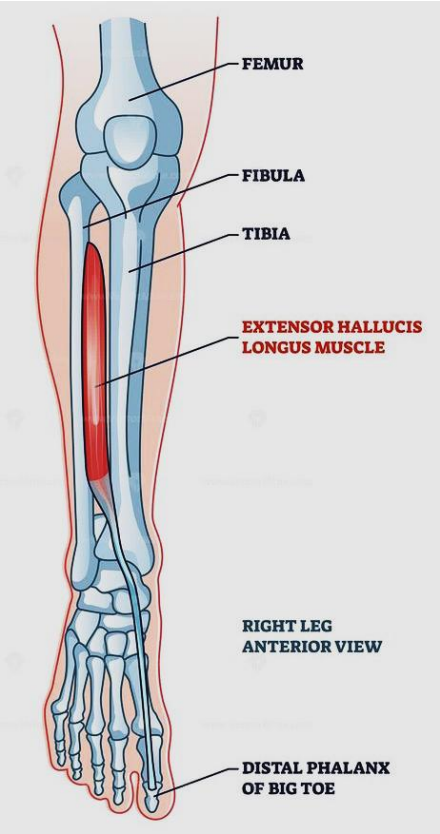

- **Arms** - Humerus in upper arm, radius and ulna in forearm, carpals in wrist, metacarpals and phalanges (fingers).

الذراع



- **Legs** - Femur in thigh, patella (kneecap), tibia and fibula in calf, tarsals in ankle, metatarsals and phalanges (toes).

الساق



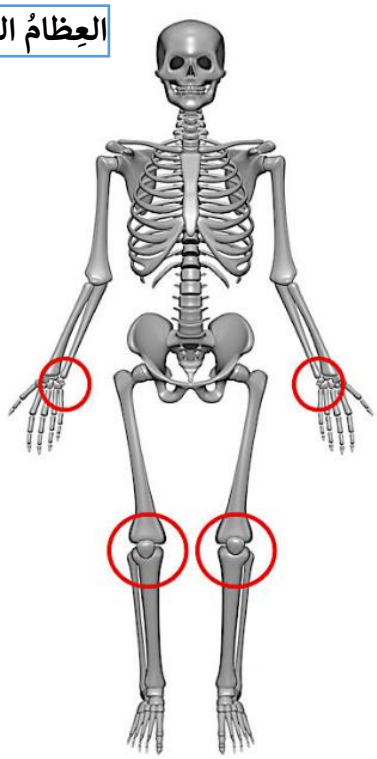

## Skeletal Bone Shapes أشكال عظام الهيكل العظمي

The different bone shapes allow the skeletal system as a whole to balance stability, protection, flexibility and weight, serving in total to support the body and enable movement.

- **Long bones** - These bones are longer than they are wide, such as the femur (thigh bone), tibia (shin bone), humerus (upper arm bone) and phalanges (finger and toe bones). Their length allows them to provide leverage and movement.
- **Short bones** - Smaller cuboid bones such as the tarsals (ankle bones) and carpals (wrist bones). They provide stability and some flexible movement.
- **Flat bones** - Thin and curved bones such as cranium, ribs, sternum, scapulae (shoulder blades) and pelvis. They usually providing protection or broad surfaces for muscle attachment

- **Irregular bones - Bones with complex shapes such as vertebrae and facial bones. Their irregularity allows them to fit perfectly with adjoining bones and protect internal structures.**
- **Sesamoid bones - Small round bones embedded in tendons such as kneecaps and carpal bone. They provide extra leverage and reduce friction.**

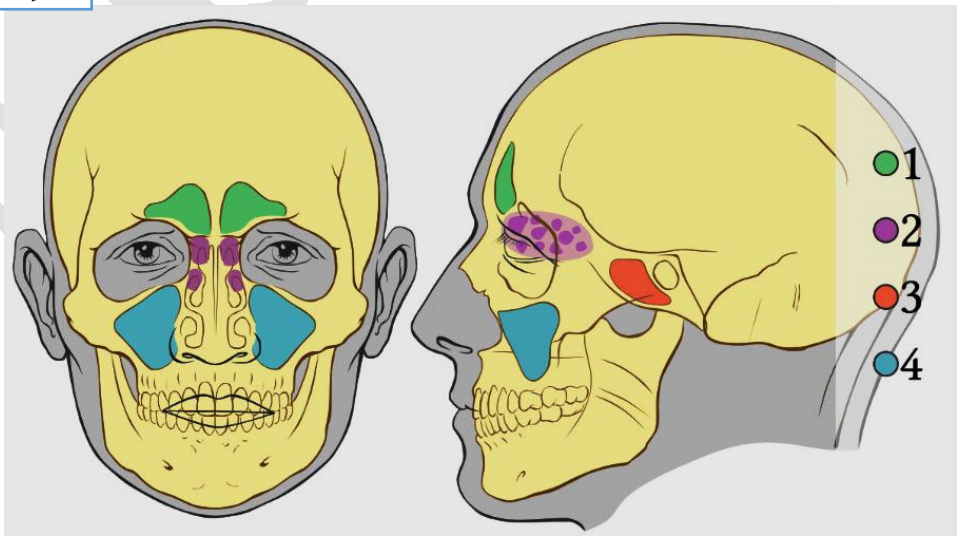
العِظامُ السمسِمانِية



- Pisiform (2) - Carpal Bones
- Patella (2) - Kneecap

- **Pneumatized bones - Bones that have air-filled spaces, such as sphenoid and temporal bones of the skull. This makes the skull lighter.**

العِظامُ الهوائية



# Joints of the Body مفاصل الجسم

are the points where two or more bones come together in the human body.

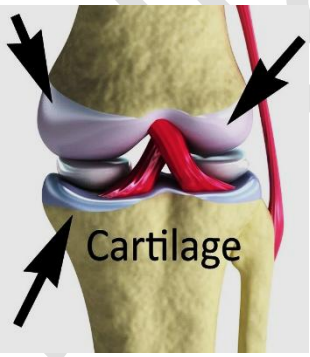
There are several types of joints in the human body, classified based on their structure and the degree of movement:

1. **Fibrous Joints**: These joints have minimal or no movement and are held together by fibrous connective tissue. Examples include sutures in the skull, where the bones are tightly connected.

المفاصل الليفية

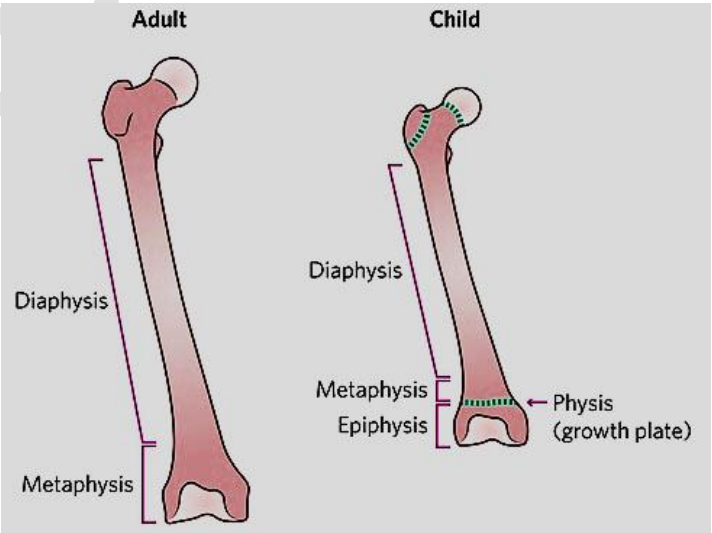
2. **Cartilaginous Joints**: These joints are connected by cartilage and allow limited movement. There are two types:

المفاصل الغضروفية



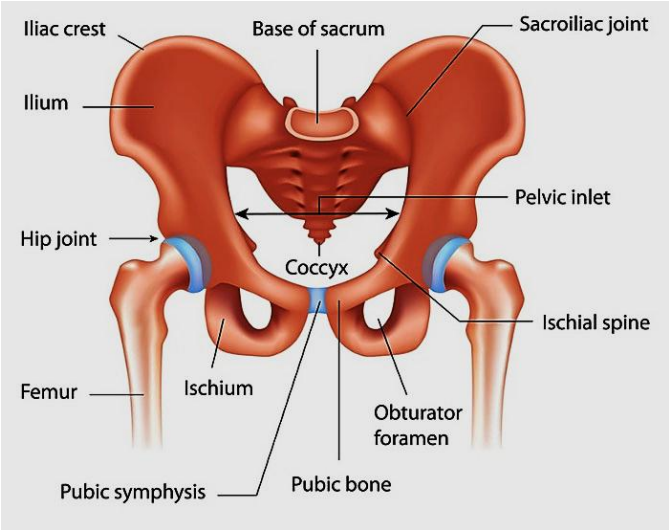

a. **Synchondroses**: These joints are connected by hyaline cartilage, example epiphyseal plate that growth plate found in long bones of children.

الالتِحامات



**b. Symphyses: These joints are connected by fibrous cartilage, example pubic symphysis that provides shock absorption and support to the pelvis.**

الارتِفاقات

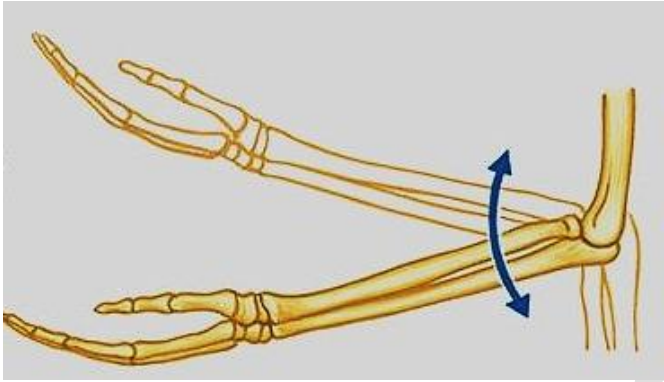



**3. Synovial Joints: These are the most common and functionally important joints in the body. They are characterized by a joint cavity filled with synovial fluid, which lubricates the joint and reduces friction. Classified into various types:**

المفاصل الزليلية

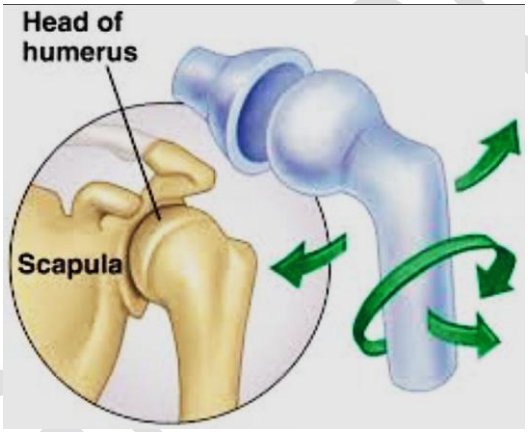
a. **Hinge Joints**: These joints allow movement in only one plane, like a hinge on a door. Example is the elbow and knee joints.

المفاصل المفصلية



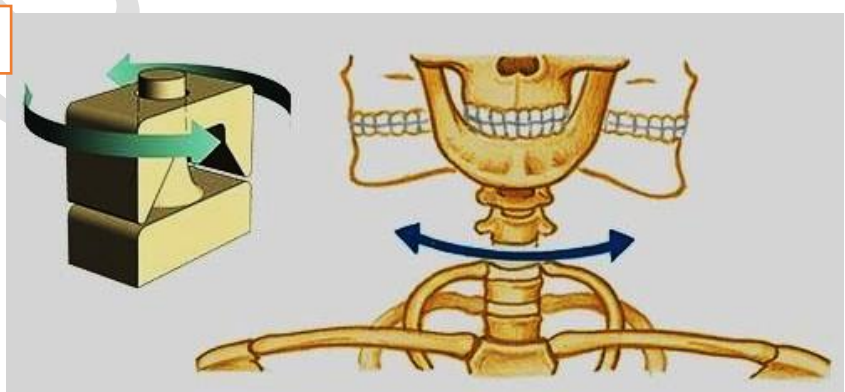
b. **Ball-and-Socket Joints**: These joints allow movement in multiple directions, including rotation. Example is the hip and shoulder.

مفصل الكرة والتجويف



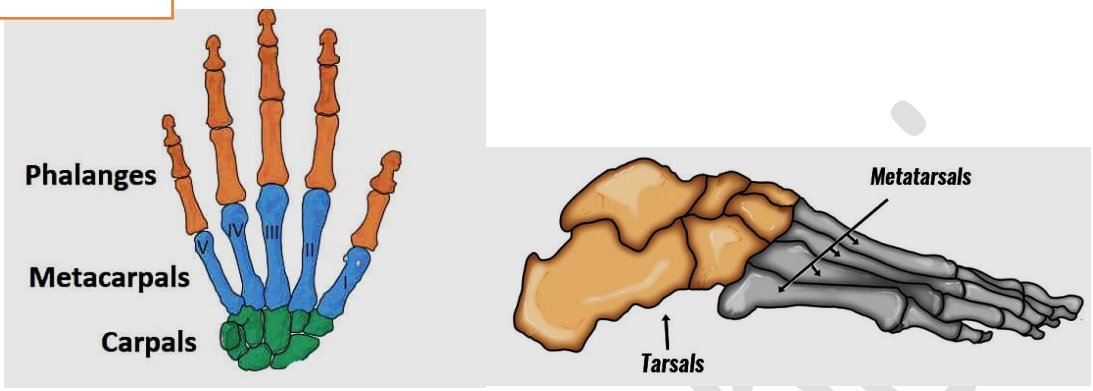

c. **Pivot Joints**: These joints enable rotational movement around a central axis. Example is the joint between the first and second cervical vertebrae (atlas and axis).

مفصل محوري



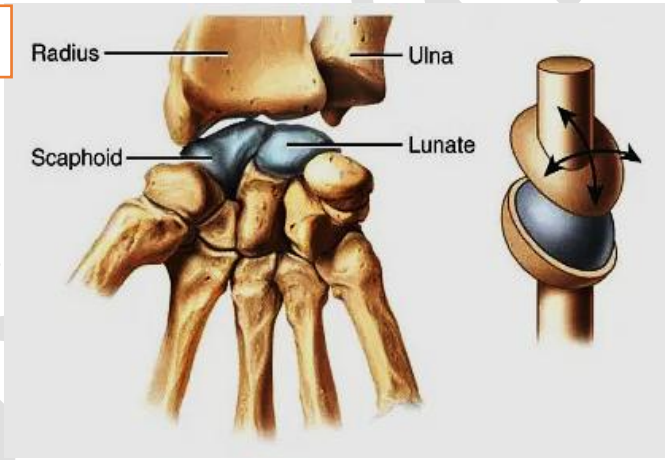
d. **Gliding Joints**: These joints allow sliding or gliding movements between bones. Example is the joints between the small bones of the wrist (carpals) and ankle (tarsals).

مفصل منزلق



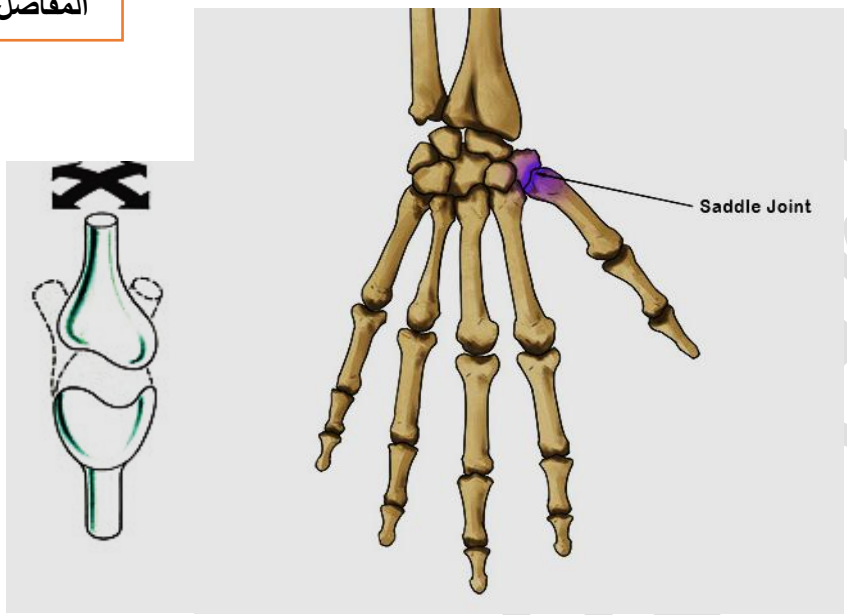

e. **Condyloid (Ellipsoidal) Joints**: These joints permit movement in two planes, allowing flexion, extension, abduction, adduction, and circumduction. Example is the joint between the radius bone and the carpal bones in the wrist.

مفصل لُقمي (أهليلجي)



**f. Saddle Joints: These joints allow movement in two planes, similar to condyloid joints, but with a greater range of motion. Example is the joint at the base of the thumb.**

المفاصل السرجية



# BRAIN الدماغ

**The brain is vital organ that serves as the control center of the human body. It is responsible for a wide range of functions, including cognition, sensory processing, motor control, and the regulation of bodily processes.**

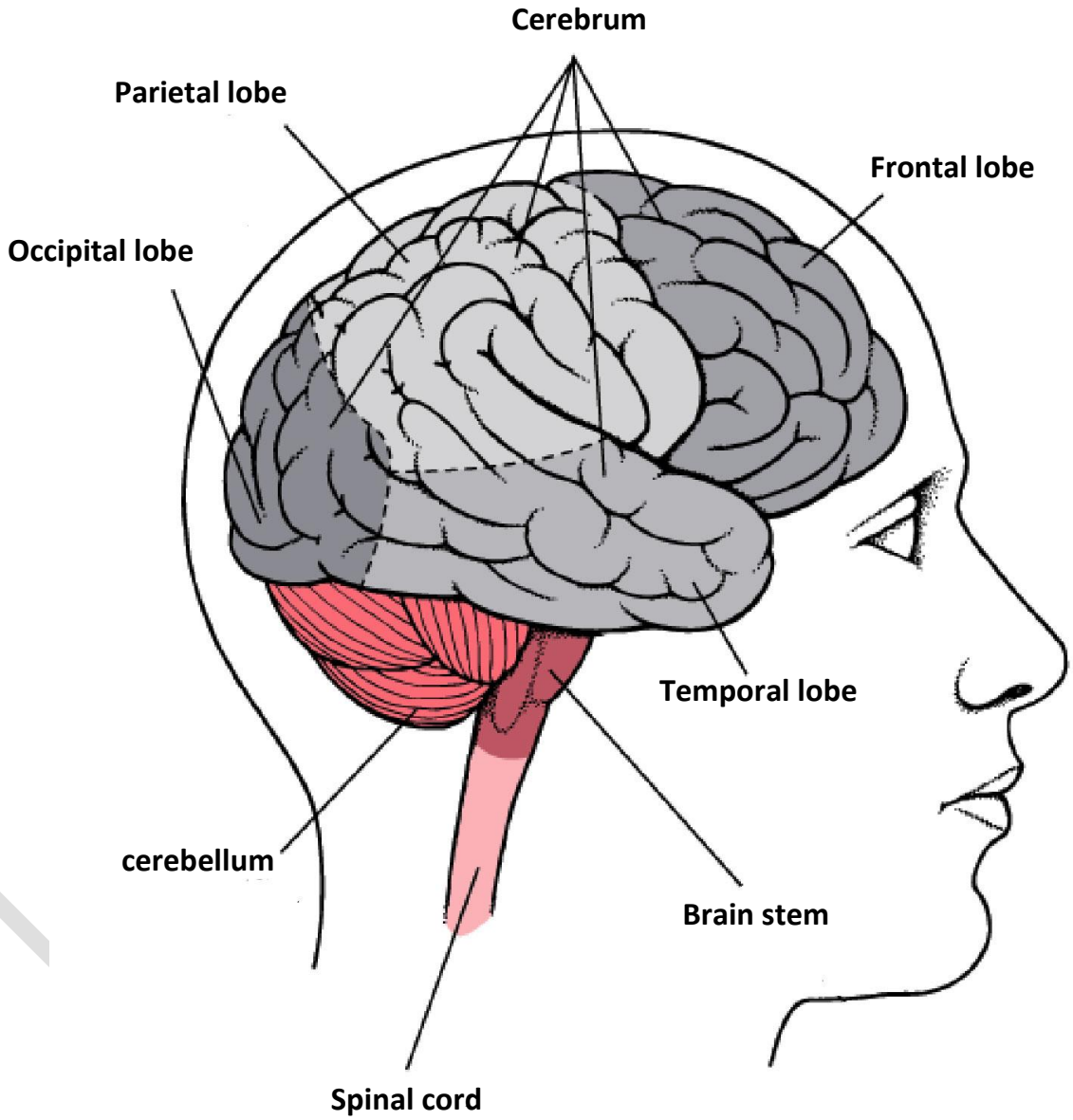



**Figure 1. show parts of brain and the lobes**

## Structure

**The brain is made up of billions of nerve cells (neurons) which connected by specialized fibers called axons. These axons form a network of connections called synapses, which allow neurons to communicate with each other.**

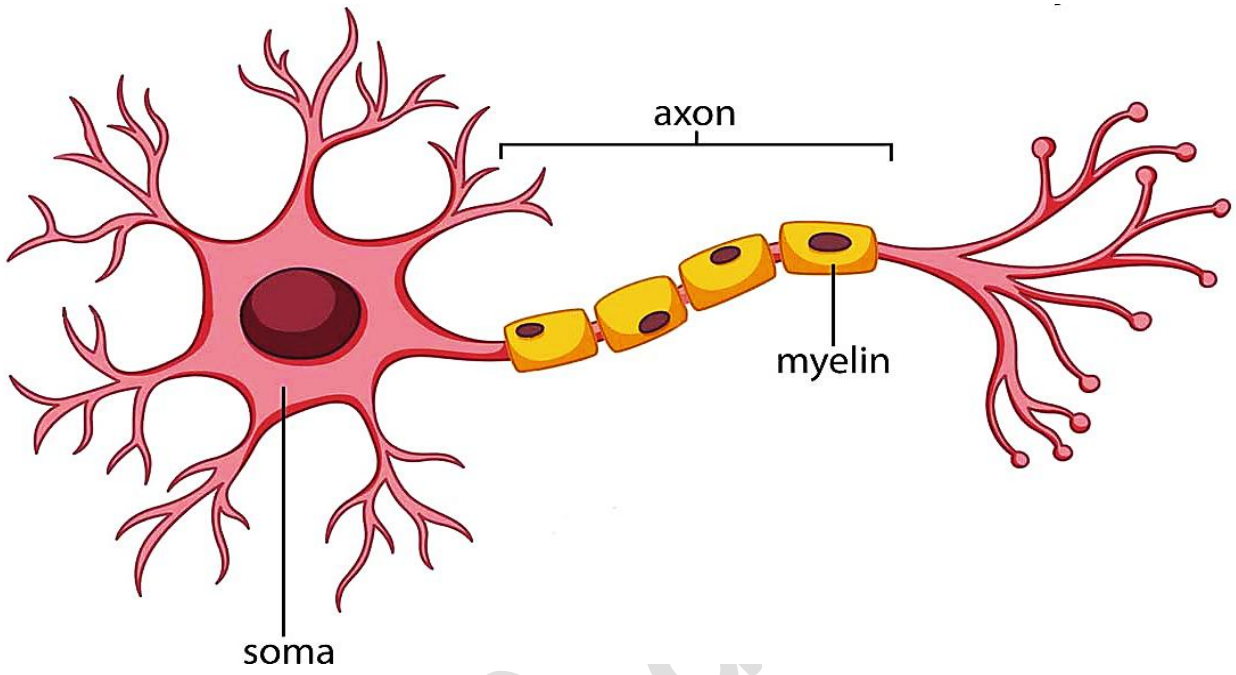



**Figure 2. show the nerve cell**

## Processing Information

**The brain receives information through our senses, which are processed by specialized areas of the brain. For example:**

- ✓ **Vision: the optic nerve sends visual information to the occipital lobe, which processes visual information.**
- ✓ **Hearing: the auditory nerve sends auditory information to the temporal lobe, which processes auditory information.**
- ✓ **Touch: the somatosensory cortex processes information from the skin, muscles, and joints.**

## Decision-Making

The brain uses information from our senses to make decisions. For example, when we see a snake, our brain processes the visual information and sends a signal to our muscles to move our feet away from the snake.

## Memory

The brain stores memories in specialized areas, such as the hippocampus and the cerebral cortex. These areas are responsible for encoding, storing, and retrieving memories.

## Emotions

The brain processes emotions through specialized areas, such as the amygdala and the hypothalamus. These areas are responsible for regulating emotions like fear, anger, and happiness.

## Brain Regions

1. **Cerebrum**: is the largest part of the brain in front of brain. It is divided into two hemispheres, the left and right hemispheres. The cerebrum is responsible for higher cognitive functions, such as thinking, memory, perception, and voluntary movement.
2. **Cerebellum**: "little brain" is located at the back of the brain, just below the cerebrum. It is responsible for motor control, balance, posture, and fine-tuning of movements.
3. **Brainstem**: "middle brain" is located at the base of the brain and connects the brain to the spinal cord. It includes the midbrain, pons, and medulla oblongata. The brainstem is responsible for vital functions such as breathing, heart rate regulation, and basic involuntary movements (sleep-wake cycles).
4. **Spinal Cord**: while technically not part of the brain, the spinal cord extends from the bottom of the medulla and through a large opening in the bottom of the skull.

Supported by the vertebrae, the spinal cord carries messages to and from the brain and the rest of the body.

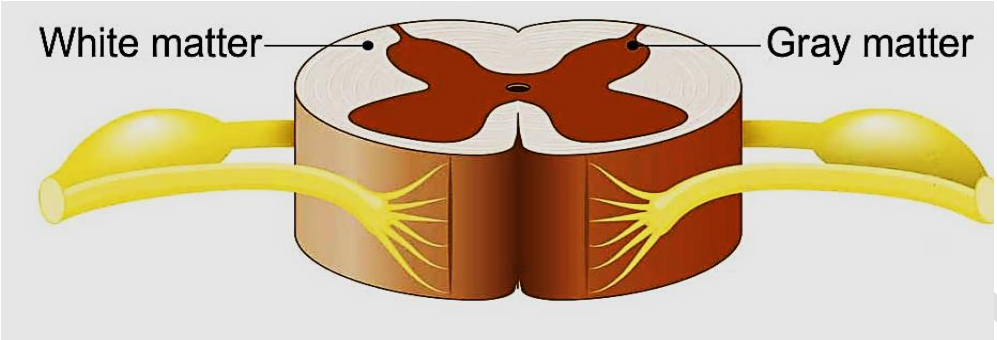



Figure 3. show cross section of the spinal cord

## Deeper Structures Within the Brain

- ✓ **Pituitary Gland الغدة النخامية**

Sometimes called the "master gland," the pituitary gland is a pea-sized structure found deep in the brain behind the bridge of the nose. The pituitary gland governs the function of other glands in the body, regulating the flow of hormones from the thyroid, adrenals, ovaries and testicles. It receives chemical signals from the hypothalamus through its stalk and blood supply.

- ✓ **Amygdala لوزة المخيخ**

Small, almond-shaped structures, an amygdala is located under each half (hemisphere) of the brain. Included in the limbic system, the amygdalae regulate emotion and memory and are associated with the brain's reward system, stress, and the "fight or flight" response when someone perceives a threat.

- ✓ **Hippocampus قرن آمون (الحُصين)**

A curved seahorse-shaped organ on the underside of each temporal lobe, the hippocampus is part of a larger structure called the hippocampal formation. It supports memory, learning, navigation and perception of space. It receives information from the cerebral cortex and may play a role in Alzheimer's disease.

### ✓ Hypothalamus تحت المهاد

**The hypothalamus is located above the pituitary gland and sends it chemical messages that control its function. It regulates body temperature, synchronizes sleep patterns, controls hunger and thirst and also plays a role in some aspects of memory and emotion.**

### ✓ Pineal Gland الغدة الصنوبرية

**The pineal gland is located deep in the brain and attached by a stalk to the top of the third ventricle. The pineal gland responds to light and dark and secretes melatonin, which regulates circadian rhythms and the sleep-wake cycle.**

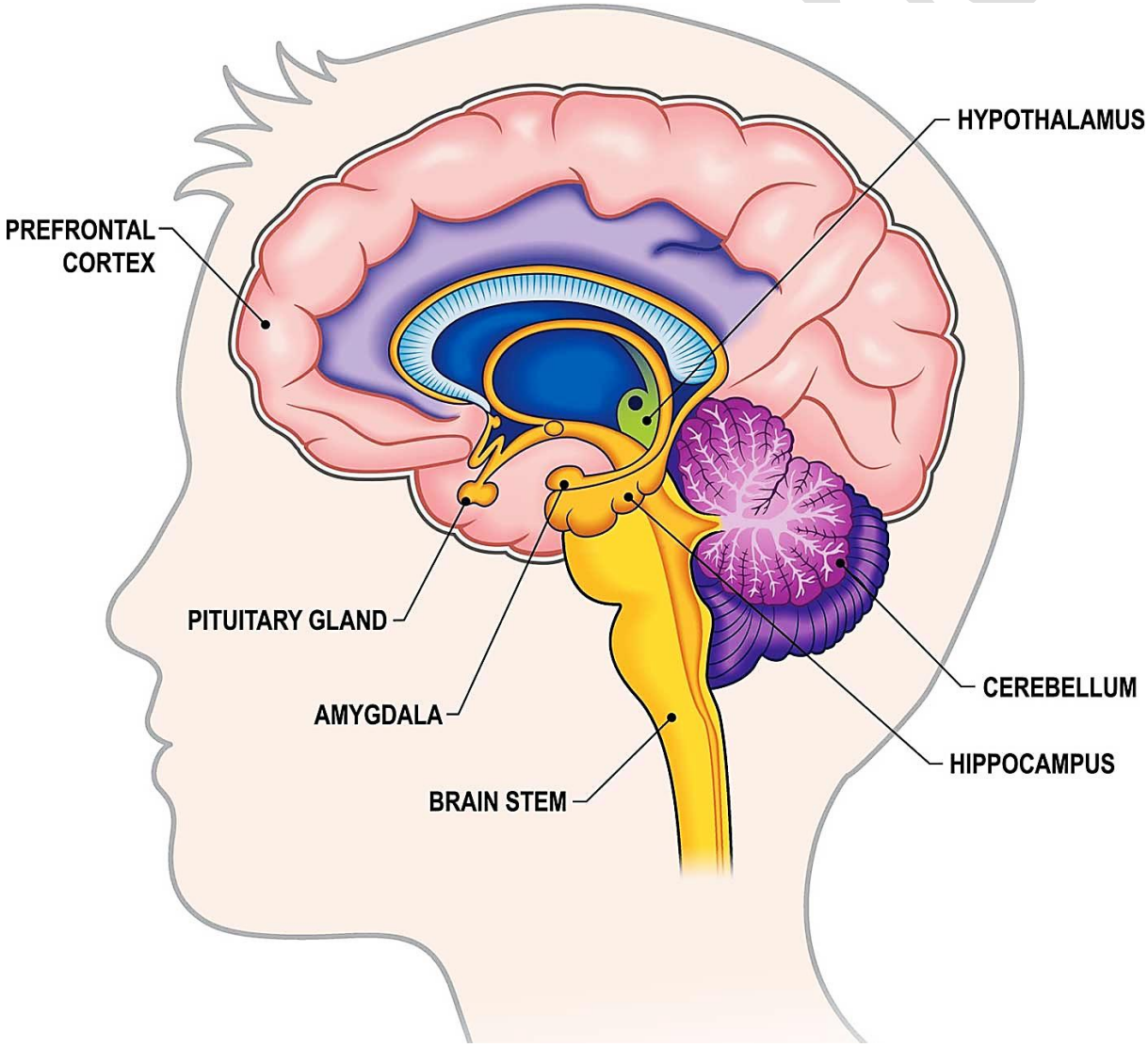



**Figure 4. show glands in the brain**

## Lobes of the Brain فصوص الدماغ

Each brain hemisphere (parts of the cerebrum) has four sections, called lobes: frontal, parietal, temporal and occipital. Each lobe controls specific functions

- **The frontal lobe**: The frontal lobe is located at the front of the brain and is involved in higher cognitive functions and executive control. It is responsible for planning, decision-making, problem-solving, and social behavior.
- **The parietal lobe**: The parietal lobe is situated near the top and back of the brain. It processes sensory information and is responsible for integrating and interpreting sensory input from various modalities, such as touch, temperature, and proprioception (awareness of body position in space).
- **The temporal lobe**: The temporal lobe is located on the sides of the brain, just above the ears. It is primarily responsible for short-term memory, speech, musical rhythm and some degree of smell recognition.
- **The occipital lobe**: The occipital lobe is situated at the back of the brain and is primarily responsible for visual processing. It receives information from the eyes and processes visual stimuli, allowing us to perceive and interpret the visual world.

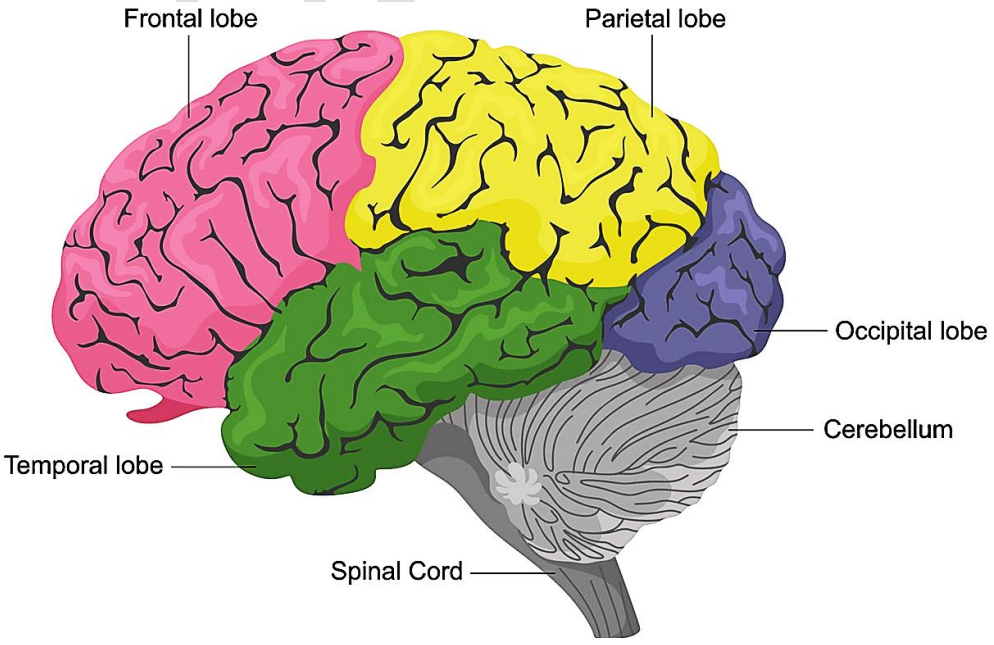



**Figure 5. show lobes in the brain**

## Ventricles and Cerebrospinal Fluid البطينين والسائل النخاعي

**The ventricles of the brain are a system of interconnected cavities filled with cerebrospinal fluid (CSF) that circulates in and around the ventricles and the spinal cord, and between the meninges. CSF surrounds and cushions the spinal cord and brain, washes out waste and impurities, and delivers nutrients.**

**There are four ventricles in the brain: two lateral ventricles, the third ventricle, and the fourth ventricle.**

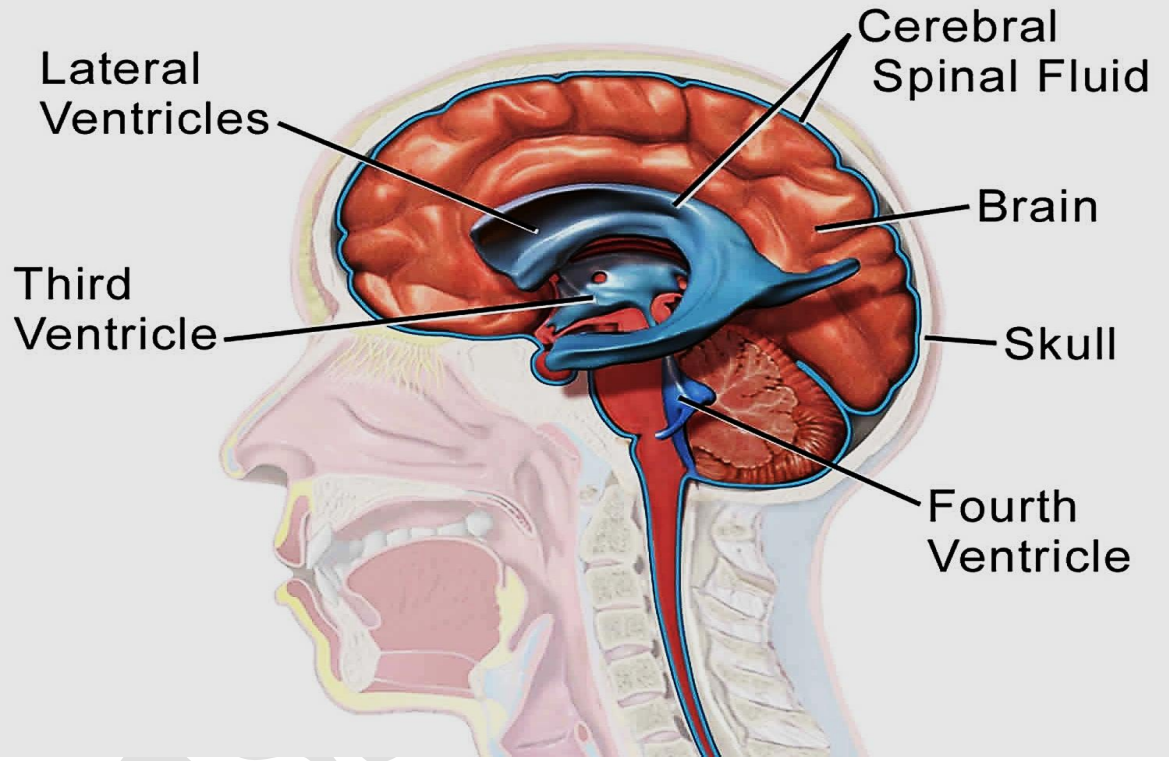



**Figure 6. show ventricles in the brain**

## Brain Coverings: Meninges

**Three layers of protective covering called meninges surround the brain and the spinal cord.**

1. **Dura Mater: the outermost layer, is thick and tough. It includes two layers: the periosteal and the meningeal layer is below that. Spaces between the layers allow for the passage of veins and arteries that supply blood flow to the brain.**
2. **arachnoid mater: is a thin, weblike layer of connective tissue that does not contain nerves or blood vessels. Below the arachnoid mater is the cerebrospinal fluid (CSF).**
3. **pia mater: is a thin membrane that hugs the surface of the brain and follows its contours. The pia mater is rich with veins and arteries.**

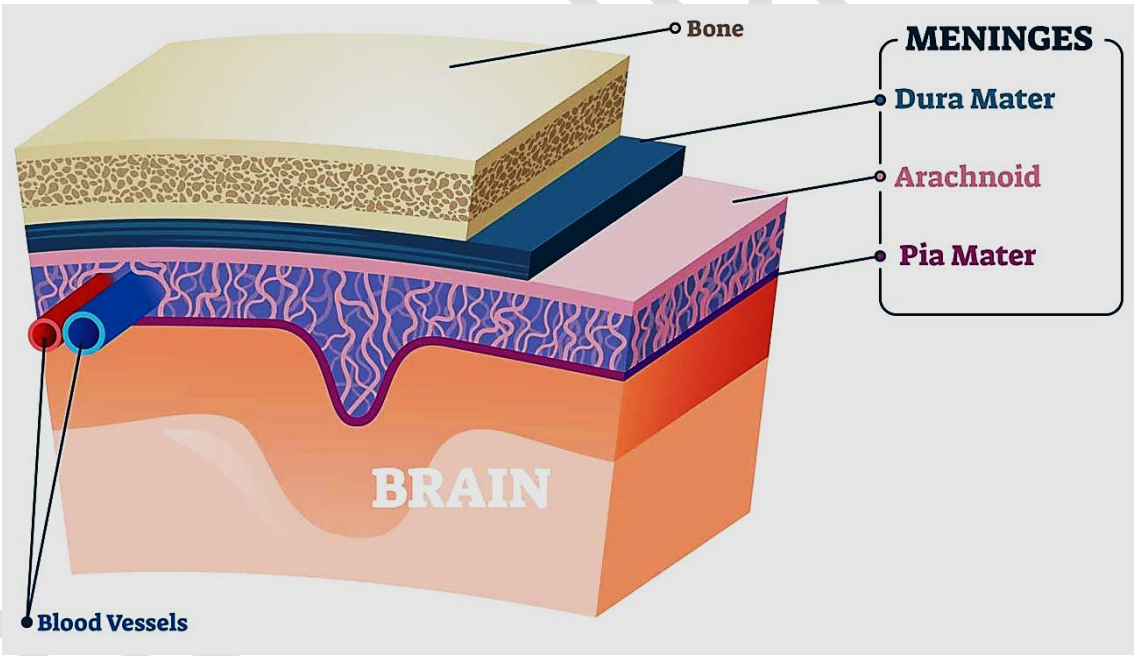



**Figure 7. show the layers of brain protection**

## Blood Supply to the Brain

**Two sets of blood vessels supply blood and oxygen to the brain: the vertebral arteries and the carotid arteries.**

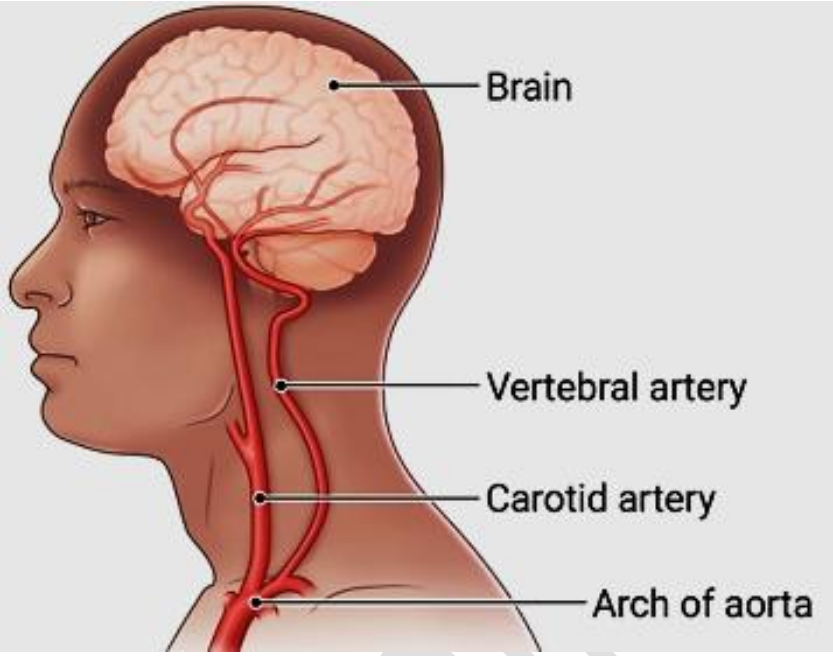



**Figure 8. shows arteries and veins in the brain**

## Brain Functions

**The brain is responsible for many functions, including:**

- **Thinking and problem-solving**
- **Language and communication**
- **Emotions and moods**
- **Memory and learning**
- **Movement and coordination**
- **Sleep and wake cycles**
- **Regulating bodily functions like breathing, heart rate, and digestion**

## Brain Disorders

**Brain disorders can affect the way the brain processes information, making it difficult to think, communicate, or control bodily functions. Common brain disorders include:**

- **Alzheimer's disease النسيان ( مرض الزهايمر)**
- **Parkinson's disease الشلل الرُّعاشي**
- **Schizophrenia أنفصام الشخصية**
- **Autism spectrum disorder اضطرابات طيف التوحد**
- **Epilepsy مرض الصرع**
- **Traumatic brain injury اصابة الدماغ الرضية**

## SUMMARY

- **Brain structure and regions: cerebrum, cerebellum, brainstem, spinal cord. Cerebrum divided into lobes (frontal, parietal, temporal, occipital) that control specific functions.**
- **Deeper brain structures: pituitary gland, amygdala, hippocampus, hypothalamus, pineal gland. Regulate hormones, emotion, memory, sleep cycles.**
- **Ventricles and cerebrospinal fluid circulate nutrients and remove waste.**
- **Meninges (dura mater, arachnoid mater, pia mater) protect brain and spinal cord.**
- **Blood supply via vertebral and carotid arteries.**
- **Brain vital functions: cognition, communication, coordination, bodily regulation.**
- **Common brain disorders: Alzheimer's, Parkinson's, schizophrenia, autism spectrum, epilepsy, traumatic injury.**