

Topic 2: The human nervous system

I REMEMBER WHAT I KNOW

- How is it formed the nervous system?
- What is the difference between the nervous system central and peripheral?

What is the human nervous system like?

The human nervous system is a set of nervous organs and tissues the basic unit of which is the neuron.

The human nervous system has three main functions:

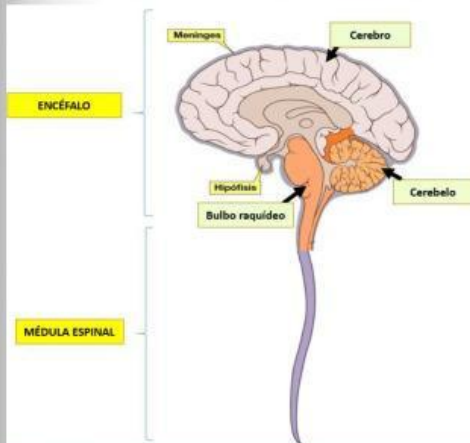
- **Sensitive** function. Reacts to external and internal stimuli.
- **Integrating** function. Analyzes, stores, processes and allows the taking of decisions in the face of the received stimuli.
- **Motor** function. Generates muscle movements or secretions glandular to execute the previously determined decision or response.

To fulfill all these functions, the human nervous system is subdivided into central nervous system and peripheral nervous system.

The central nervous system (CNS)

The central nervous system is responsible for analyzing and processing information coming from the receivers and to order an appropriate response so that the execute the effector organs.

The central nervous system is composed of the encephalon (brain, cerebellum and brain stem) and the spinal cord.

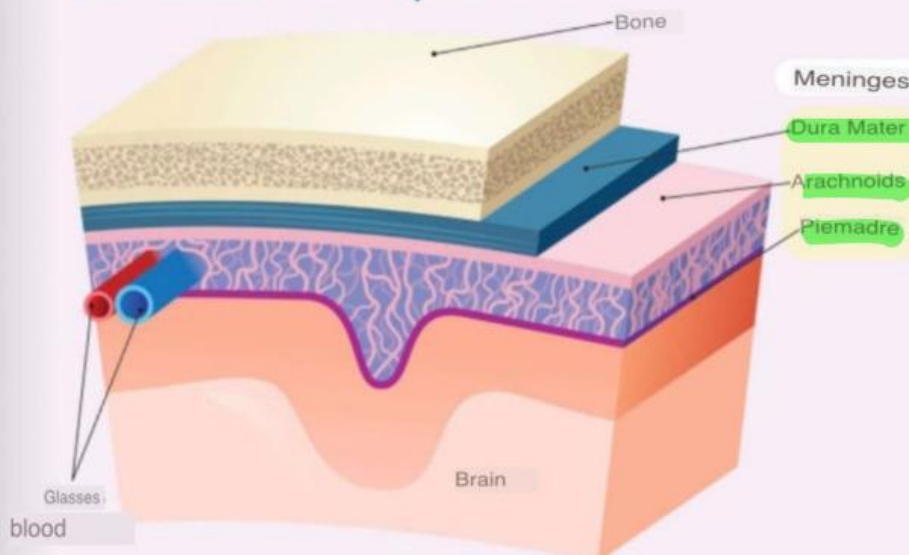


The brain is surrounded by meninges, three layers of connective tissue that make it they protect against infections and possible traumas generated by blows and allow the circulation of the cerebrospinal fluid. They are called pia mater, arachnoids and dura mater.

D The **dura mater** is the layer external, thicker and resistant that establishes direct contact with the the cranial vault and the canal spinal.

A The **arachnoid** is the layer intermediate which includes two layers that intertwine like a spider's web.

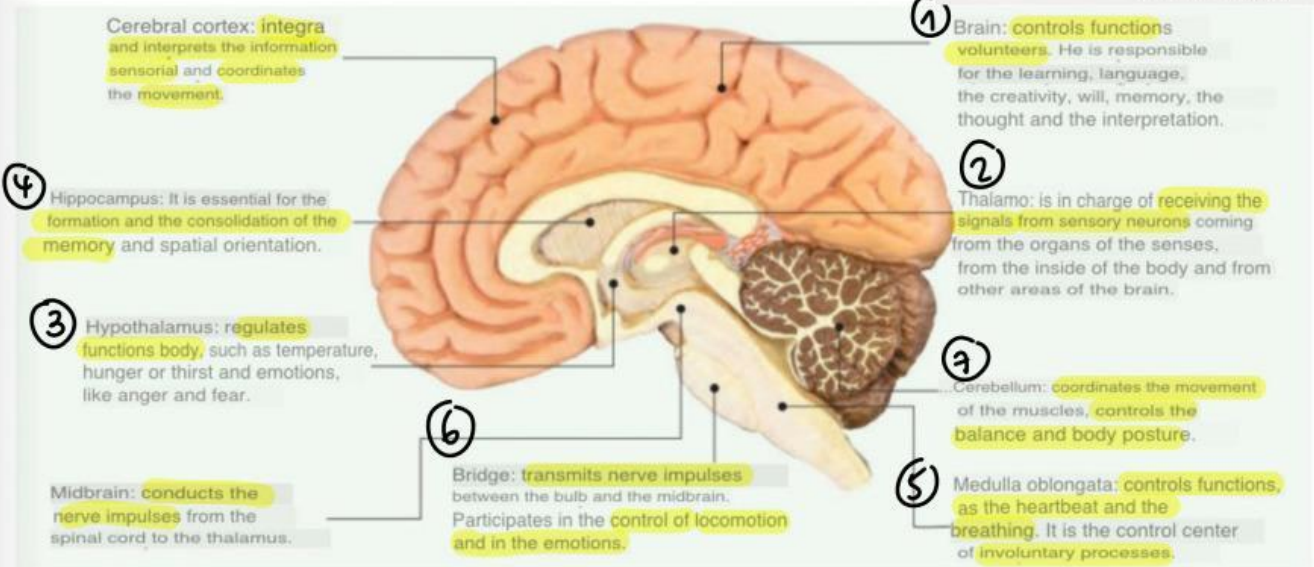
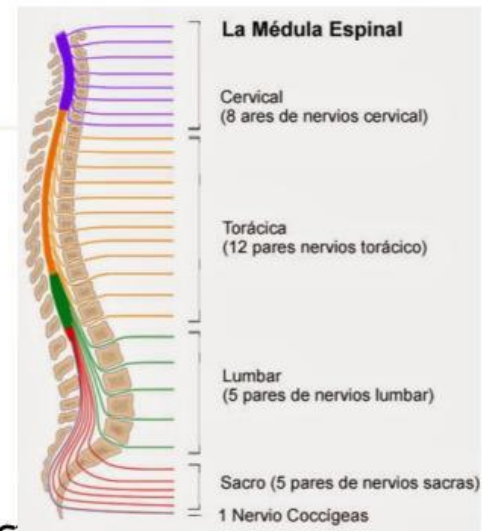
P The mother's pie is the cape more internal covering the the brain and the marrow; it is highly vascularized and he is in direct contact with the structures mentioned.



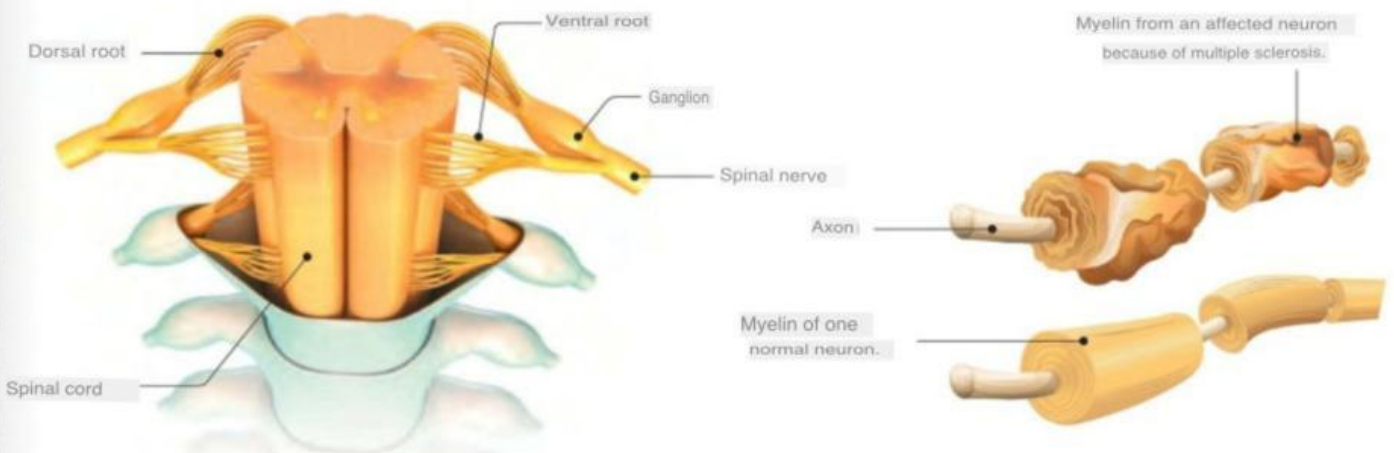
encephalon

The **brain** is the part of the central nervous system located **within the skull** and includes the following structures:

- ① Its anterior or forebrain part, contains the **brain**, the **thalamus**, the **hypothalamus** and the **hippocampus** ④
- ② Its middle part, or **midbrain**, includes the reticular substance.
- ③ Its posterior part, or rhombencephalon, contains the **medulla oblongata**, the **annular protuberance** and the **cerebellum** ⑤. The midbrain, the protuberance annular and the medulla oblongata together form the so-called trunk encephalic.



The **spinal cord** is responsible for **communicating the brain with the rest of the body** and also to **control many reflex actions** that do not require of the intervention of the conscious part of the brain. It is composed of **31 segments**, from which the spinal nerves originate and extends approximately from the occipital region to a level of the first lumbar vertebra. Eight **cervical** segments are considered, twelve **thoracic or dorsal**, five **lumbar**, five **sacral** and one **coccygeal**.



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The peripheral nervous system (PNS)

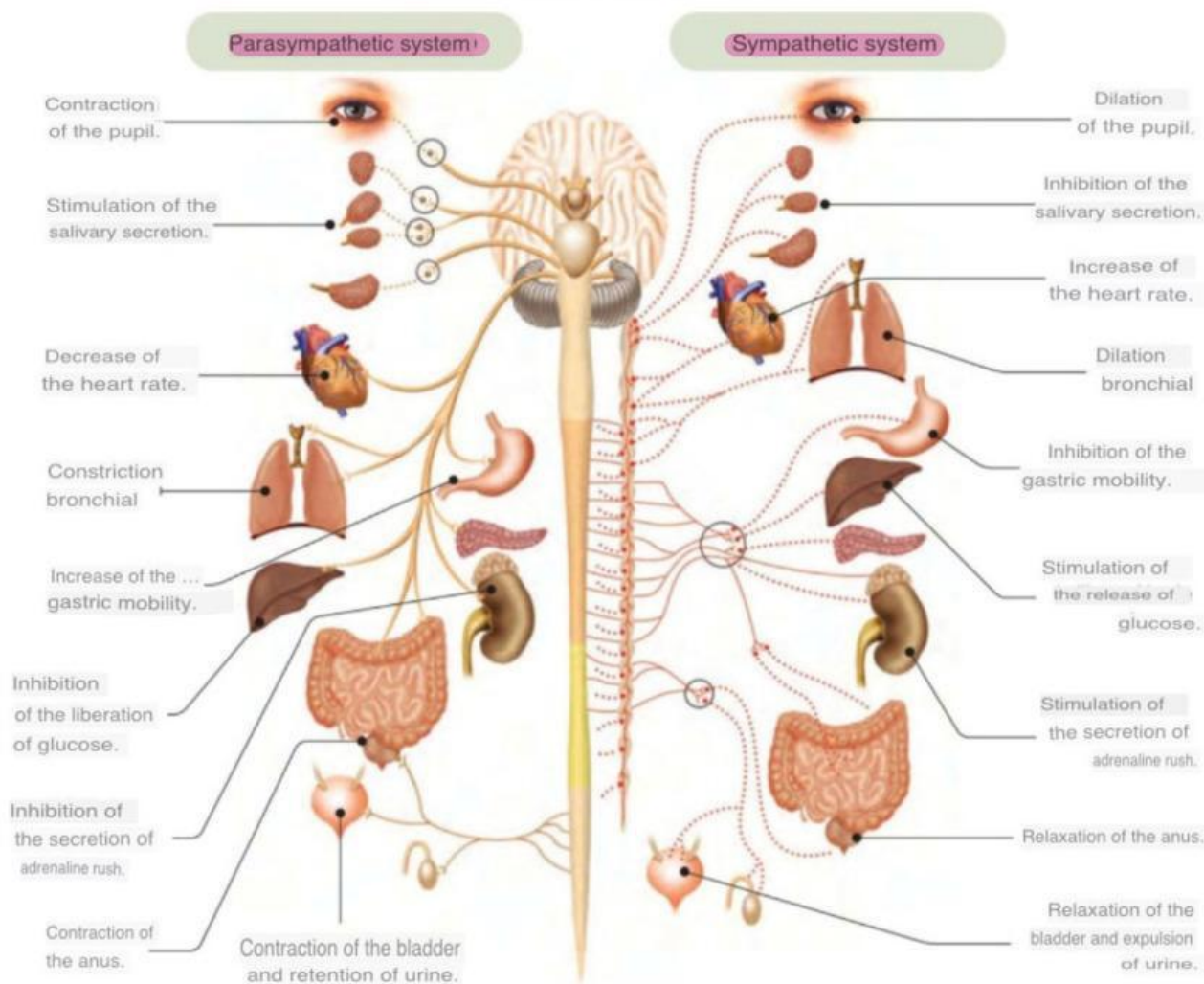
The **peripheral nervous system (PNS)** connects the central nervous system with the rest of the body and is made up of the nerves and nerve ganglia.

Usually, the nerves that make up this system are classified according to with the region of the central nervous system to which they are connected.

In humans, the PNS is divided into **cranial nerves** and **spinal nerves**. In addition, depending on the place in which it acts, the SNP is divided into system **somatic** nervous and **autonomic** nervous system.

The **somatic nervous system** intervenes in **voluntary responses**, influences in skeletal muscles that **move with conscious control**. Has nerves in charge of the relationship with the environment, and can respond to the changes that occur in him.

The **autonomic nervous system** is in charge of **controlling the operation of the internal organs involuntarily**. Their neurons are in contact with glands of the endocrine system, with smooth muscle cells and with heart muscle cells. **It is divided into two systems** that produce opposite effects on the organs that control:



The nerve impulse

The nerve impulse is the set of electrical and chemical reactions that they allow the transmission of information between neurons. The information enters through the dendrites, the impulse is generated in the cell body, travels through the axon and is sent by the nerve terminals to other neurons or even the effectors. The nerve impulse is determined by the gradient of concentration and electric potential.

The concentration gradient. When a substance is more concentrated on one side of the membrane, the particles tend to escape into the spaces where the concentration is lower.

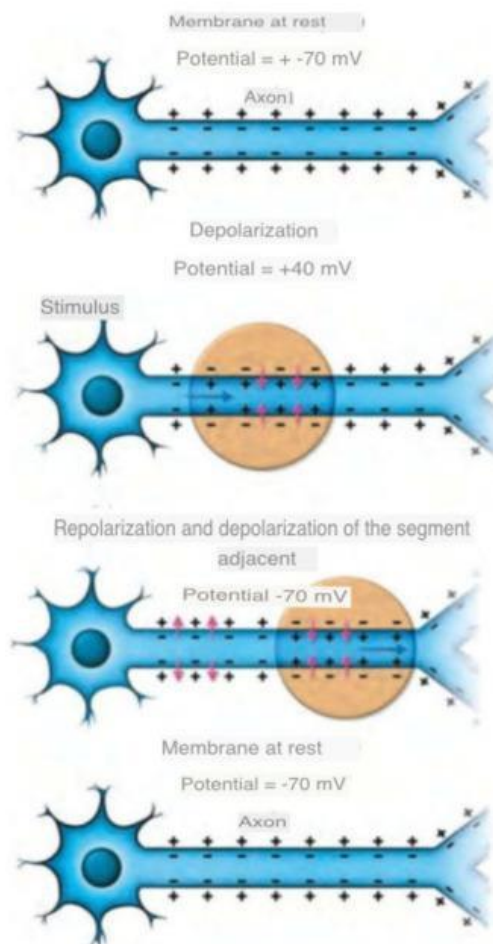
The electric potential or potential at rest. It is the ability to displacement of an electric charge and depends on the difference between the the total number of charges that exist in two spaces. The cytoplasm has a charge negative with respect to the extracellular medium, although in both (cytoplasmic and extracellular medium) there are positive and negative ions. To this difference is this is known as the membrane potential. Because the positive charges and negative attract each other, the electric potential creates an attractive force about the ions involved in the electrical impulse.

Propagation of the nerve impulse

- Under normal conditions, a nerve fiber at rest is polarized; this means that on the outside of its membrane there is a large amount of cations and inside, a predominance of anions. This distribution creates an difference in charge between the two sides of the membrane, which it produces an electric potential or resting potential. The the plasma membrane acts as an insulator and prevents create electric current between the outside and the inside.
- When the axon is stimulated, the local alteration is caused of the permeability of the membrane, and many ions enter Na^+ . This causes the interior to be positively charged, and the exterior, negatively at that point, it also registers a very brief reversal of polarity. This investment creates an sudden variation of the potential difference which is called action potential.
- The areas adjacent to the point where the depolarization are affected by charge currents positive towards the interior, which produces new potentials of action in these areas. The action potential is due to the propagation of these currents, it originates a wave of depolarization that travels along the length of the neuron, and it this is the nerve impulse.
- Then, the neuron is repolarized again by a repolarization wave that is due to the outflow of K^+ ions from the inside.

To consult

To deepen your knowledge about the system a nervous person checks the pages 297 - 309 of the Atlas of human Body, Jordi Vigue, (Ed.)

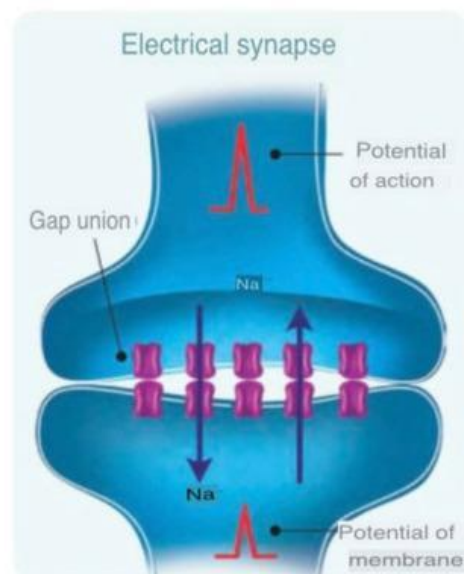
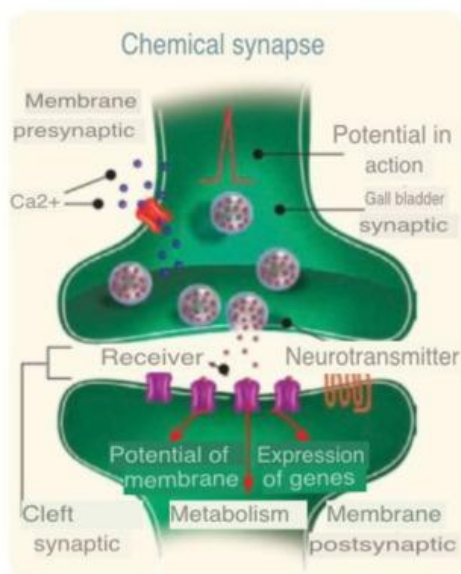


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The synapse

The synapse is the **functional junction** by which the nerve impulse is transmitted from one neuron to another, between a neuron and a sensory receptor, or between a neuron and an effector cell. **This communication occurs due to that the buttons on the axon terminals are in contact with the dendrites or the cell body of another neuron.** There are two **types of synapses**, the synapse electrical and chemical synapses.

- At the **electrical synapse** the **electric current** that is generated in a neuron **circulates directly to another** through the plasma membranes, where the slit or gap joints are found. This type of union allows the passage of substances directly between one neuron and another and, in addition, the current circulation between them. The arrival of the nerve impulse at a the cell generates the entry of ions that flow freely to the other cell.
- The **chemical synapse** occurs by the **release of chemical called neurotransmitters** in a space known as the cleft or synaptic space. The chemical synapse begins when the impulse the nerve reaches the axonal terminals. The change in the polarity of the membrane opens specific channels permeable to calcium (Ca^{2+}). The the entry of this ion into the cytoplasm activates the fusion of bags filled with neurotransmitters, called synaptic vesicles, with the membrane of the axon, or presynaptic membrane.



GLOSSARY

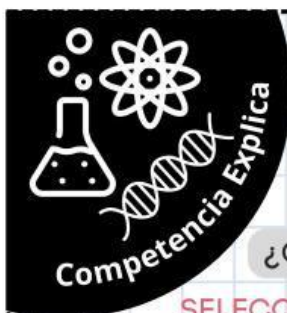
neurotransmitters.

Chemical substances fundamental to the communication between neurons and the operation of the system nervous.

Es **eprocessesumlions of times by seguryca** la vez que we act or there is a change in the external or internal environment. **The nervous system** he's always active.



What are the similarities between the chemical synapse and the electric? Look carefully at the images.



SISTEMA NERVIOSO HUMANO

Instrucciones:

Después de haber leído el texto anterior, responde cada pregunta.

¿Cómo es el sistema nervioso humano?

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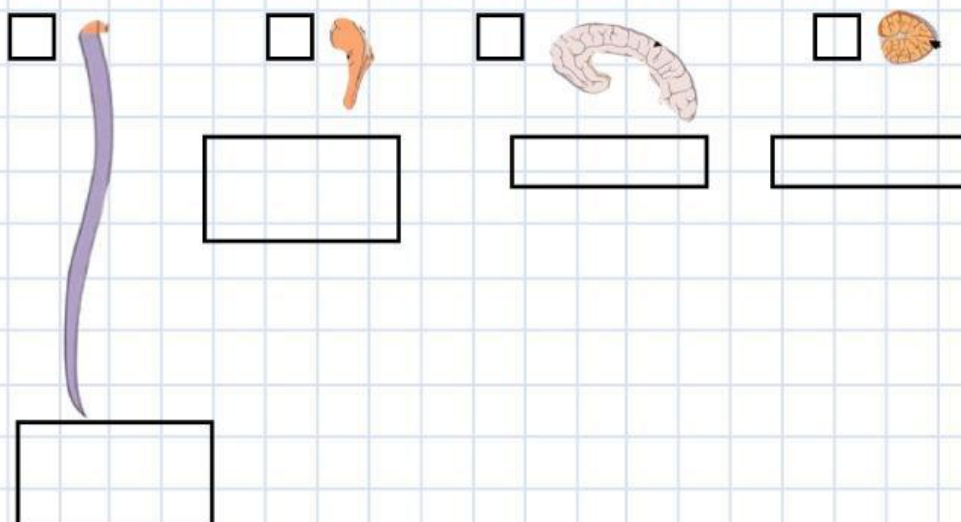
SELECCIONA LA OPCIÓN CORRECTA:

- 1) Un sistema es un conjunto de ...
a) tejidos b) órganos c) células
- 2) Un tejido es un conjunto de ...
a) órganos b) células c) tejidos
- 3) _____ es la unidad básica del sistema nervioso humano.
a) neurona b) cerebro c) nervios
- 4) Las capas que cubren el cerebro se denominan ...
a) membranas cerebrales b) meninges c) encefalopliegues

RELACIONA LAS COLUMNAS CORRECTAMENTE:

- | | |
|------------------------|--|
| 1) Función sensitiva | a) reacciona frente estímulos |
| 2) Función integradora | b) Genera movimientos o secreciones glandulares |
| 3) Función motora | c) analiza, almacena, procesa información de los estímulos |

MARCA LOS ÓRGANOS QUE PERTENECEN AL ENCÉFALO
LUEGO, ESCRIBE EL NOMBRE A CADA UNO DE LOS ÓRGANOS DEL SISTEMA NERVIOSO CENTRAL HUMANO
FINALMENTE, ARRASTRA Y ÚBICALOS SEGÚN CORRESPONDA:



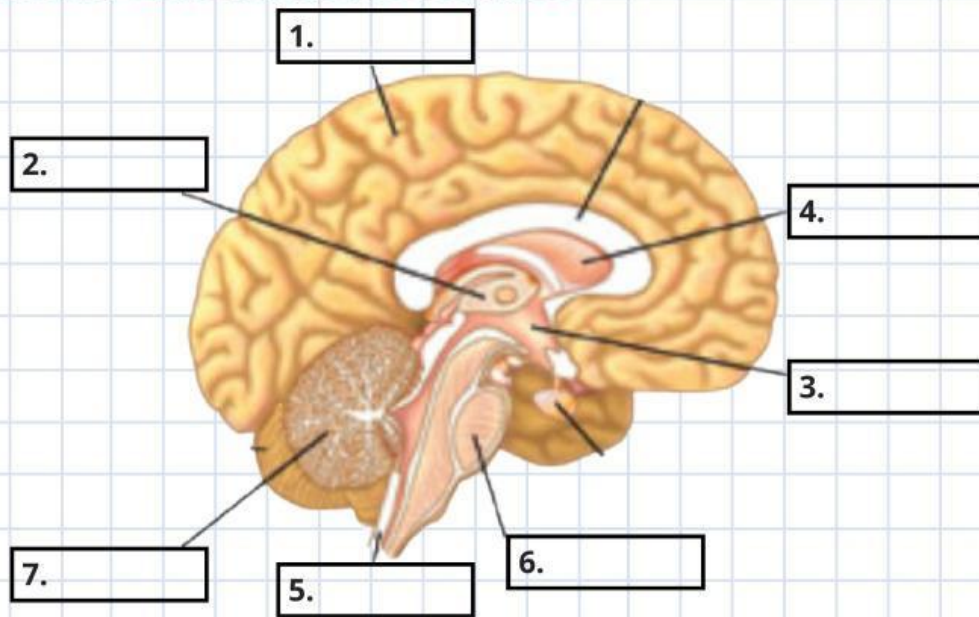
ESCRIBE V o F SEGÚN CORRESPONDA:

- ☐ Las meninges protegen al cerebelo de infecciones y golpes.
- ☐ Las meninges permiten la circulación del líquido cefalorraquídeo.
- ☐ Cuando ocurre una lesión que rompe el hueso, la primera meninge afectada es la aracnoides.
- ☐ La piamadre está en contacto con el cerebro y es la más vascularizada

¿Cómo es el sistema nervioso humano?

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ESCRIBE EL NOMBRE DE LOS ÓRGANOS



RELACIONA LOS ÓRGANOS Y SUS FUNCIONES:

- | | |
|-------------------|--|
| 1) Bulbo raquídeo | a) Recibe las señales de las neuronas sensitivas |
| 2) Cerebro | b) Coordina el movimiento, controla equilibrio y postura |
| 3) Cerebelo | c) Consolida la memoria y la orientación espacial |
| 4) Hipocampo | d) Controla la locomoción y las emociones |
| 5) Hipotálamo | e) Controla procesos involuntarios |
| 6) Puente | f) Controla funciones voluntarias |
| 7) Tálamo | g) Regula funciones corporales |

El sistema nervioso periférico (SNP)

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COMPLETA SEGÚN CORRESPONDA:

- El sistema nervioso periférico (SNP) conecta al _____ y el resto del cuerpo.
- _____ constituyen al sistema nervioso periférico (SNP).
- El sistema nervioso periférico (SNP) se divide en nervios _____.
- _____ es la parte del sistema nervioso periférico (SNP) que controla las respuestas voluntarias del cuerpo, como movimiento de los músculos.
- _____ es la parte del sistema nervioso periférico (SNP) que controla las respuestas involuntarias del cuerpo, como los latidos cardíacos.

SELECCIONA Y ARRASTRA PARA CLASIFICAR SEGÚN CORRESPONDA:

Dilata la pupila Aumenta ritmo cardíaco Estimula la secreción de adrenalina
 Retiene la orina Aumenta la movilidad gástrica Estimula la secreción salival

Sistema parasimpático	Sistema simpático

El impulso nervioso

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OBSERVA EL VIDEO Y RESPONDE:

COMPLETA SEGÚN CORRESPONDA:

- 1) El impulso nervioso es el conjunto de reacciones _____.
- 2) A través de _____ ingresa la información de neurona a neurona.
- 3) El impulso nervioso se genera en _____.
- 4) A través del axón _____, viaja el impulso nervioso.
- 5) Las sustancias suelen ir de una zona de _____ concentración.

ARRASTRA Y ORDENA SEGÚN CORRESPONDA:

Se invierte la polaridad, entra Na^+ Repolarización entra k^+ , sale Na^+

Despolarización con neurotransmisor

Membrana en reposo polarizada

ARRASTRA Y ORDENA AQUÍ

SELECCIONA Y ARRASTRA SEGÚN CORRESPONDA:

Requiere neurotransmisores
Requiere hendidura sináptica

Circula corriente eléctrica
Requiere iones Na^+

Requiere unión GAP
Requiere iones Ca^{2+}

Sinapsis química	Sinapsis eléctrica