

## **8. organ system**

### **8.1. The Digestive system**

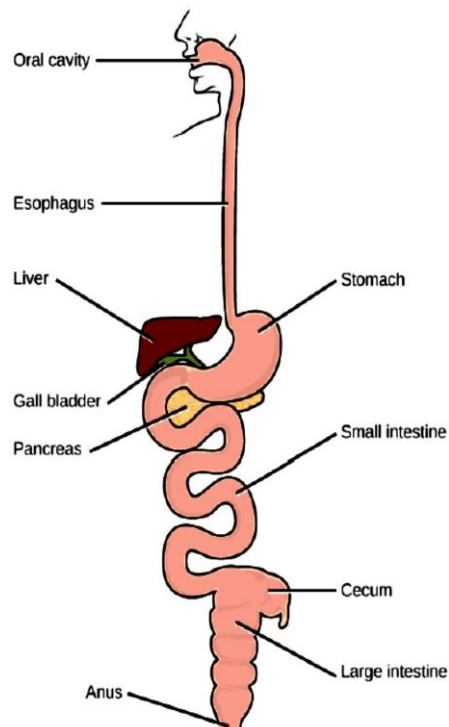
All living organisms need nutrients to survive. While plants can obtain nutrients from their roots and the energy molecules required for cellular function through the process of photosynthesis, animals obtain their nutrients by the consumption of other organisms. At the cellular level, the biological molecules necessary for animal function are amino acids, lipid molecules, nucleotides, and simple sugars.

However, the food consumed consists of protein, fat, and complex carbohydrates. Animals must convert these macromolecules into the simple molecules required for maintaining cellular function. The conversion of the food consumed to the nutrients required is a multistep process involving digestion and absorption.

#### **8.1.1. The Human Digestive System**

1. **Oral Cavity** Both physical and chemical digestion begin in the mouth or oral cavity, which is the point of entry of food into the digestive system. The food is broken into smaller particles by mastication, the chewing action of the teeth.
2. **The teeth** play an important role in masticating (chewing) or physically breaking food into smaller particles. This action not only decreases the size of the food particles to facilitate swallowing, but also increases surface area for chemical digestion. All mammals have teeth and can chew their food to begin the process of physically breaking it down into smaller particles.
3. **The esophagus** is a tubular organ that connects the mouth to the stomach. The chewed and softened food (i.e. the bolus) passes through the esophagus after being swallowed.
4. **The enzymes** present in saliva (amylase and lipase) also begin to chemically break down food (starch and fats, respectively).
5. **The stomach** A large part of protein digestion occurs in the stomach. The stomach is a saclike organ that secretes gastric digestive juices. Protein digestion is carried out by an enzyme called pepsin in the stomach chamber.

6. **The small intestine** is the organ where the digestion of protein, fats, and carbohydrates is completed. The small intestine is a long tube-like Organ with a highly folded surface containing finger-like projections called the villi.
7. **The large intestine** reabsorbs the water from indigestible food material and processes the waste material .The human large intestine is much smaller in length compared to the small intestine but larger in diameter. It has three parts: the **cecum, the colon, and the rectum**
8. The **pancreas**, The pancreas secretes bicarbonate that neutralizes the acidic chyme and a variety of enzymes (trypsin, amylase, and lipase) for the digestion of proteins, carbohydrates, and fats, respectively.
9. **The waste material travels** on to the large intestine where water is absorbed and the drier waste material is compacted into feces.



((The components of the human digestive system))

**The colon** has four regions, the ascending colon, the transverse colon, the descending colon and the sigmoid colon. The main functions of the colon are to extract the water and mineral salts from undigested food, and to store waste material.

## **Accessory Organs**

Accessory organs add secretions and enzymes that break down food into nutrients. Accessory organs include the salivary glands, the liver, the pancreas, and the gall bladder. The secretions of the liver, pancreas, and gallbladder are regulated by hormones in response to food consumption.

**The liver** is the largest internal organ in humans and it plays an important role in digestion of fats and detoxifying blood.

**The gallbladder** is a small organ that aids the liver by storing bile and concentrating bile salts.

**Nutrition** The human diet should be well balanced to provide nutrients required for bodily function and the minerals and vitamins required for maintaining structure and regulation necessary for good health and reproductive

## **8.2. the nervous system (Neurons and Glial Cells)**

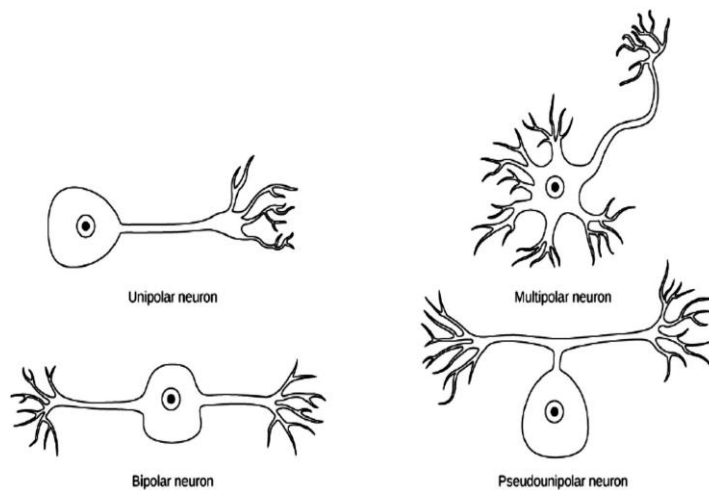
**The nervous system** is made up of neurons, specialized cells that can receive and transmit chemical or electrical signals, and glia, cells that provide support functions for the neurons by playing an information processing role that is complementary to neurons.

There are four major types of neurons, and they share several important cellular components.

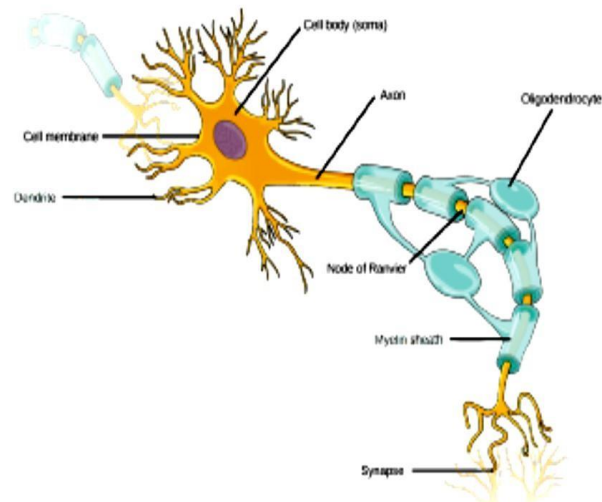
### **1. Neurons**

Neurons share the same cellular components. But neurons are also highly specialized different types of neurons have different sizes and shapes that relate to their functional roles.

Neurons are broadly divided into four main types based on the number and placement of axons: (1) **unipolar**, (2) **bipolar**, (3) **multipolar**, and (4) **pseudo unipolar**



**Parts of a Neuron** each neuron has a cell body that contains a nucleus, smooth and rough.



(Neuron )

## 2. Glia

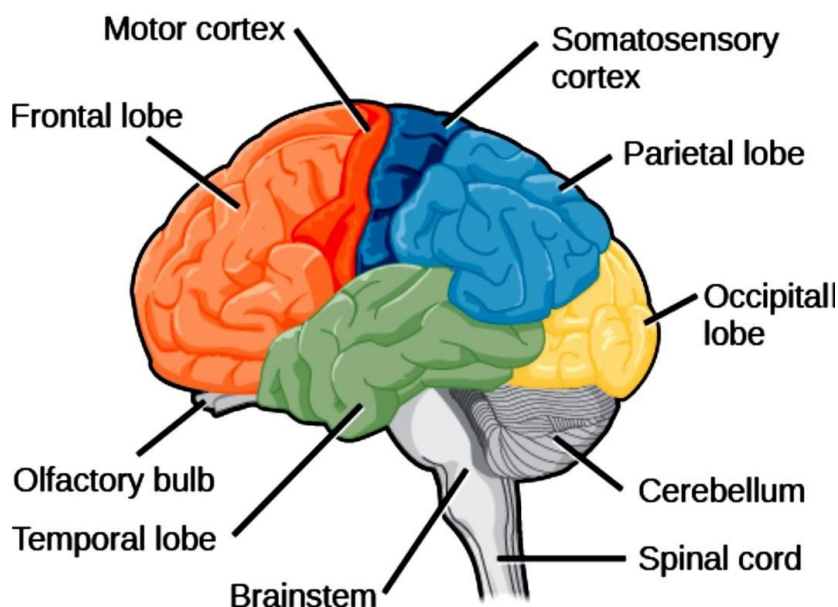
play a role in responding to nerve activity and modulating communication between nerve cells. When glia do not function properly, the result can be disastrous most brain tumors are caused by mutations in glia.

**Section Summary ( abstract)**

The nervous system is made up of neurons and glia. Neurons are specialized cells that are capable of sending electrical as well as chemical signals. Most neurons contain dendrites, which receive these signals, and axons that send signals to other neurons or tissues.

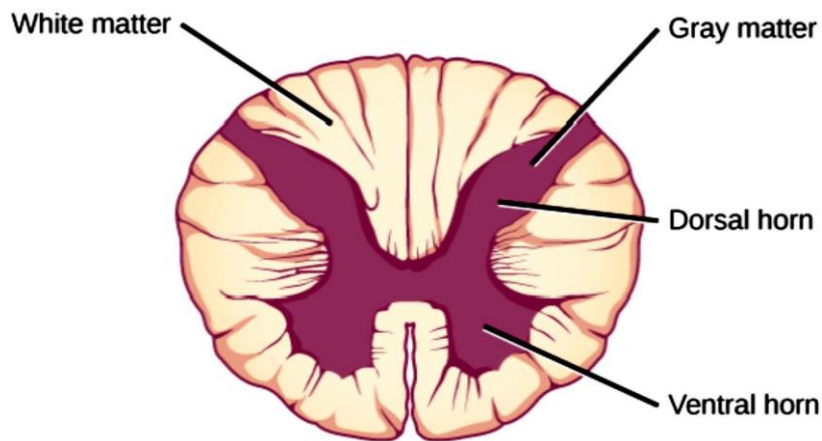
**The Brain**

The brain is the part of the central nervous system that is contained in the cranial cavity of the skull. It includes the cerebral cortex, limbic system, basal ganglia, thalamus, hypothalamus, cerebellum, brainstem, and retinas. The outermost part of the brain is a thick piece of nervous system tissue called the cerebral cortex. The cerebral cortex, limbic system, and basal ganglia make up the two cerebral hemispheres.

**Spinal cord**

The spinal cord is a thick bundle of nerve tissue that carries information about the body to the brain and from the brain to the body. The spinal cord is contained within the meninges and the bones of the vertebral column but is able to communicate signals to and from the body through its connections with spinal nerves (part of the peripheral nervous system).

A cross-section of the spinal cord looks like a white oval containing a gray butterfly-shape. Myelinated axons make up the \_white matter\_ and neuron and glia cell bodies (and interneurons) make up the \_gray matter\_.



## The Peripheral Nervous System

The peripheral nervous system (PNS) is the connection between the central nervous system and the rest of the body.

The PNS can be broken down into the autonomic nervous system, which controls bodily functions without conscious control, and the sensory-somatic nervous system, which transmits sensory information from the skin, muscles, and sensory organs to the CNS and sends motor commands from the CNS to the muscles.

M.SC. Mohammad JawaD

[mohammad.jawad.khadum@nomus.iq](mailto:mohammad.jawad.khadum@nomus.iq)