

## شكراً لتحميلك هذا الملف من موقع المناهج الإماراتية



## مراجعة الوحدة التاسعة النظام العصبي System Nervous - انسابير

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تاريخ نشر الملف على موقع المناهج: 12:14:49 2023-02-09 | اسم المدرس: Emam-El Aya

## التواصل الاجتماعي بحسب الصف التاسع المتقدم



## روابط مواد الصف التاسع المتقدم على تلغرام

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## المزيد من الملفات بحسب الصف التاسع المتقدم والمادة علوم في الفصل الثاني

[أسئلة الامتحان النهائي - بريدج](#)

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# Inspire Biology grade 9

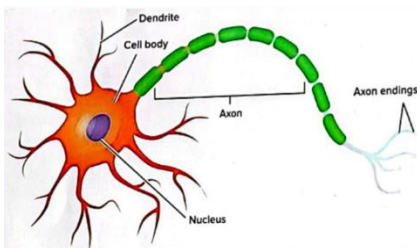
## Chapter 5

### G9. Module 23 Nervous system

#### Lesson 1: Structure of the nervous system

**Neurons:** are specialized cells that help you **gather information** about your environment, **interpret** the information and **react** to it.

Neurons make up an enormous communication network in your body called the **nervous system**.



➤ Neuron consist of 3 main regions:

1. Dendrite.
2. A cell body.
3. An axon.

#### 1) Dendrite:

Receive signals called impulses from other neurons and conduct the impulses to the cell body.

#### 2) Cell body:

The nucleus of the neuron and many of the cell organelles are found in it.

#### 3) Axon:

An axon carries the nerve impulse from the cell body to other neurons and muscles.

➤ There are 3 kinds of neurons:

- 1- Sensory neurons.
- 2- Interneurons "found in the brain and spinal cord".
- 3- Motor neurons.

#### 1) Sensory neurons:

Send impulses from receptors in the skin and sense organs to the brain and spinal cord \*Signal interneurons"





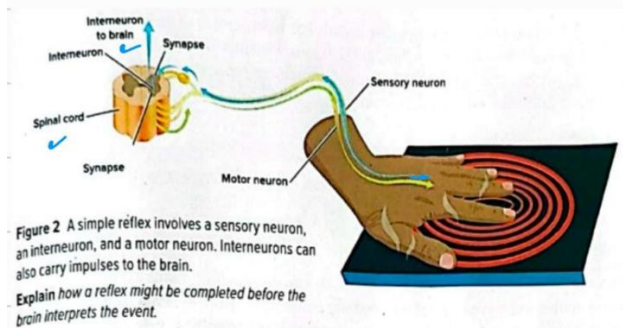
## 2) Interneurons:

Carry the impulse to **motor neurons**.



## 3) Motor neurons:

Carry impulses **away from** the brain and spinal cord **to** a gland or muscle, which result in a **response**.



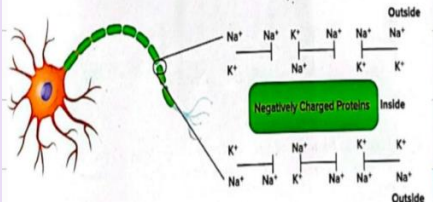
The nerve impulse completes what is called a reflex arc.

**Reflex arc:** is a nerve pathway that consists of a sensory neuron, an interneuron “spinal cord only” and motor neuron.

- ❖ Notice that the brain isn't involved.
- ❖ A reflex arc is a basic structure of the nervous system.

## A nerve impulse:

- Is an **electrical charge** travelling the length of a neuron.
- An impulse results from **a stimulus** such as a touch or aloud bang. Which causes a person to **react**.

	A neuron at rest	An action potential
	<ul style="list-style-type: none"> <li>▪ The neuron in a rest which means it is not conducting an impulse.</li> <li>▪ There are more <b>Na<sup>+</sup> outside</b> the cell than inside the cell.</li> <li>▪ There are more <b>K<sup>+</sup> inside</b> the cell than outside the cell.</li> </ul> 	<ul style="list-style-type: none"> <li>▪ Another name for a nerve impulse is an <b>action potential</b>.</li> <li>▪ The minimum stimulus to cause an action potential to be produced is a <b>threshold</b>.</li> <li>▪ action potential is described as being “<b>all or nothing</b>” meaning that a nerve impulse is either strong enough to travel along the neuron or it is not strong enough.</li> <li>▪ When a stimulus reaches the threshold, channels in the <b>plasma membrane</b> <b>open</b>.</li> </ul>



- Proteins called **the sodium potassium pump** keep the inside of the cell more **negatively** charged than outside the cell.
- For every 2 potassium ions  $K^+$  pumped into a neuron, 3 sodium ions  $Na^+$  are pumped out.

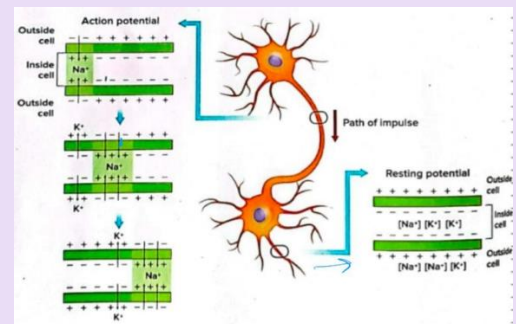
This maintains an unequal distribution of positively charged ions, resulting in a **positive charge outside** the neuron and a **negatively charged** cytoplasm **inside** the neuron.

- Sodium ions** rapidly move **into** the cytoplasm of the neuron through these channels.

Causing a temporary reversal in electrical charges

The inside of the cell then has a positive charge which causes other channels to open

**$K^+$  leave** the cell through these channels, **restoring a positive** charge **outside** the cell.



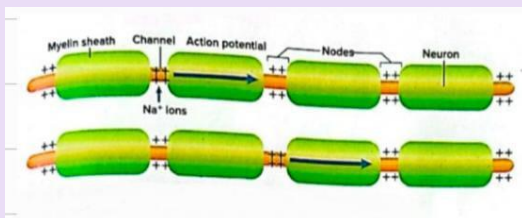
### Speed of an action potential:

#### Axon with myelin sheath

- Many axons have a covering of a lipid, insulating layer called a sheath,

The myelin sheath has many gaps called **nodes**

- Sodium ions and potassium ions cannot diffuse through myelin, they can reach the plasma membrane at these nodes this allows the action potential to **jump** from node to node → **greatly increasing the speed of the impulse**
- Neurons that have myelin carry impulses that are associated with sharp pain.



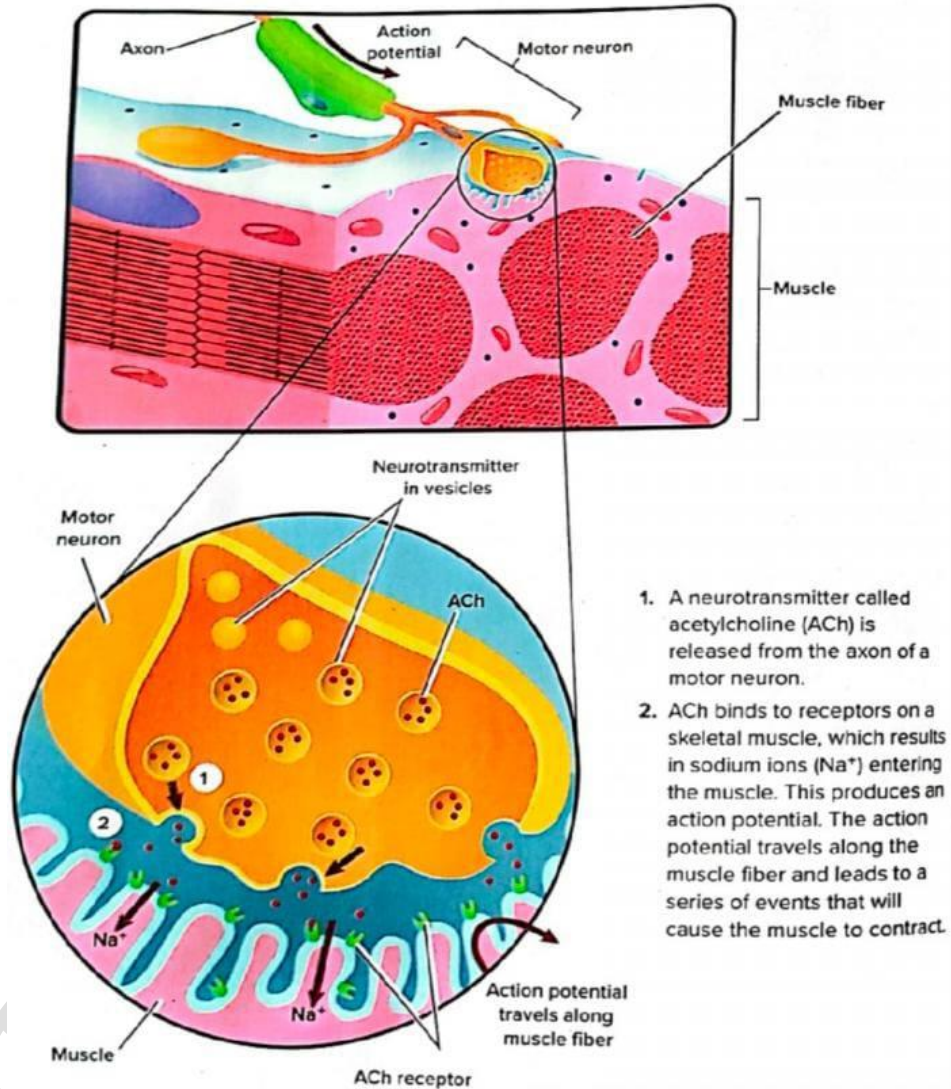
#### Axon without myelin sheath

- Axon **without** myelin sheath **slower than** axons **with** myelin sheath.
- So, axons **without** myelin sheath **associated with dull, throbbing pain**



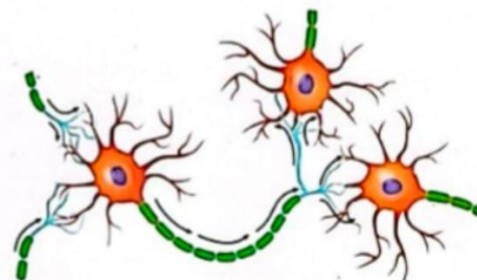
**Figure 7 Visualizing An Action Potential**

To cause the voluntary contraction of a muscle, a signal from the brain creates an action potential in a motor neuron. This action potential travels along the motor neuron, which leads to the release of a neurotransmitter that signals the fibers of the muscle to contract.



### The synapse:

A small gap exists between the axon of one neuron and the dendrite of another neuron.



**Figure 8** A single neuron can have multiple connections with other neurons.



## Lesson 2: organization of the nervous system

The nervous system consists of two major divisions:

### 1. The central nervous system (CNS)

(Consists of interneurons of the brain and spinal cord)

### 2. Peripheral nervous system (PNS)

(Consists of sensory neurons and motor neurons)

### 1) The central nervous system: (C.N.S)

**Function:**

- coordinate of all body's activities.
- relay messages and analyze response.

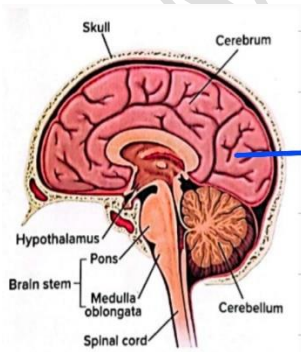
✚ **The brain:** called **control centre of the body** because the brain maintains homeostasis, and involved with almost all of the body's activities.

❖ **The cerebrum:** is the **largest** part of the brain, and is divided into two halves called **hemispheres.**

The 2 hemispheres are **connected by nerves.**

**Function of cerebrum:**

- Carries out **thought processes** involved with
- Learning
- Memory
- Language
- Speech
- Voluntary body movements
- Sensory perception



Folds and grooves on the surface of cerebrum increase its surface area and allows more complicated thought processes.



❖ **The cerebellum:** located at the back of the brain

#### Function of cerebellum:

- Controls balance, posture and coordination
- Responsible for the smooth and coordinated movement of skeletal muscles.
- Involved with motor skills, such as playing the piano or riding a bike.

❖ **The brain stem:** connects the brain and spinal cord



Medulla oblongata	Pons
<ul style="list-style-type: none"> <li>▪ Relays signals between the brain and the spinal cord.</li> <li>▪ It helps control breathing rate, heart rate, blood pressure rate.</li> <li>▪ responsible for the swallowing, gagging, vomiting, coughing, and sneezing.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Relays signals between the cerebrum and the cerebellum.</li> <li>▪ It helps control breathing rate.</li> </ul>

❖ **The hypothalamus:**

#### Function:

- Essential for maintaining homeostasis
- Regulates body temperature, thirst, appetite and water balance.
- Partially regulates: blood pressure, sleep, aggression fear, and sexual behaviour.

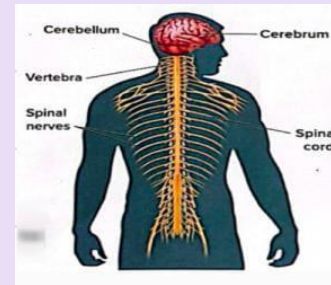
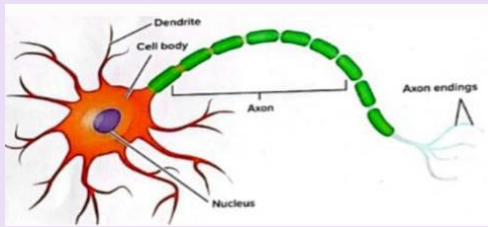
➤ Hypothalamus is about the size of **fingernail** and **performs more functions than any brain region.**

❖ **The spinal cord: (the second part of CNS)**

Spinal cord is a nerve column that **extends** from **the brain** to the **lower back**, it's protected by the **vertebrae**, **reflexes** are processed in the spinal cord.

## 2) The peripheral nervous system: (P.N.S)

Neurons	Nerves
<ul style="list-style-type: none"> <li>▪ Specialized cells that help you gather information about your environment, interpret the information, and react to it.</li> <li>▪ Neurons make up the nervous system.</li> <li>➤ Consist of: dendrite, cell body and axon.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Are bundle of axons</li> <li>▪ There are <b>12 cranial nerves</b> "lead to and from the brain"</li> <li>▪ <b>31 spinal nerves</b> "lead to and from the spinal cord"</li> </ul>



Peripheral nervous system includes sensory neurons and motor neurons.

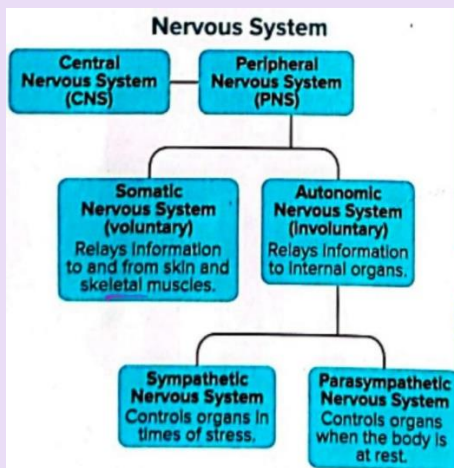
**Complete:**

- P.N.S includes ..... and ..... neurons but C.N.S includes .....

P.N.S classified as part of **somatic nervous system** or part of the **autonomic nervous system**.

**The somatic nervous system**

- Relays information to and from **skin** and **skeletal muscle**.
- Usually this is **voluntary**, but not reactions of the central nervous system are voluntary, some responses are **involuntary, result of a reflex**.



**Autonomic nervous system**

- Carries impulses **from** the **central nervous system** to the **heart** and other **internal organs**.
- The body responds **involuntarily**, not under conscious control.
- When you have a nightmare or find yourself in a **scary situation**, your body responds with what is known as a **fight or flight** response.
- When everything is **calm**, your body **rests and digests**.

There are two branches of the autonomic nervous system, and they act together.

1. **Sympathetic nervous system.**
2. **The parasympathetic nervous system.**

**Sympathetic**

- Most active in times of emergency or stress.
- When the heart rate and breathing rate increase.

**Parasympathetic**

- Most active when the body is relaxed, restore the body to a resting state after a stressful experience.

Structure	Sympathetic Stimulation	Parasympathetic Stimulation
Iris (eye muscle)	Pupil dilation	Pupil constriction
Heart	Heart rate and force increased	Heart rate and force decreased
Lung	Bronchial muscle relaxed	Bronchial muscle contracted
Small Intestine	Muscle contractions reduced	Digestion increased





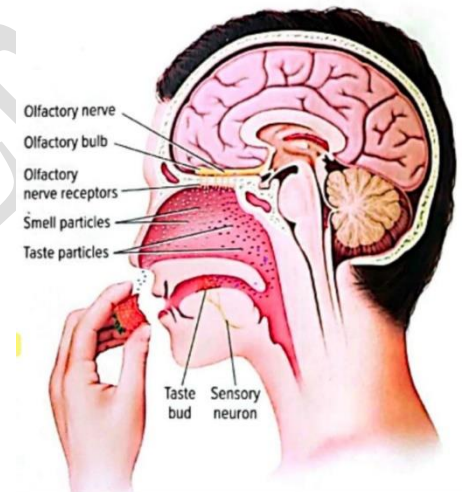
## Lesson 3: The senses

1. Taste and smell
2. Sight
3. Hearing and Balance
4. Touch

### ➤ Taste and smell:

the receptors associated with taste and smell function together, and signals from the receptors that work together to create a combined effect in the brain.

- Specialized receptors located high in the nose respond to chemicals in the air and send the information to the **olfactory bulb** in the brain.
- **Taste buds:** are areas of specialized chemical receptors on the tongue that detect the tastes of sweet, sour, salty ...



### ➤ Sight:

a) light first enters the eye through a **cornea**.

**Cornea:** transparent, yet durable layer of cells.

b) the cornea focuses the light through the **pupil**.

**pupil:** an opening in the eyes.

c) the size of the pupil is regulated by the **iris**.

**iris:** the coloured part of the eye.

d) Behind the iris is the **lens**.

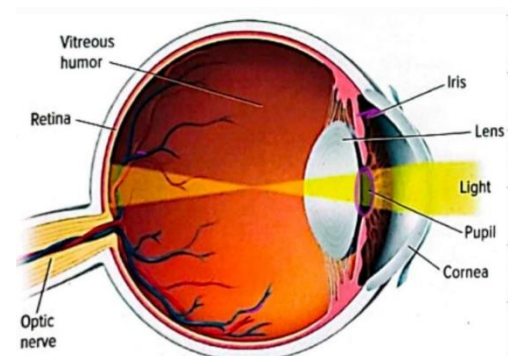
e) the lens inverts the image onto the retina through the **vitreous humour**.

**Vitreous humour:** colourless, gelatine like liquid between the lens and the retina.

f) the retina contains rods and cons.

**rods:** are light sensitive cells, excited by low levels of light.

**Cones:** function in bright light, and provide information about colour to the brain.





g) these receptors "rods and cones" send action potential to the brain via the neurons in the **optic nerve**.

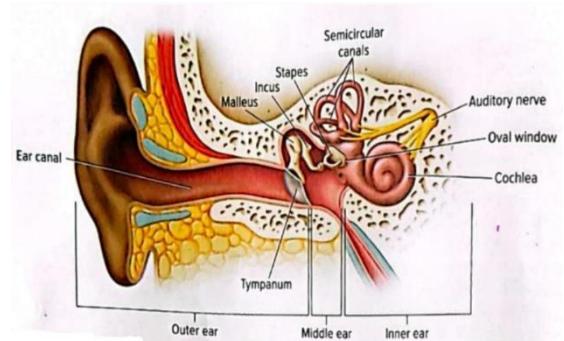
h) the brain then interprets the specific signals and forms a **visual image**.

### ➤ **Hearing and Balance:**

Hearing and balance are two major functions of the ear.

#### **Hearing:**

1. Vibrations called sound waves cause particles in the air to vibrate.
  2. sound waves enter the **auditory, or ear canal** and cause a membrane called **ear drum or tympanum** at the end of the ear canal to vibrate.
  3. these vibrations travel through **three bones in the middle ear**. (The malleus (hammer), the incus (anvil) and the stapes (stirrup))
  4. when the stapes vibrations, it causes the **oval window** to move back and forth.
- Oval window:** a membrane that separates the middle ear from the inner ear.
5. in the inner ear, a snail shape called **cochlea** is filled with **fluid** and lined with **tiny hair cells**.
  6. vibration causes **the fluid** inside the cochlea to move.
  7. the **tiny hair cells** transmit impulses in the auditory nerve in the brain.



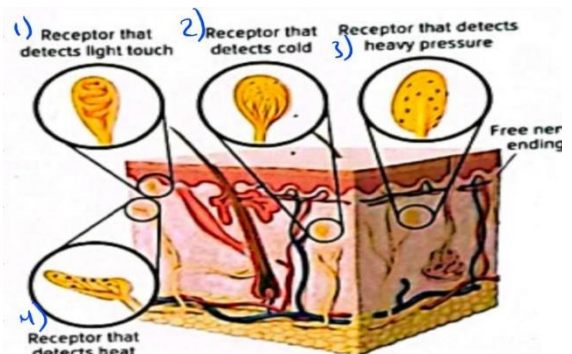
#### **Balance:**

Three **semi-circular canals** transmit information about body position and balance to the brain.

- The brain then is able to determine your position and whether your body is still or in motion.

### ➤ **Touch:**

Receptors found in the epidermis and dermis layers respond to temperature, pressure, and pain.










## Lesson 4: Effects of Drugs

### How do drugs work?

**Drug:** is substance, natural and artificial that alters the function of the body.

✚ **Drugs that affect the nervous system work in one or more of the following ways:**

- 1) A drug can cause an increase in the amount of neurotransmitter that is released into a synapse.
- 2) A drug can block a receptor site on a dendrite, preventing a neurotransmitter from binding.
- 3) A drug can prevent a neurotransmitter from leaving a synapse.
- 4) A drug can imitate a neurotransmitter.

Alcohol	Caffeine	Prescription Drugs	Over-the-Counter Drugs	Tobacco
				
beer, wine	coffee, tea, soda, chocolate	antibiotics, pain medications	aspirin, cold medications	cigarettes, cigars

Many drugs that affect the nervous system influence the level of a neurotransmitter called **dopamine**.

**Dopamine:** is a neurotransmitter found in the brain that is involved with the control of body movements, and involved with feelings of pleasure or reward.

### Classes of commonly Abused drugs:

Stimulants	Depressants
<ul style="list-style-type: none"> <li>▪ Drugs that increase alertness and physical activity are <b>stimulants</b>.</li> <li>1) <b>Nicotine:</b> in a cigarette increase the amount of dopamine.               <ul style="list-style-type: none"> <li>- Constricts blood vessels.</li> <li>- Raising blood pressure.</li> <li>- Causing the heart to work harder than normal.</li> <li>- Cause lung cancer.</li> </ul> </li> <li>2) <b>Caffeine:</b> found in coffee, Tea, Chocolate...               <ul style="list-style-type: none"> <li>- Caffeine binding to <b>adenosine</b> receptors in the brain.</li> <li>- Adenosine slows down neural activity, causing <b>drowsiness</b>.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Drugs that slow down the central nervous system are <b>depressants</b>.</li> <li>▪ These drugs can lower blood pressure, interrupt breathing and slow the heart rate.</li> <li>▪ Relieve anxiety and can cause effect of sedation.</li> <li>1) <b>Alcohol:</b> produces by the fermentation of grains and fruits.               <ul style="list-style-type: none"> <li>- Alcohol results in feeling of relaxation and sluggishness.</li> <li>- <b>Short-term</b> alcohol use impairs judgment, coordination and reaction time.</li> </ul> </li> </ul>



- When caffeine binds to adenosine receptors, it has opposite effect that makes users feels awake and alert.
- Caffeine increases adrenaline levels in the body temporarily.
- Long-term effects of alcohol include a reduction brain mass, liver damage, stomach and intestinal ulcer, and high blood pressure.
- 2) Inhalants: are chemical fumes that have influence on the nervous system.
- Short-term effect of intoxication, nausea and vomiting.
- Long-term cause memory loss, hearing loss, vision problems and brain damage.

### Illegal drugs:

**Amphetamine and cocaine:** both increase dopamine levels which result in a feeling of pleasure and wellbeing.

**Cocaine:** abuse results in disturbance in heart rhythm, heart attacks, chest pain, respiratory failure.

**Marijuana:** the active chemicals in marijuana are THC.

**Short-term:** effects of marijuana use include problems with memory and learning, increase heart rate, anxiety, panic attacks.

**Long-term:** cause lung cancer.

### Tolerance and Addiction:

**Tolerance:** when a person needs more and more of the same drug to get the same effect.

**Addiction:** the psychological and physiological dependence on a drug.

### Treatment

medic supervision is necessary when people try to quit the drugs.



## Ch.5 Assessment

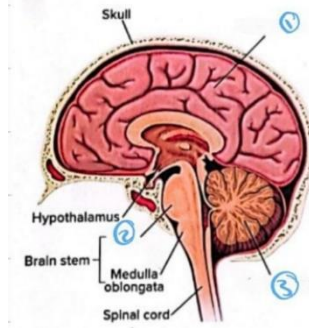
### Answer the questions:

1. The building block of nervous system is ( )
2. Which part of the neuron receive signals from other neurons? ( )
3. Which kind of neurons send impulses from receptors to the brain spinal cord? ( )
4. Nerve pathway that consists of sensory neuron, an interneurons, and motor neuron is ( )
5. An electrical charge travelling the length of a neuron ( )
6. A neuron at rest: there are more ( ) ions outside the cell and more ( ) ions inside the cells.
7. Another name for a nerve impulse is an ( )
8. The minimum stimulus to cause an action potential to be produced is a ( )
9. A small gap exists between the axon of one neuron and the dendrite of another neuron is ( )
10. Which part of the brain responsible for thought processes? ( )
11. Which part of the brain responsible for smooth and coordinated movement of skeletal muscles? ( )
12. Medulla oblongata relays signals between ( ) and the ( )
13. Pons relays signals between ( ) and ( )
14. ( ) is essential for maintaining homeostasis.
15. ( ) extend from the brain to the lower back and protected by the vertebrae.
16. ( ) are bundle of axons.
17. C.N.S include ( ) but P.N.S include ( ) and ( ) neurons.
18. ( ) carries impulses from the central nervous system to the heart and other internal organs.
19. ( ) is active when the body is relaxed, but ( ) is active in times of emergency or stress.

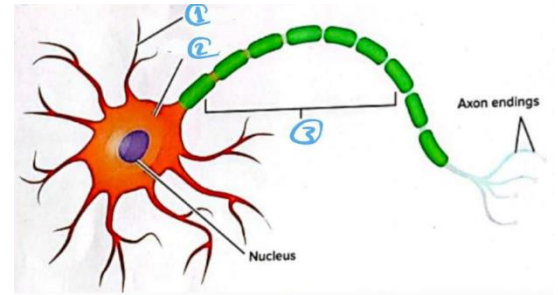
20. To which the numbers 1.2.3 refer to?

**Figure1:**

- 1) .....
- 2) .....
- 3) .....



**Figure 1**



**Figure 2**

**Figure2:**

- 1) .....
- 2) .....
- 3) .....

- 21.( ) are specialized chemical receptors on the tongue that detect different tastes.
- 22.( ) Is coloured part of the eyes.
- 23.The lens inverts the image onto the retina through the ( )
- 24.( ) are light sensitive cells and ( ) are function in bright light.
- 25.Sound waves enter the ( ) and cause a membrane called ( ) at the end of the ear canal to vibrate.
- 26. Middle ear consists of ( ), ( ), ( ).
- 27.( ) a membrane that separates the middle ear from the inner ear.
- 28.( ) is a snail shape filled with fluid and lined with tiny hair cells.
- 29.( ) is a neurotransmitter found in the brain that is involved with feelings of pleasure or reward.
- 30.( ) drugs that increase alertness and physical activity.
- 31.( ) is a stimulants that bind to adenosine receptors in the brain.
- 32.( ) are chemical fumes that have influence on the nervous system.
- 33.( ) when a person needs more and more of the same drug to get the same effect.



## Answers

1. Neuron
2. Dendrite
3. Sensory neuron
4. Reflex arc
5. Nerve impulse
6. Na – K
7. An action potential
8. Threshold
9. Synapse
10. Cerebrum
11. Cerebellum
12. Brain and spinal cord
13. Cerebrum and cerebellum
14. Hypothalamus
15. Spinal cord
16. Nerves
17. Interneuron – sensory neuron and motor neuron
18. Autonomic
19. Parasympathetic – sympathetic
20. **Figure 1:**
  - 1) cerebrum
  - 2) Pons
  - 3) Cerebellum
21. **Figure 2:**
  - 1) Dendrite
  - 2) Cell body
  - 3) Axon
21. Taste buds
22. iris
23. Vitreous humor
24. rods - cons
25. Auditory or ear canal – eardrum or tympanum
26. The malleus, the incus, the stapes.
27. Oval window
28. Cochlea
29. Dopamine
30. Stimulants
31. Caffeine
32. Tolerance