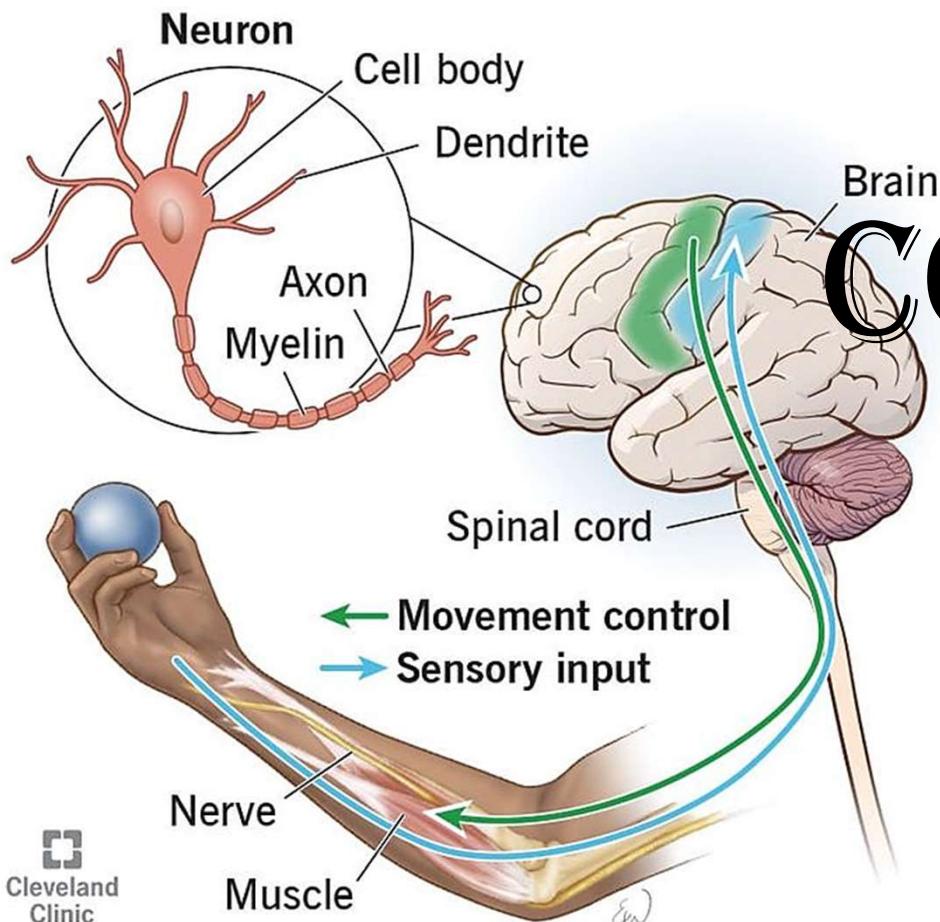




Somatic Nervous System



NERVOUS COORDINATION

BY ELLY KENEDDY NALITSO

0708838163 | 0770031329

LEARNING OUTCOMES



The learner should be able to:

- a) understand how the nervous system (brain, spinal cord, and nerves) extends to all parts of the body and has sensory and motor functions (u)
- b) identify the parts of the brain (cerebrum, cerebellum, medulla oblongata, pituitary gland and hypothalamus) and describe the role of the parts (k, u)
- c) understand the concept of reflex action, identify the five components and explain their functions (k, u)
- d) differentiate between voluntary and involuntary responses (u)
- e) distinguish between substance/drug use and abuse (k, s)
- f) know the common substances and drugs abused in Uganda and understand the physiological, social and economic effects of substance and drug abuse (k, u)
- g) understand how to prevent, control and avoid involvement in substance and drug abuse (u, v, gs)

INTRODUCTION.



This is comprised of the nervous system which is a system of **nerve cells** and **sensory organs** that carry out co-ordination by **transfer of impulses**.

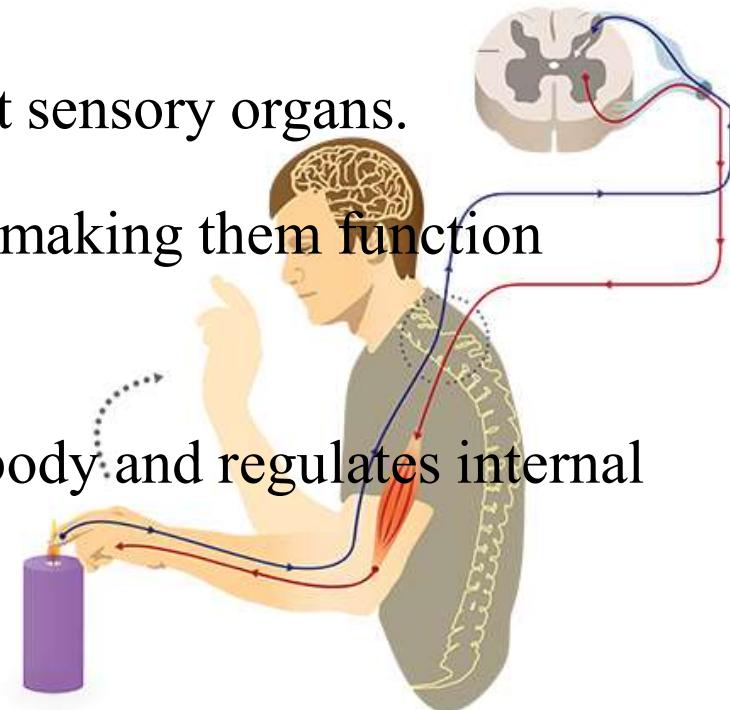
The nervous system consists of;

- **Receptors**: These are organs detect stimuli to which the animals respond. E.g. sensory endings in the skin, nose, tongue, eyes and ears
- **Stimuli** create impulses which are relayed to the coordinating system.
- **Impulses**: these are electrical transmissions or chemical stimuli sent from the receptors to the coordinating center. The coordinating center interprets the impulses before a response is made.
- **Effectors**: These are organs that respond to the stimuli and carry out the response.



FUNCTIONS OF THE NERVOUS SYSTEM

- ❑ It receives impulses from all sensory organs of the body.
- ❑ It stores information.
- ❑ It correlates various stimuli from different sensory organs.
- ❑ It sends messages to all parts of the body making them function accordingly.
- ❑ It coordinates metabolic reactions in the body and regulates internal environment



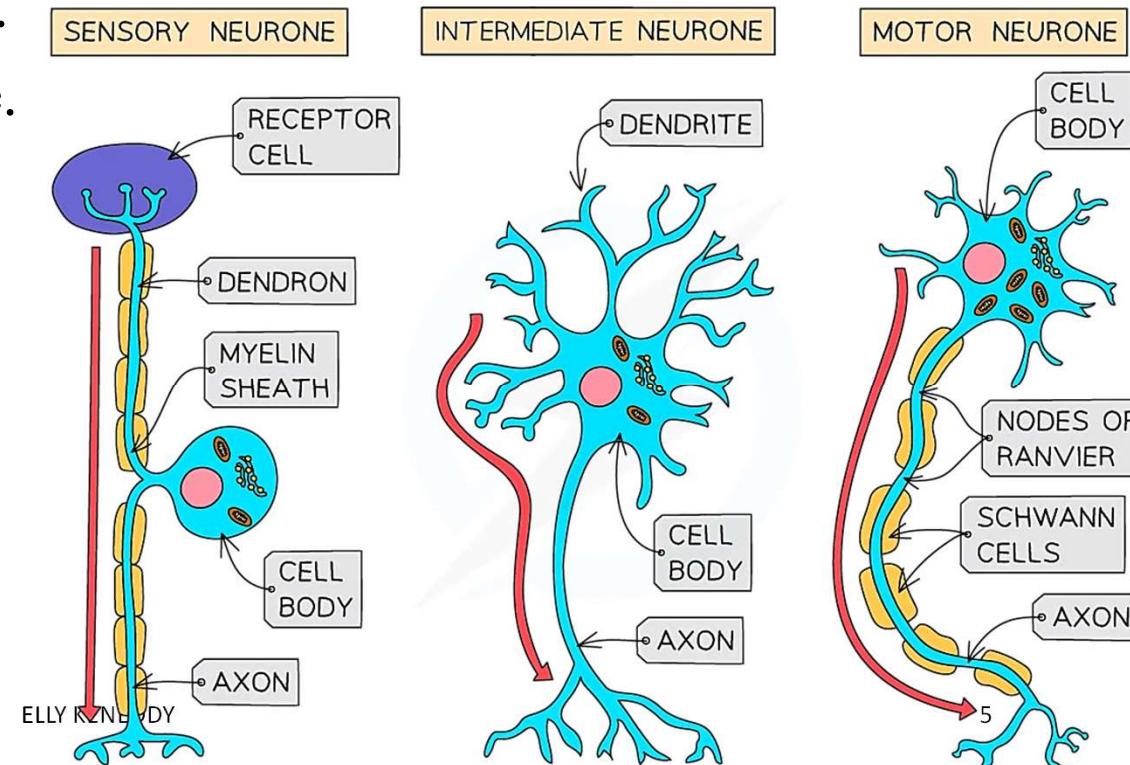


NEURONE

- A neurone is made up of a small mass of cytoplasm, a nucleus in a structure called the cell body, branching cytoplasmic filaments called dendrites and a single long fiber called axon.

There are three types of neurones i.e.

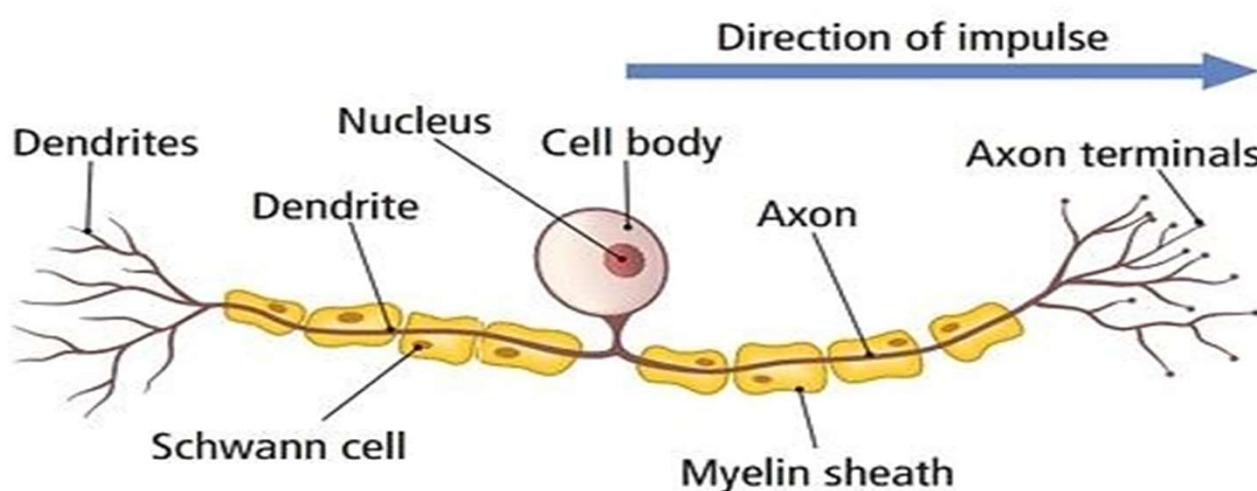
- ❖ Sensory neurone
- ❖ Motor neurone
- ❖ Relay neurone



SENSORY NEURONE



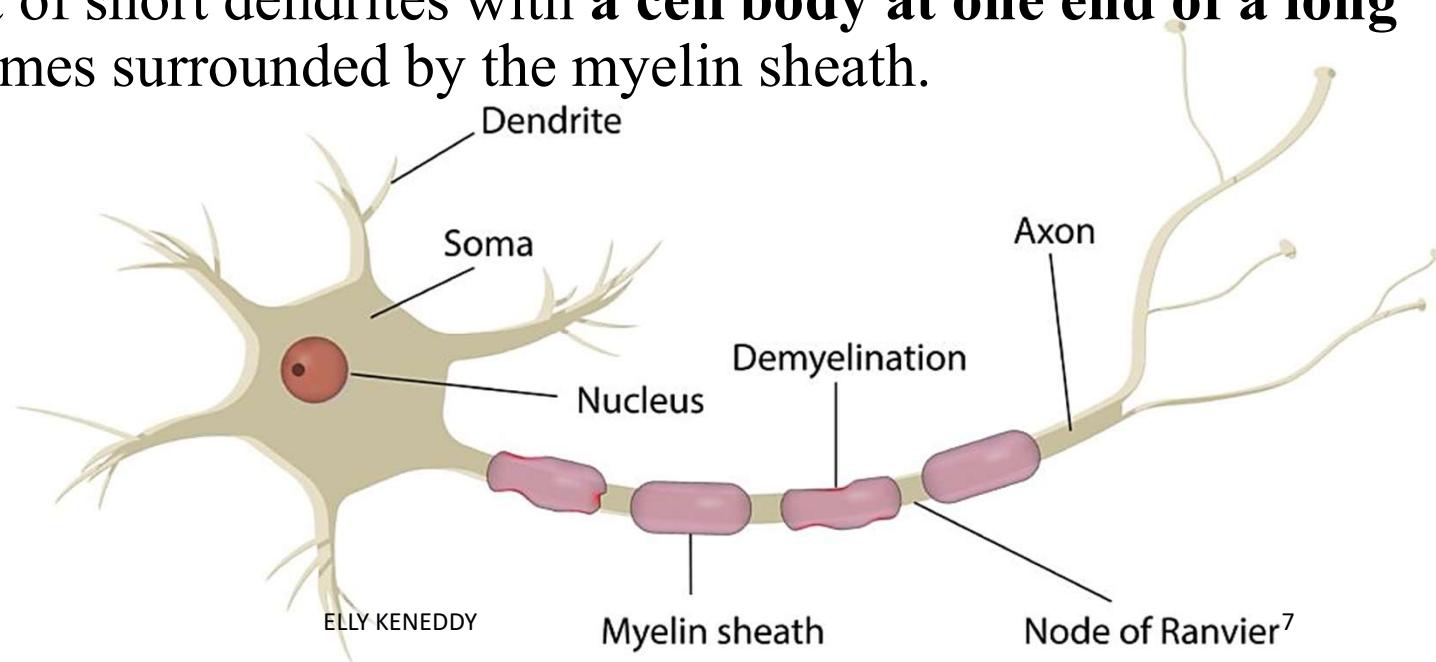
- Sensory neurones are cells that **transmit impulses from the receptor cells to the central nervous system**. It has a single elongated dendrite called a dendron.
- It has a **cell body in the middle of a short axon and dendron**. It is sometimes surrounded with myelin sheath.



MOTOR NEURONE



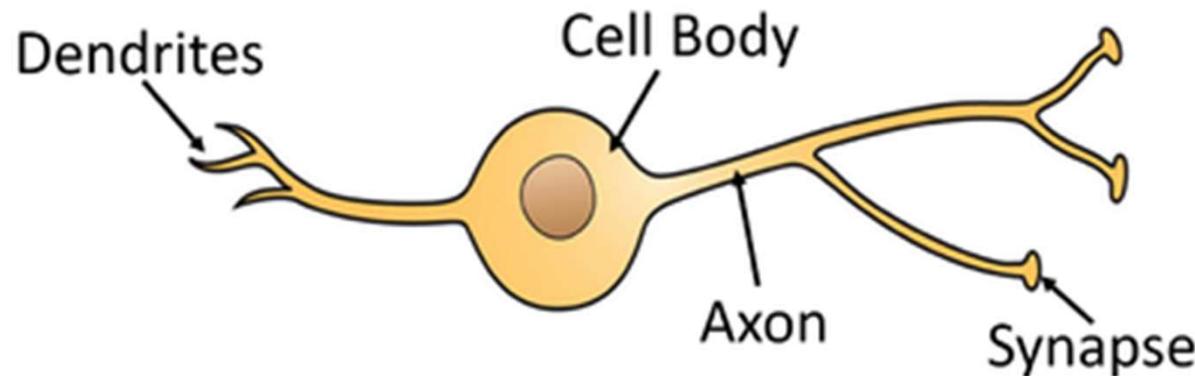
- This is a neurone that *transmits impulses from the central nervous system to the effector organs* such as muscles and glands, where a response is made.
- **The muscles respond by contracting** while **glands respond by secreting substances**.
- Motor neurons consist of short dendrites with **a cell body at one end of a long axon**. It is also sometimes surrounded by the myelin sheath.



RELAY NEURONE

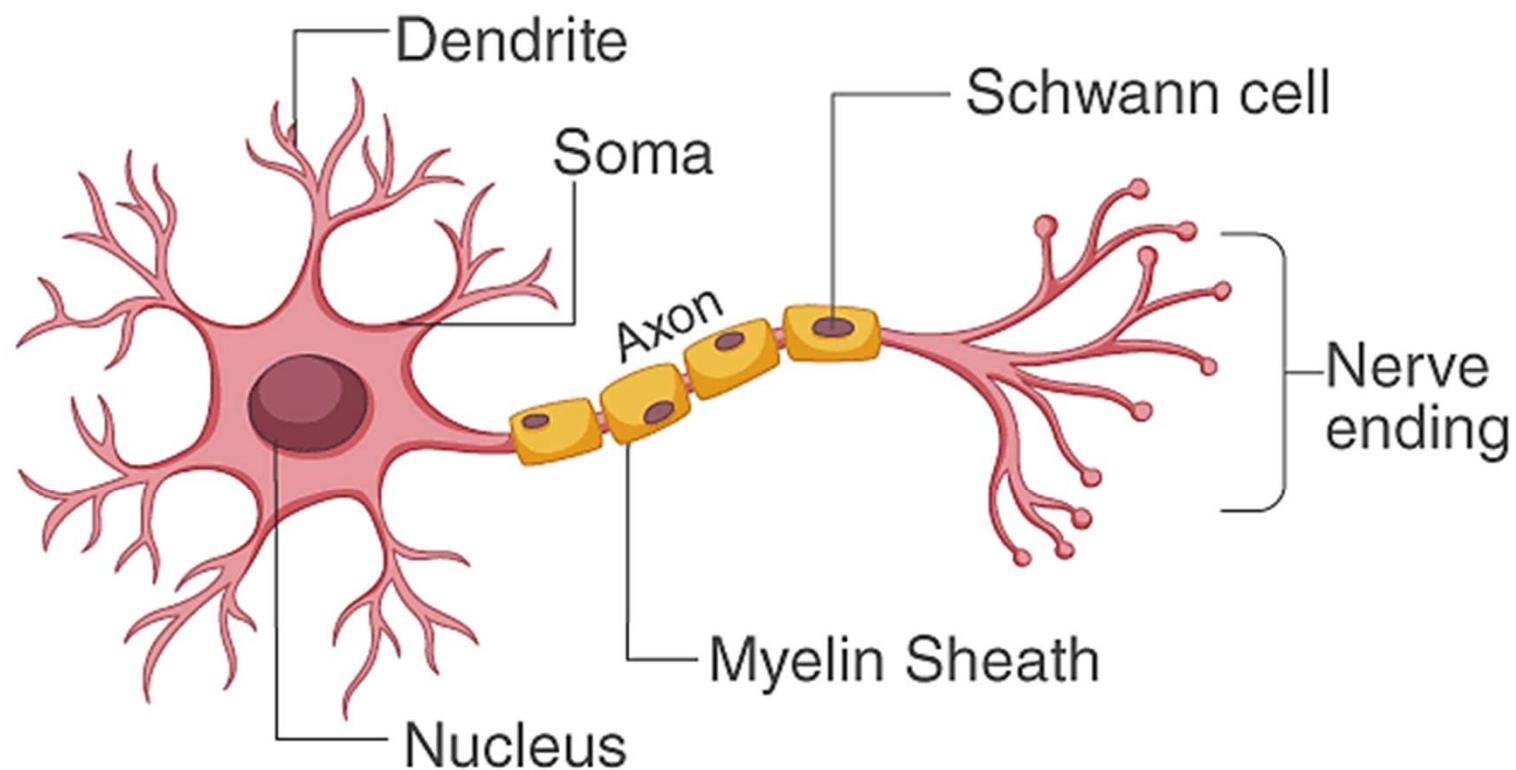


- This is a *neuron located in the central nervous system* and *transmits impulses from the sensory neurone to the motor neurone*. The axon extends towards the motor neurone.
- It is also referred to as an **intermediate neurone**. A relay neurone is either unipolar, bipolar or multipolar.
- Its **cell body is in the middle** of the fiber and have **no myelin sheath**.





STRUCTURE OF NEURON



FUNCTIONS OF THE PARTS OF A NEURONE



- **Cell body:** This consists of a nucleus surrounded by a mass of cytoplasm. The *nucleus controls all activities of the neuron*.
- **Axon:** *Transmits impulses over long distances in the body.* Each axon is filled with cytoplasm called axoplasm.
- **Myelin sheath:** This is a fatty material that covers the axon. The myelin sheath is secreted by cells called Schwann cells. The myelin sheath *insulates the axon and speeds up the transmission of impulses.*
- **Dendrites:** These are hair-like structures surrounding the cell body. *They conduct incoming signals.*
- **Node of Ranvier:** This is the space on the axon between two adjacent myelin sheaths. *It speeds up nervous transmission.*
- **Dendron:** It is a branch through which impulses are transmitted to the body.

COMPARISON.



Motor neuron

- Has a long axon
- It has a cell body at the terminal end of the axon
- It has a short dendron
- It carries impulses from the central nervous system to the effectors
- It has several dendrons
- Terminal dendrites connect with effectors

Sensory neuron

- Has a short axon
- Has a cell body located on the axon branch.
- It has a long dendron
- It carries impulses from the receptors to the central nervous system.
- It has one dendron
- Terminal dendrites connect to interneurons.

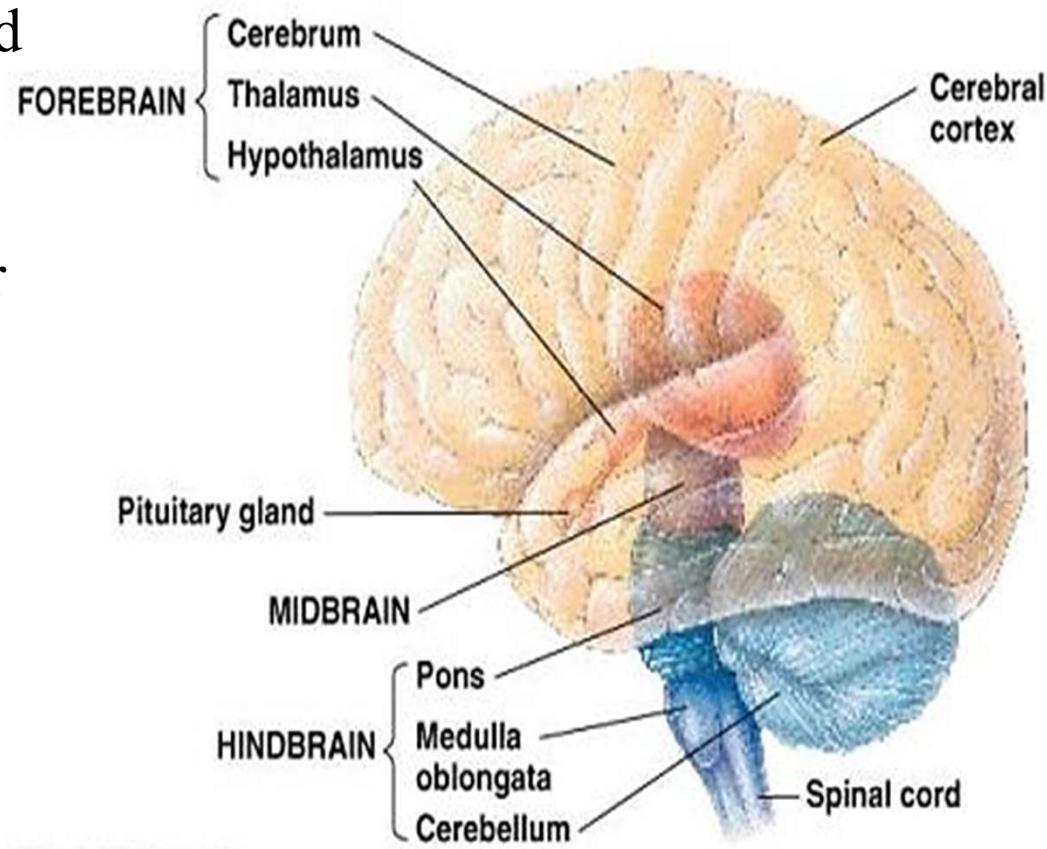
THE BRAIN



The brain is covered and protected externally by the **skull** (cranium) and internally by membranes called **meninges**.

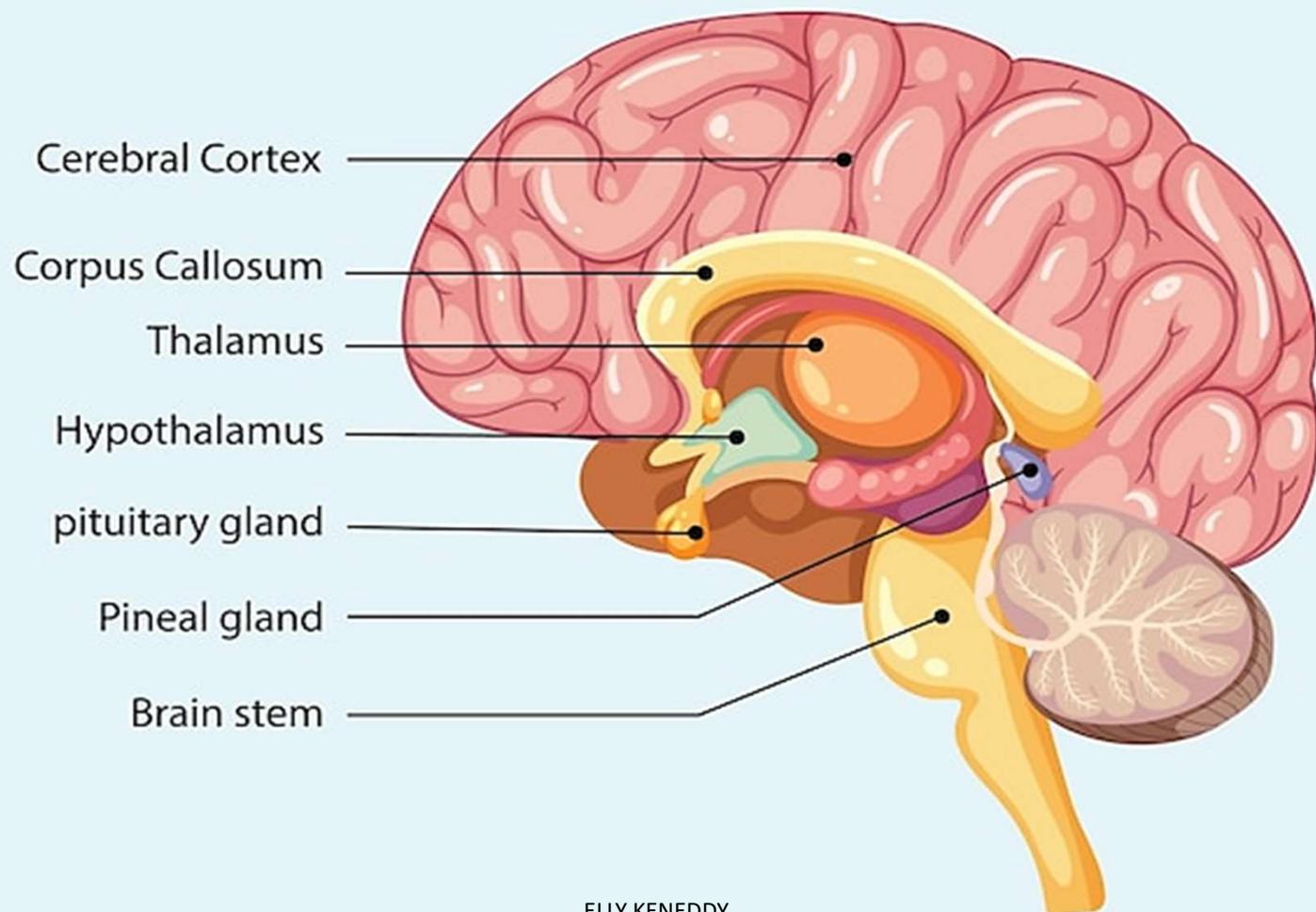
The brain is divided into three major regions, that is;

- Fore brain
- Mid brain
- Hind brain





PINEAL GLAND



THE FORE BRAIN



It consists of:

The cerebrum (cerebral hemisphere)

- This is the largest part of the brain. It is made up of **2** hemispheres i.e. the **left** and the **right** cerebral hemispheres.
 - The right hemisphere *controls the activities of the left side of the body* while the left hemisphere *controls the activities of the right side of the body*. The 2 hemispheres are joined by a fiber known as **corpus callosum**.
- It controls all voluntary activities
- It is a center of memory and reasoning.
- It receives impulses from the sense organ of smell, touch, sight, taste and sound.

The olfactory lobes

- These are paired lobes **located ventrally at the base of the cerebrum**.
- They are small in size. They receive impulses from the olfactory nerves bringing **about the sense of smell**.



THE MID BRAIN

- It consists of:

Thalamus

- It *integrates sensory impulses from the eyes, skin and ear* and sends them to the *cerebral cortex of the cerebrum*.
- It also *directs impulses from all parts of the body to particular areas of the brain*.

Hypothalamus

- It is a centre of many activities. It is below the thalamus.
- It *controls involuntary activities* e.g. water and salt balance (osmoregulation)
Controls body temperature, CO₂, levels in blood, appetite, sleep, hunger, wakefulness, sex drive and produces hormones e.g. oxytocin and ADH which are stored in the pituitary gland.

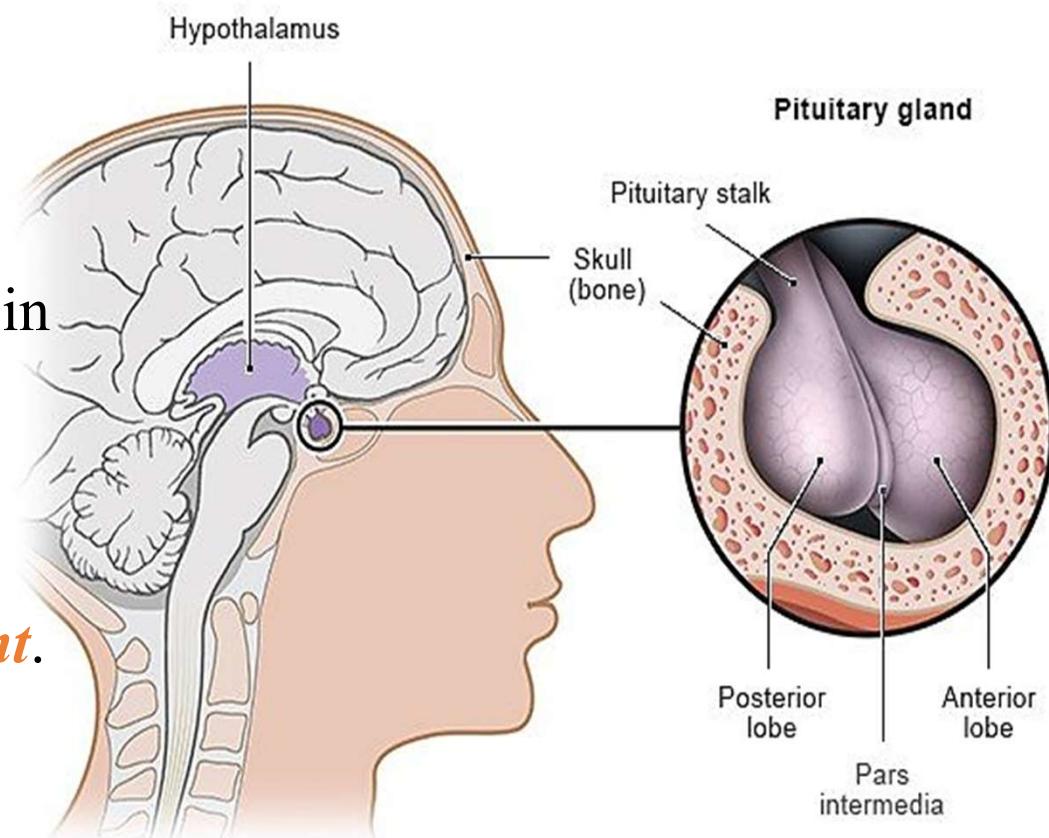


Pituitary gland

- It *secretes a number of hormones* like the thyroid stimulating hormone, FSH, LH, ADH, etc. which control various activities.
- It also controls other endocrine glands in the body thus called the **master gland**.

Optic lobes

- These are paired lobes.
- Their main function is to *interpret sight*.





HIND BRAIN

It is made up of:

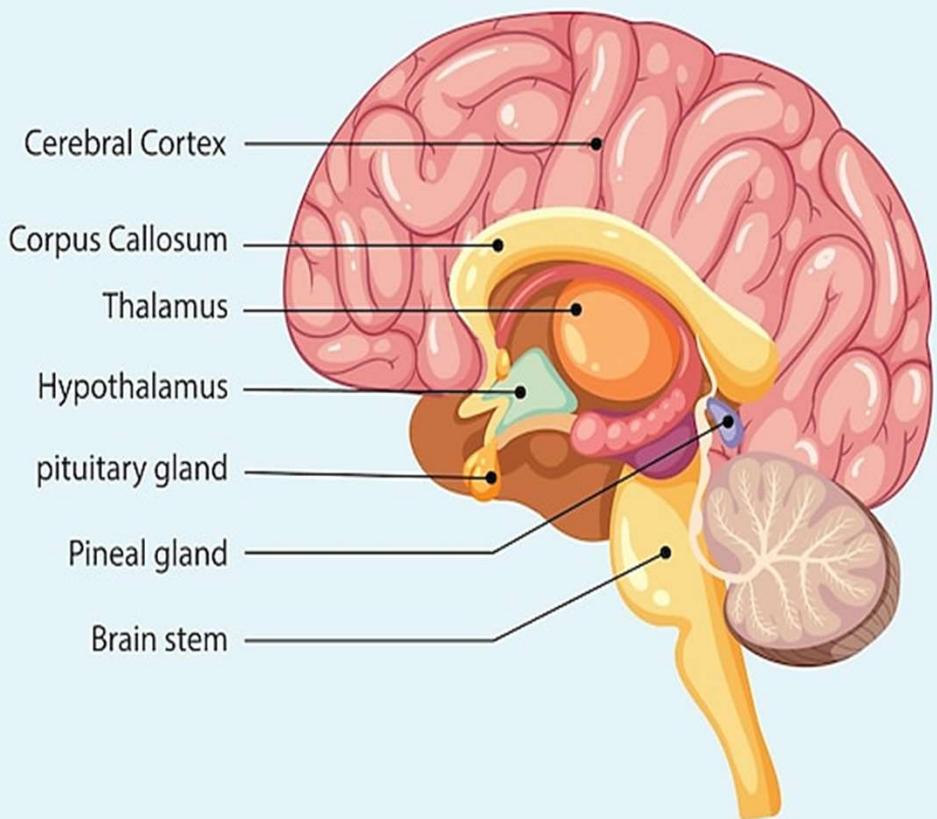
Cerebellum

- This is concerned with *maintenance of balance, locomotion* and *posture*.
- It receives impulses from the skeletal muscles.

Medulla oblongata

- This *controls involuntary actions* like *yawning, vomiting, blinking* of the eye, etc.
- *Any injury to this region leads to instant death.*

PINEAL GLAND



FUNCTIONS OF THE BRAIN



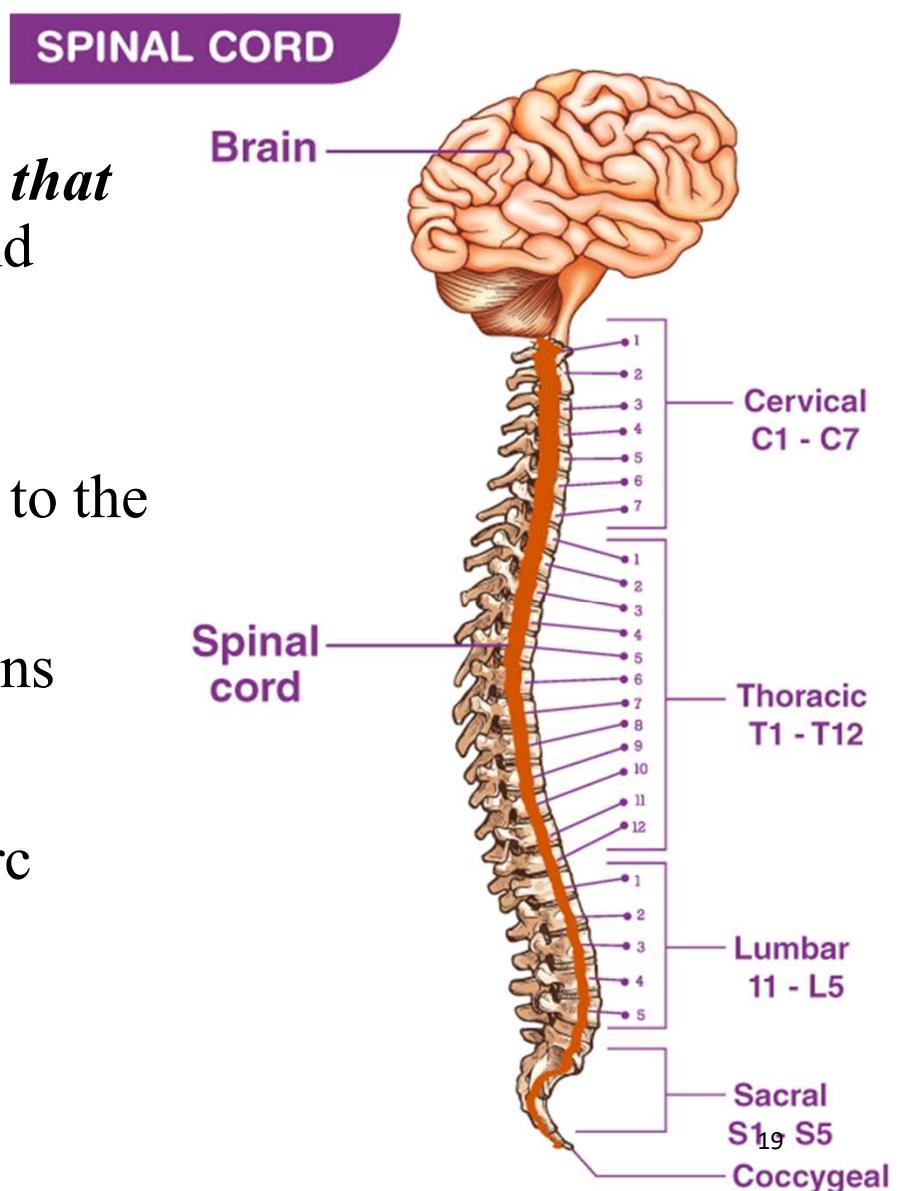
- It receives impulses from all receptors and sends back impulses to the effectors.
- It integrates and coordinates all activities in the body such that the body works efficiently.
- It stores information.
- It is involved in cranial reflex actions but it does not initiate them.

THE SPINAL CORD

- This is part of *the central nervous system that runs from the brain to the tail* through and covered by the vertebral column.

Functions of the spinal cord

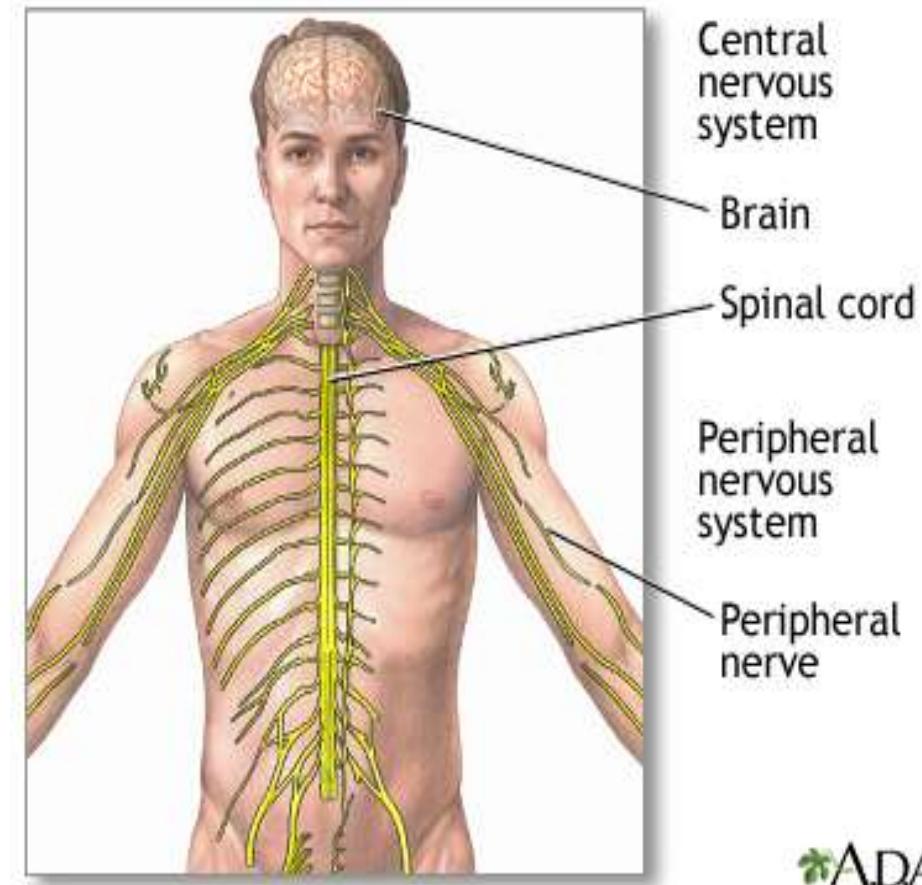
- It connects the peripheral nervous system to the brain.
- It is a center for simple spinal reflex actions
- Receives impulses from receptors
- Interprets messages especially in reflex arc
- Sends impulses to the receptors.



THE PERIPHERAL NERVOUS SYSTEM



- It is made up of neurones that link the brain and spinal cord to muscles and organs such as the eyes and ears.
- It is divided into **autonomic** nervous system and **somatic** nervous system.
- The **autonomic** nervous system is *responsible for the involuntary control of internal organs, blood vessels, smooth muscles and cardiac muscles.*
- The **somatic** nervous system is *responsible for the voluntary control of skin, bones, joints and skeletal muscles.*



VOLUNTARY AND INVOLUNTARY ACTIONS



- The nervous system *controls several actions in the body*. Such actions may be **voluntary** or **involuntary**.
- A voluntary action is *one initiated consciously under the direct control of the brain* i.e. they are actions one at will e.g. dancing, laughing, stealing, etc.
- These actions are performed consciously by an animal.
- In such actions **the animal chooses to do** or **not to do** something.
- Involuntary actions are the **ones that occur without conscious thoughts** e.g. breathing, etc.

THE REFLEX ACTION



- This is *a rapid automatic response of an organism, which is not initiated by the brain*. Reflex actions **take place without the awareness of the individual**.
- A reflex action occurs as a result of impulses travelling along neurons in a path called a **reflex arc**.

Examples of reflex actions

- ✓ Blinking when a foreign body falls on the eye
- ✓ Withdraw of the arm when someone accidentally touches a hot body.
- ✓ Sneezing
- ✓ Knee jerk i.e. a relaxed leg gives a forward kick when tapped slightly below the patella.
- ✓ Withdraw of the foot from a sharp object.

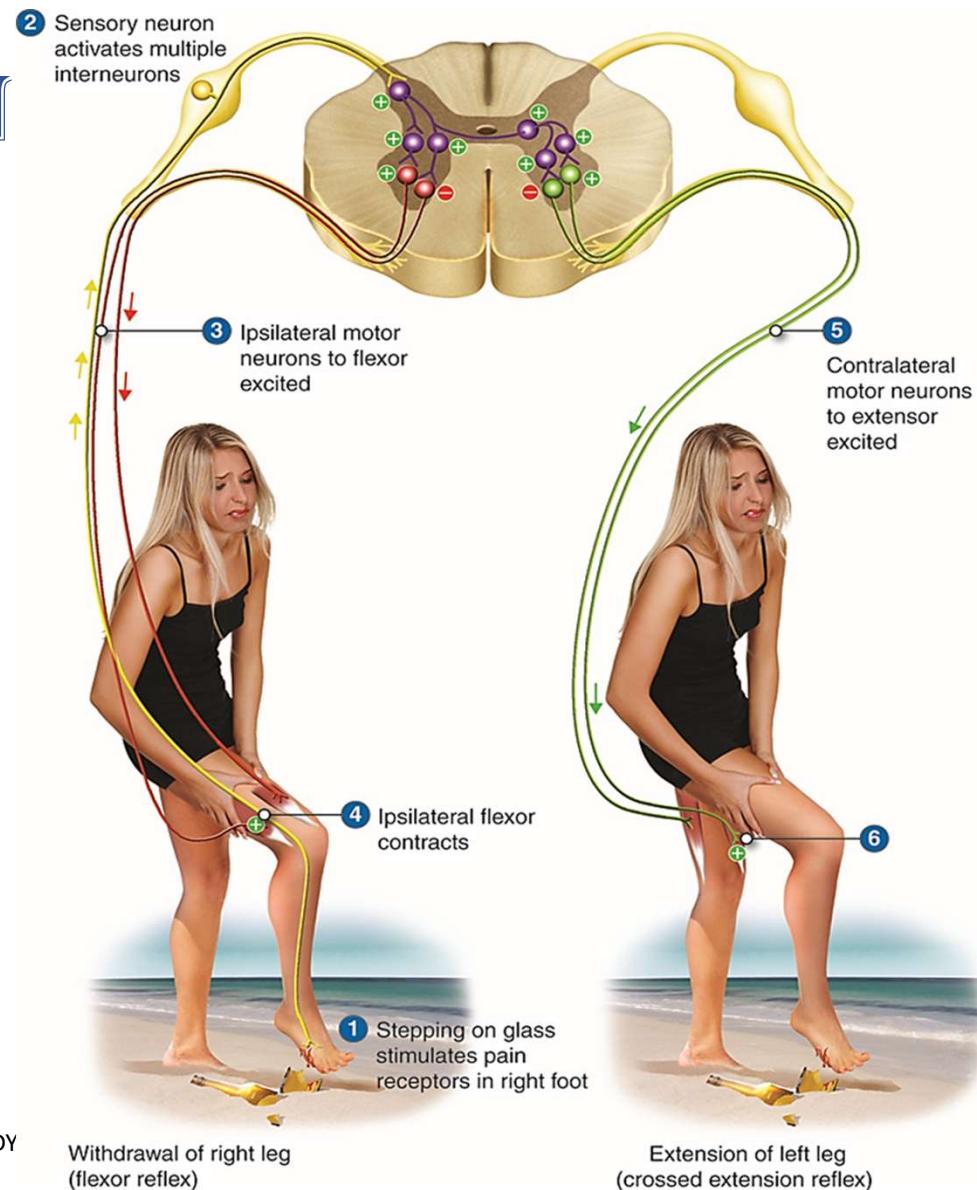
CHARACTERISTICS OF A REFLEX ACTION



- ❖ It occurs rapidly i.e. The action occurs very fast.
- ❖ It is inborn (innate) but not learnt.
- ❖ It is coordinated by either the brain or spinal cord but usually initiated by spinal cord.
- ❖ It occurs without one's will.
- ❖ It is a repeated response to a similar stimulus.

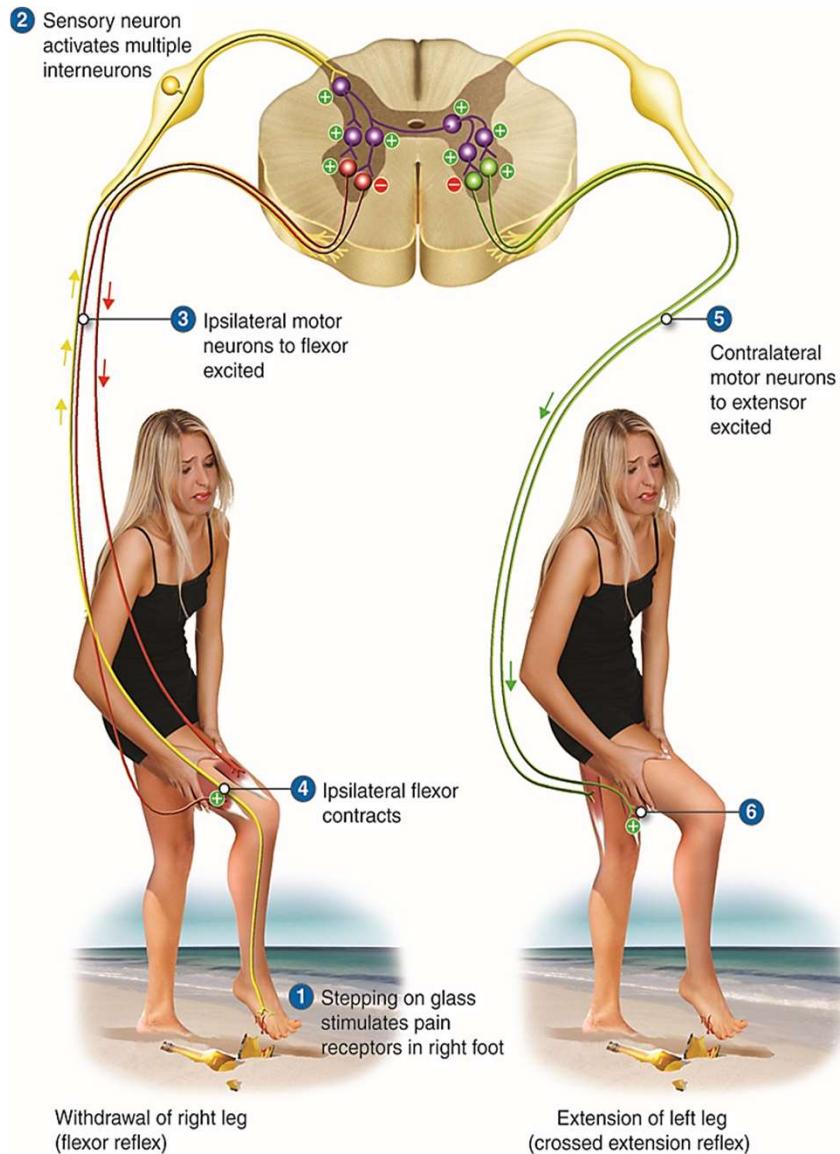
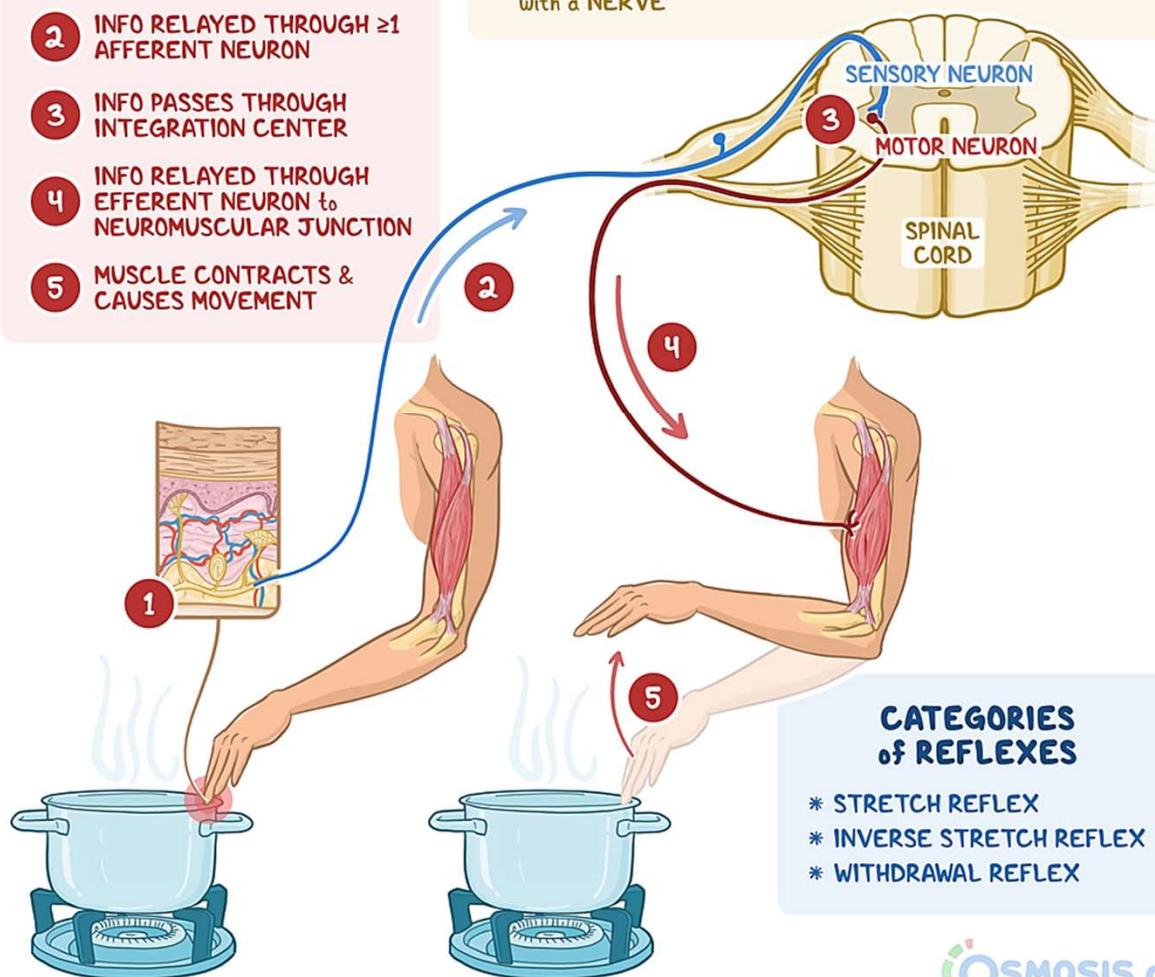
SIMPLE REFLEX ACTION

- This is an involuntary quick response to a stimulus without conscious thought.
- It is also known as **an instinctive reflex** which ***does not have to be learnt***.
- They include : sneezing, coughing, salivating, the knee jerk and removal of a hand from a hot flame.
- **For instance**, when one steps on a sharp object, the knee jerk enables the removal of the foot thus avoiding further injury.



SOMATIC REFLEX ARC

- 1 SENSORY INPUT FROM the ENVIRONMENT
- 2 INFO RELAYED THROUGH ≥1 AFFERENT NEURON
- 3 INFO PASSES THROUGH INTEGRATION CENTER
- 4 INFO RELAYED THROUGH EFFERENT NEURON to NEUROMUSCULAR JUNCTION
- 5 MUSCLE CONTRACTS & CAUSES MOVEMENT

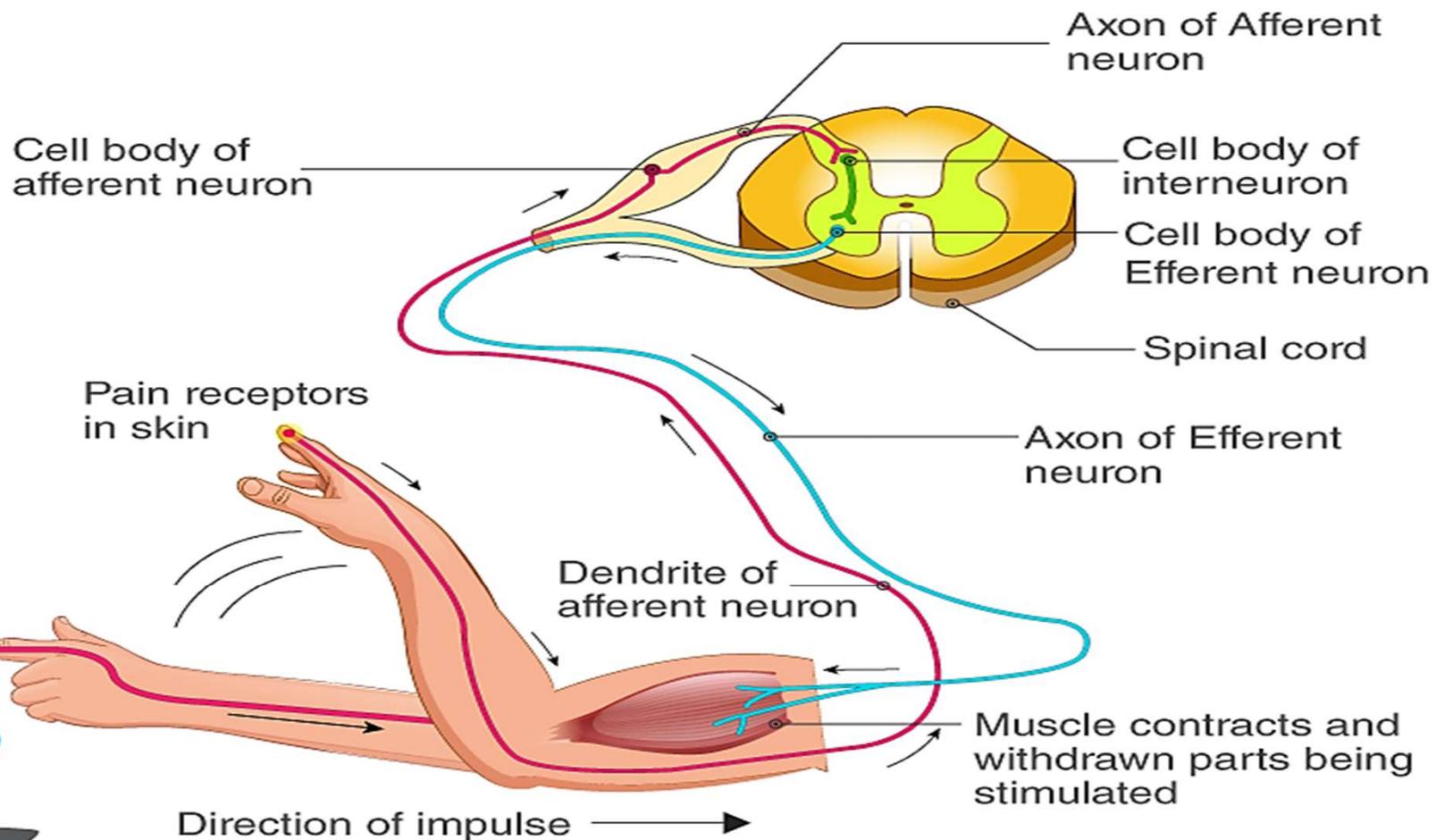


REFLEX ARC.



- The ***stimulus is perceived by the receptors***, which ***change it into nervous impulse*** (transduction).
- The impulse travels ***along the sensory neurone to the spinal cord***.
- In the grey matter of the spinal cord, the **sensory neurone makes synaptic connections to the relay neurone** and **impulses move from the sensory neurone to the relay neurone across synapses**.
- The **relay neurone in turn transmits the impulse to the motor neurone** across a synapse.
- The ***impulse then moves from the spinal cord to the effector muscles through the motor neurone***.
- The impulse ***causes the muscles to contract or relax depending*** on the stimulus.

REFLEX ACTION



Hot Object



IMPORTANCE OF SIMPLE REFLEX ACTIONS TO ANIMALS

- ❖ They help animals to avoid danger.
- ❖ They control activities in the body, which we do not have conscious control over.

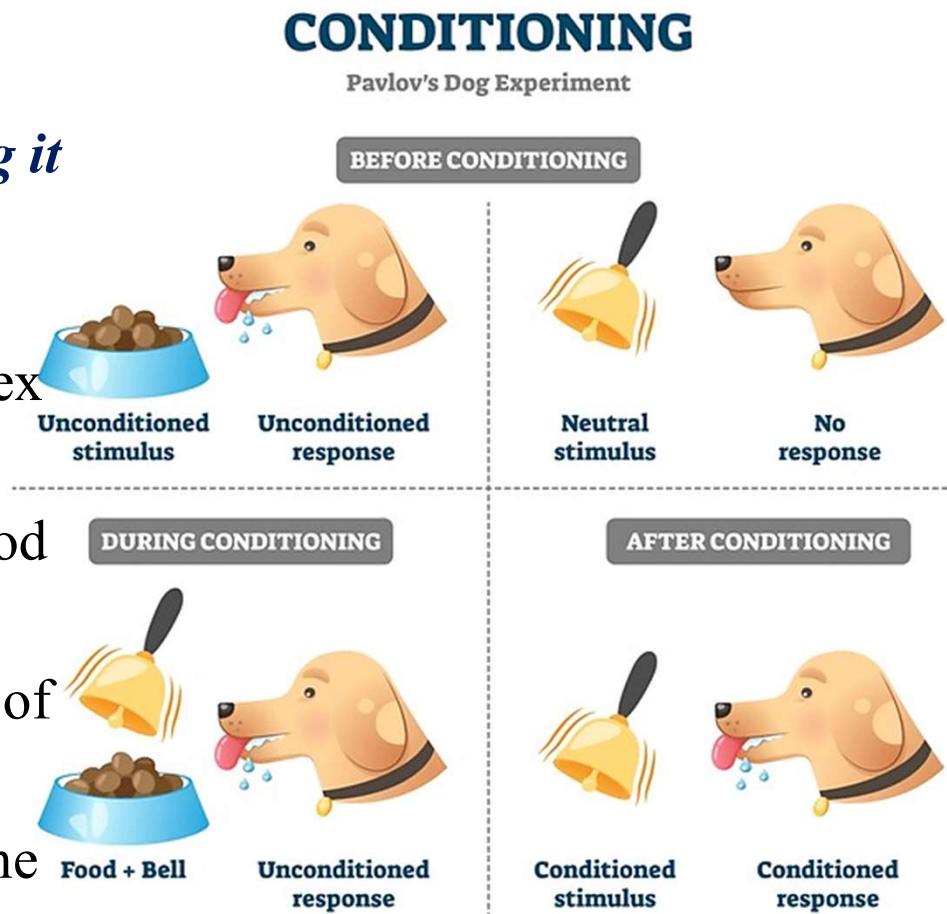
CONDITIONED REFLEX



- This is the type of reflex which involves ***learning organisms learn to respond to strange*** (meaningless) ***stimulus*** by ***associating it with another meaningful stimulus***.
- A scientist called **Ivan Pavlov** performed an experiment to demonstrate a conditioned reflex in a dog.

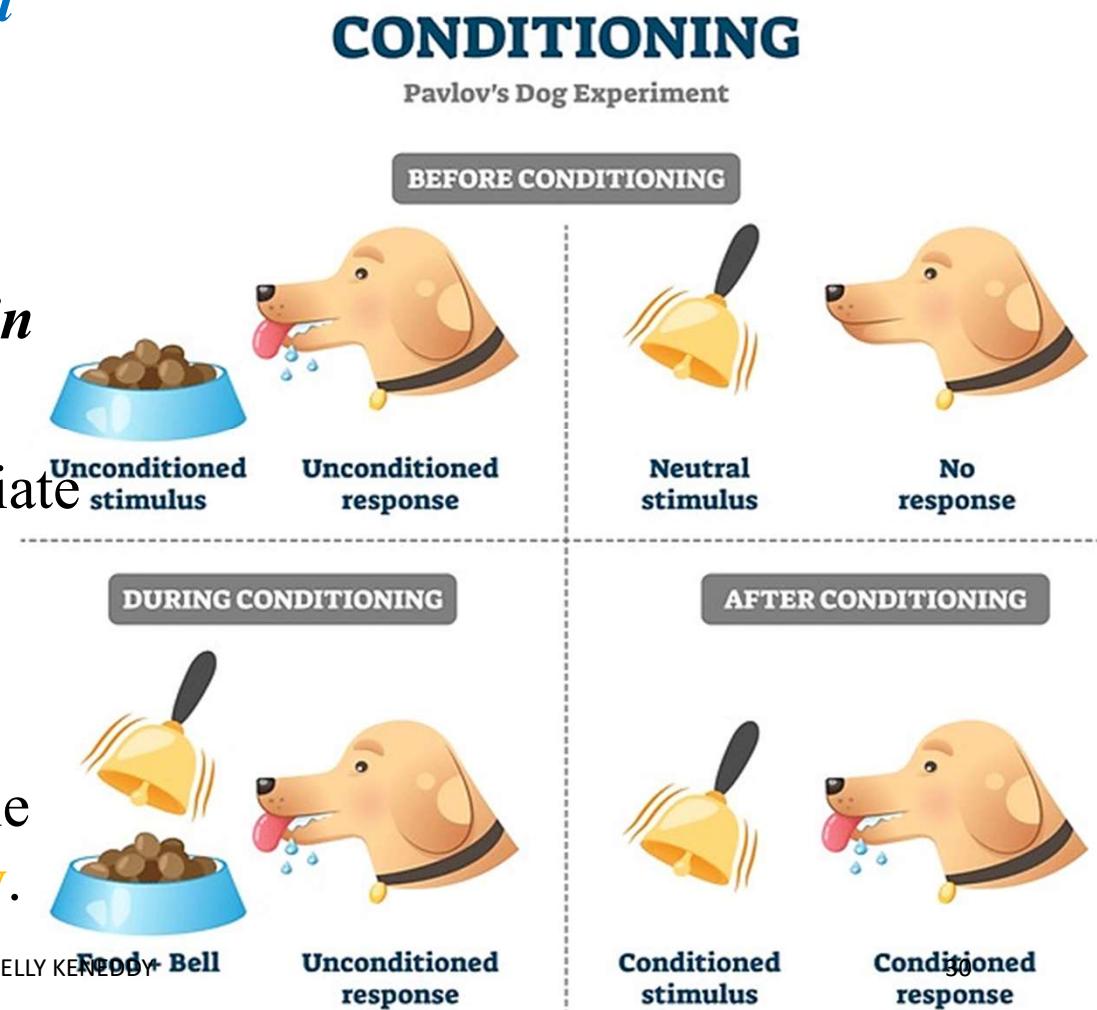
- In the experiment, he used to give the dog food at a particular time.
- The dog would salivate either after the smell of food or taste of food (normal response).
- He then started ringing a bell before giving the dog food.

ELLY KENEDDY
4/14/2025





- He did this several times. *After several times, the dog salivated when a bell was rung even without food being presented* (conditioned response).
- For a conditioned reflex to be established, thus the dog in *the brain is necessary*
- Pavlov's experiment learnt to associate the sound of the bell with food.
- When Pavlov rang the bell without food for a long time, **the dog later stopped salivating** implying that the conditioned reflexes are **temporary**.



OTHER EXAMPLES CAN INCLUDE

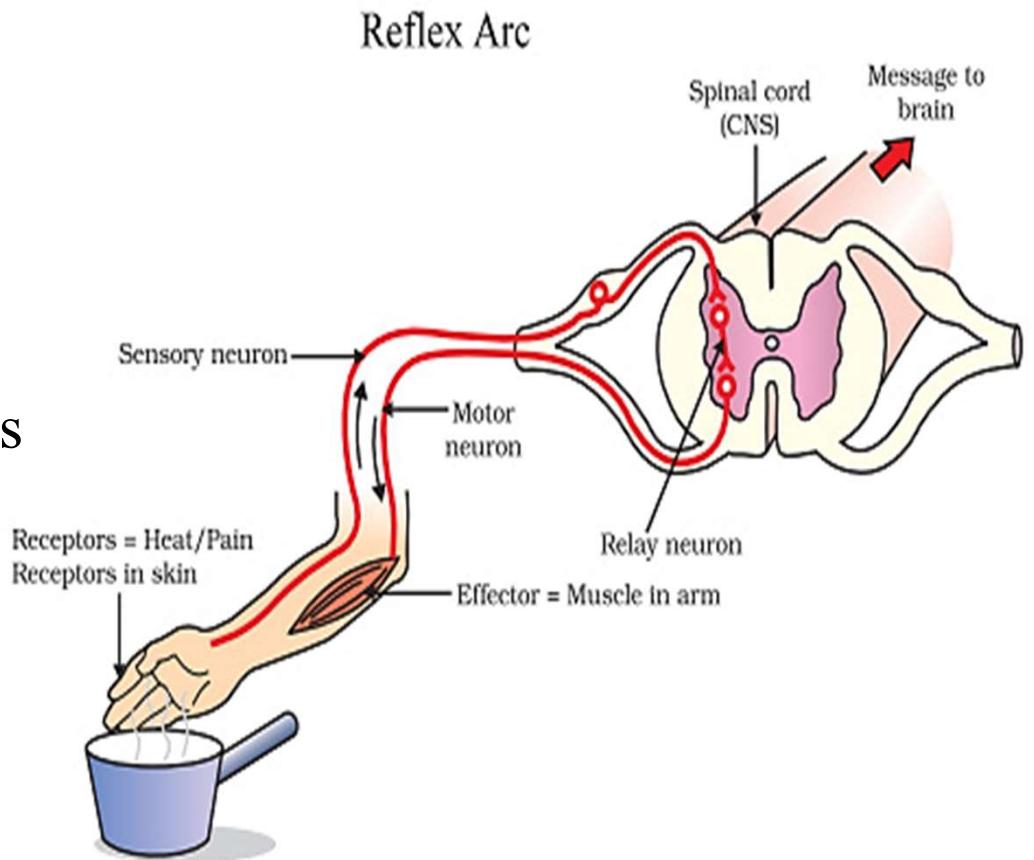


- Applying the brake while driving when a red or yellow traffic light appears; you do not have to think about pressing the brake.
- Feeling sick/upset near a location where a person was attacked in the past.
- Experiencing nausea when presented with an exam in a subject that is one in which multiple tests have been failed.
- Feeling hungry whenever a bell for breaktime or lunch time is rung.

CHARACTERISTICS OF A CONDITIONED REFLEX ACTION



- It is a temporary reflex
- It involves learning
- It takes a longer time to learn
- It is coordinated in the brain
- It involves more than one stimulus
- It involves association of stimuli
- It is reinforced by repetition
- Responses are involuntary



SIMILARITIES BETWEEN SIMPLE AND CONDITIONED REFLEX ACTIONS



- ❖ They both involve the central nervous system particularly the brain.
- ❖ Both are autonomic responses
- ❖ Both are associated with a stimulus.
- ❖ Both involve neurons for the transmission of impulses

DIFFERENCES.



Conditioned

- Stimulus and responses are not directly related
- More than one stimulus is required to cause a response
- It involves learning
- Takes time
- It is co-ordinated in the brain only
- Responses occur as a result of repetition and practice.

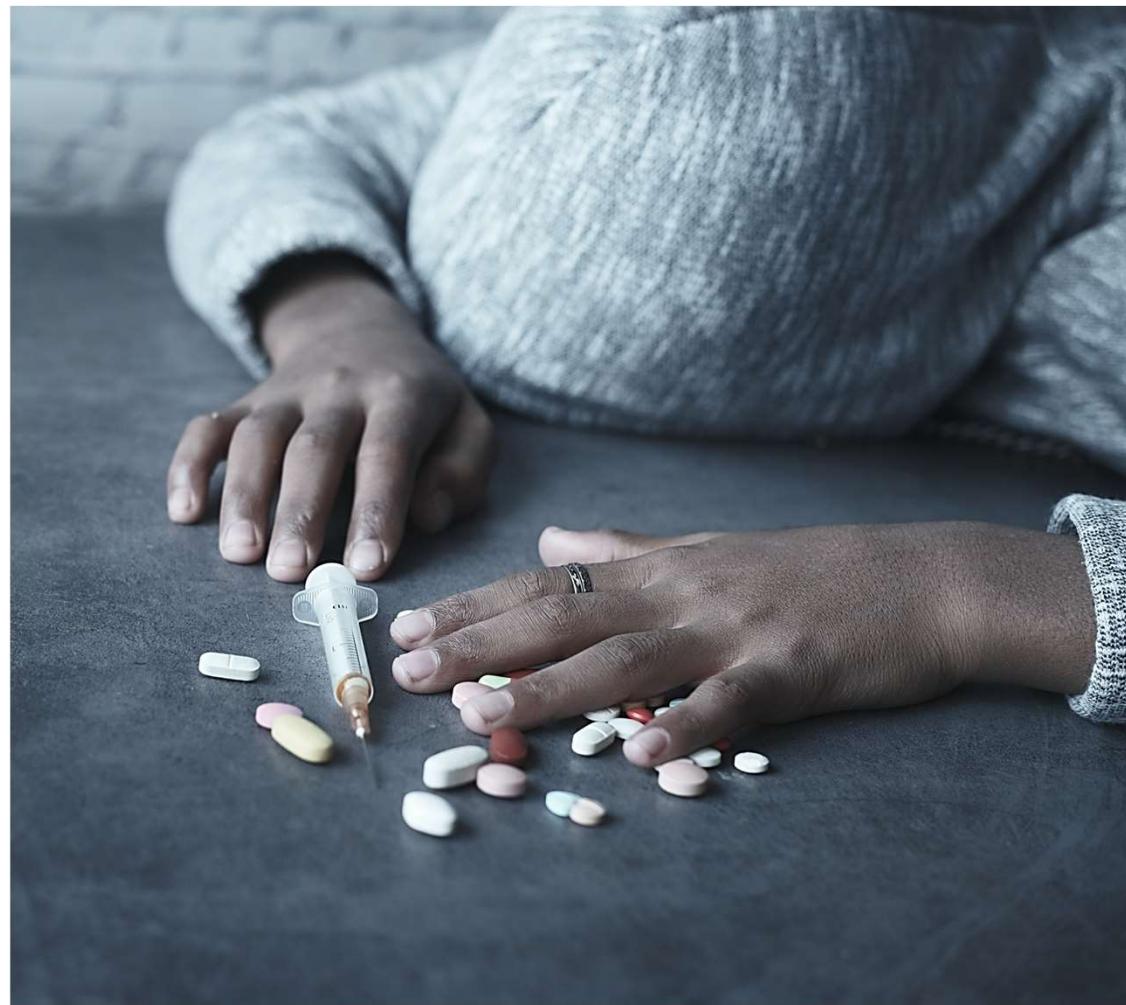
Simple

- Stimulus and response are related
- Only one stimulus is needed to cause a response
- No learning but in born
- Takes a very short time
- Co-ordinated in either the brain or spinal cord
- Responses occur instantly after a stimulus.

SUBSTANCE, DRUG USE AND ABUSE



- Any substance except food and water when taken into the body *changes the body or minds functioning either physically or psychologically* is called a **drug**.
- A drug changes the way someone **feels, behaves, thinks, understands** and **senses**



EXAMPLES OF DRUGS COMMONLY ABUSED

- ❖ Alcohol
- ❖ Cocaine
- ❖ Caffein
- ❖ Tobacco and its products
- ❖ Marijuana
- ❖ Kuber
- ❖ Sisha
- ❖ Petrol etc



- Drugs are majorly classified by the way they affect the body as follows



STIMULANTS

- These are drugs that *speed up the functioning of the brain and the whole central nervous system.*
- They *speed up messages between the brain and the body.*
- They make the person **more awake, alert, confident and energetic.**
- They do this by increasing the breathing rate, heart rate, body temperature, blood pressure, blood sugar levels and others.
- Large doses of such drugs *may cause anxiety and make a person paranoid.* Examples of such drugs include **cocaine, nicotine, caffein, petrol, Kuber,** etc.



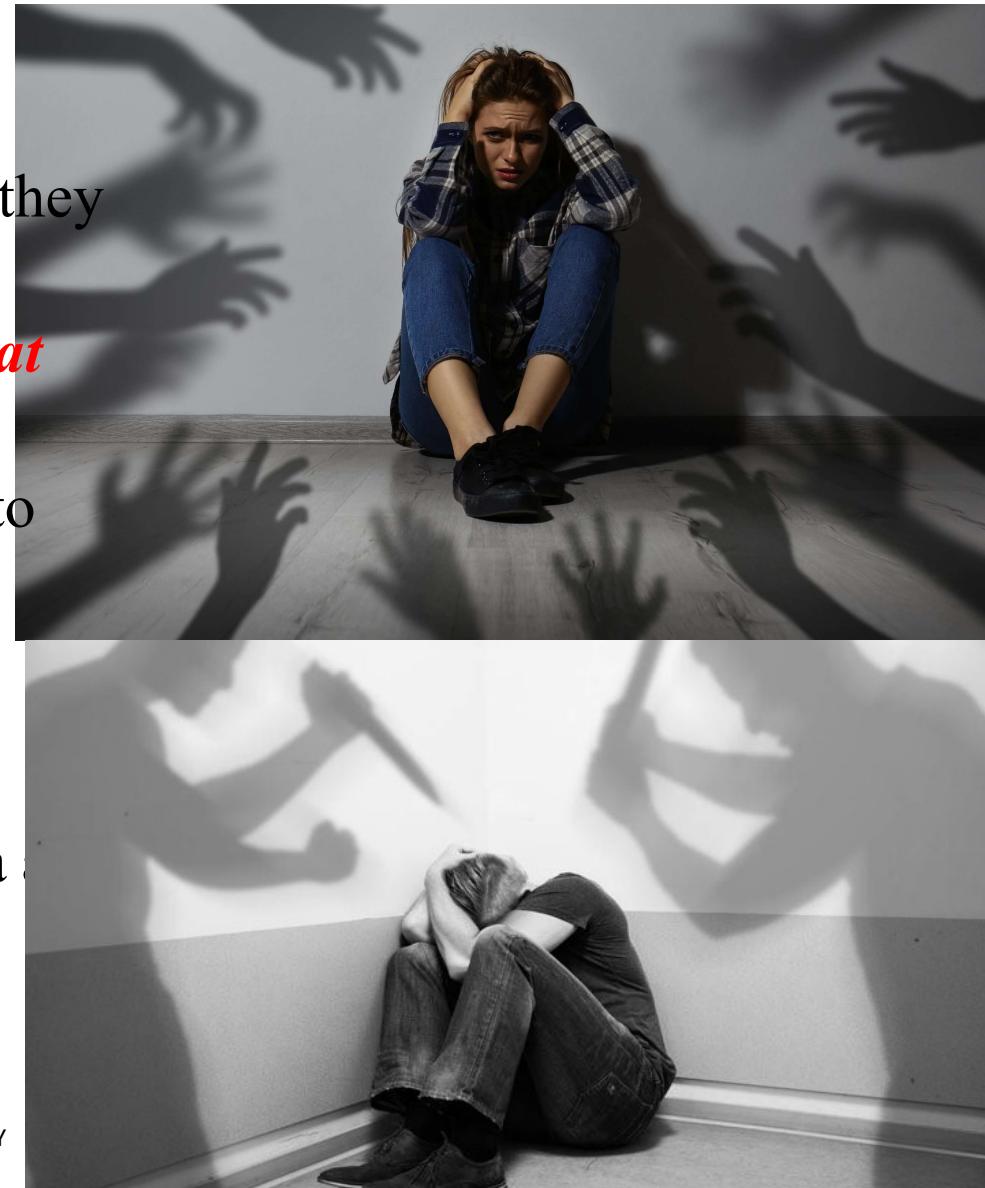
SEDATIVES OR DEPRESSANTS.

- These drugs *slow down the function of the brain and the central nervous system*. They do this by slowing down the messages between the brain and the body.
- This makes the person to feel **sleepy**.
- **Small doses** of such drugs *make someone relaxed* and very **high doses** make a *person unconscious*.
- Examples of such drugs include **morphine, alcohol, marijuana, shisha, sleeping pills** and all **tranquillizers**



HALLUCINOGENS

- These drugs alter the sense of reality , i.e. they cause **hallucinations** in high doses.
- Hallucinations are *sensory experiences that appear real but are created by the mind.*
- Small doses of such drugs make a person to **feel no or less pain, dizzy, confused and disoriented.**
- Large doses cause **anxiety, memory loss, aggression and increased heart beat.**
Examples of such drugs include marijuana and LSD(lysergic acid diethylamide)



ANALGESICS MEDICINE



- The term analgesic refers to a medication that provides relief from pain without outing someone to sleep or making one lose consciousness. They are also known as pain killers.
- They work by **interfering with the transmission of pain signals to the brain.**

They are divided into two classes:

- Non-narcotic analgesic
- Narcotic analgesics



NON-NARCOTIC ANALGESIC

- Antipyretics are medicine that **reduce fever by lowering body temperature**.
- The most famous example of this class of medicine are **aspirin** and **paracetamol**.
- **Aspirin** is chemically known as acetylsalicyclic acid. It is used to reduce fever, pain or inflammation.
- **Paracetamol** is also used to treat moderate pain, body aches and fever. *They are nonnarcotic analgesics ie. They are non-addictive.*



NARCOTIC ANALGESICS

- Produce desired pharmacological effects like **they reduce fever** and **induce sleep**.
- Morphine narcotics (**obtained from the**) are mostly used to get relief from pain after medical operation, cardiac pain and labour pain during child birth, several stage of cancer and many more.



REASONS WHY PEOPLE ENGAGE IN DRUG ABUSE.

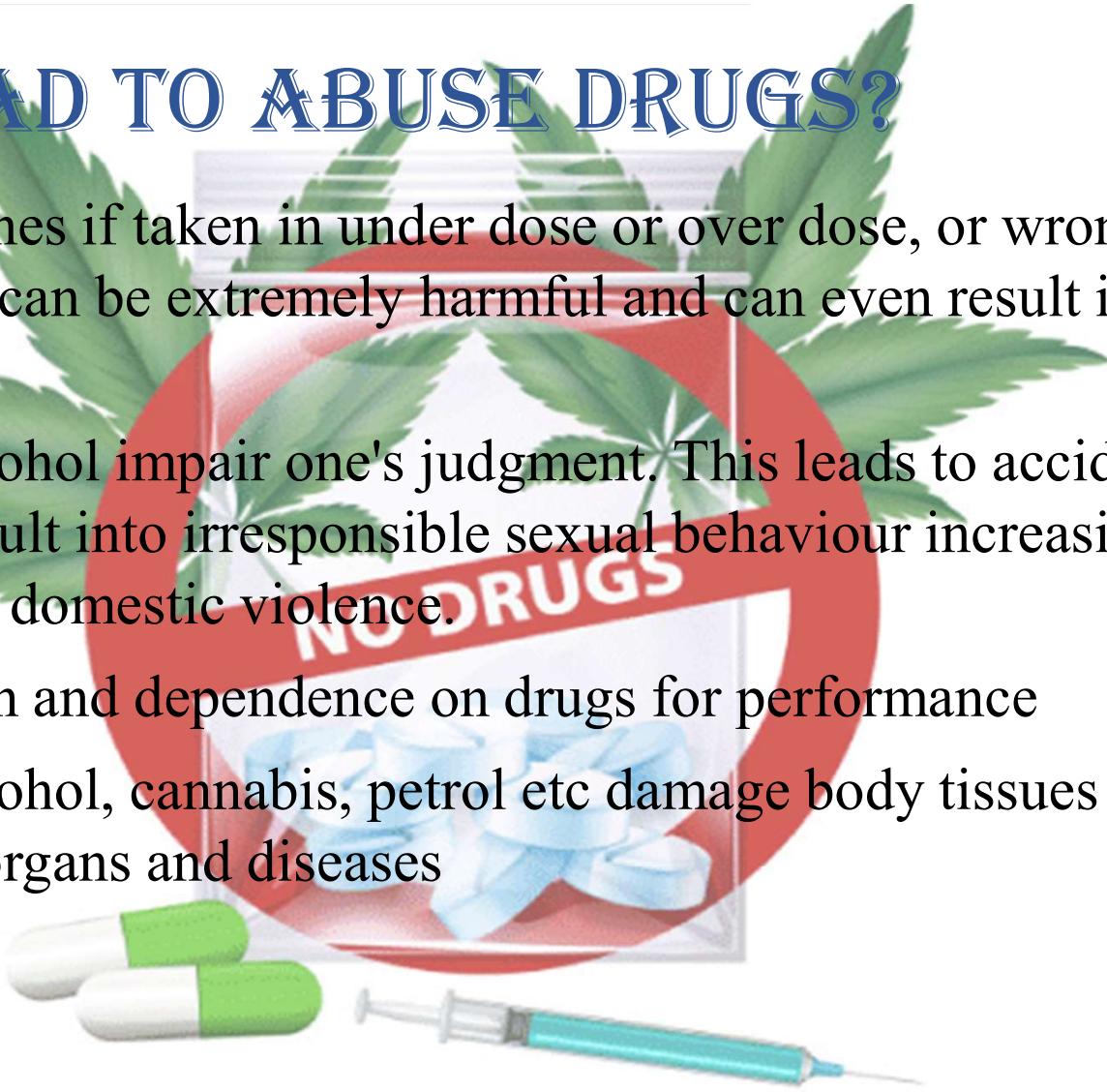
- Recreational and pass time
- Celebration
- Relaxation
- Boredom
- To be socially accepted by peers
- Rebellion
- To enhance performance at work places



WHY IS IT BAD TO ABUSE DRUGS?



- Prescription medicines if taken in under dose or over dose, or wrong circumstances, they can be extremely harmful and can even result into death.
- Some drugs like alcohol impair one's judgment. This leads to accidents at work or home or result into irresponsible sexual behaviour increasing risks of getting STDs and domestic violence.
- Result into addiction and dependence on drugs for performance
- Some drugs like alcohol, cannabis, petrol etc damage body tissues leading to damage of body organs and diseases





- Results into strained relationships e.g. divorce
- Leads to increased crime rates e.g. stealing in order to sustain the supply of drugs
- It results into school dropout and poor academic performance.
- Results into absenteeism from work and under performance which may lead to being fired hence loss of income.
- Increased risks of developing cancer, brain damage and organ failure which cause death or financial strains to manage.
- Abuse of drugs during pregnancy can harm the development of the baby causing birth defects and the mother may experience withdraw syndromes after delivery.

PREVENTION OF DRUG ABUSE



Education and Awareness:

- Educate individuals, especially young people, about the risks and consequences of drug abuse.
- Implement school-based programs to teach healthy coping mechanisms and decision-making skills.

Strengthening Family Bonds:

- Encourage open communication within families to address stressors and emotional issues.
- Promote positive role models and parenting practices.

Community Engagement:

- Create safe, drug-free recreational spaces for youth.
- Engage community leaders to advocate for drug-free lifestyles.

Policy and Regulation:

- Enforce strict laws against drug trafficking and availability.
- Regulate the prescription and sale of medications to prevent misuse.

CONTROL OF DRUG ABUSE.



Rehabilitation Programs:

- Offer treatment options like counseling, behavioral therapy, and support groups for individuals struggling with addiction.
- Provide medication-assisted treatment for certain drug dependencies.

Law Enforcement:

- Monitor and reduce illegal drug production and distribution.
- Implement drug courts that focus on treatment rather than punishment.

Workplace and School Policies:

- Establish drug-free policies and conduct regular training to identify signs of drug abuse.

Harm Reduction:

- Provide resources like clean needle programs and overdose-reversal medications to minimize the harmful effects of drug abuse.

AVOIDANCE OF DRUG ABUSE.



Personal Choices and Lifestyle:

- Surround yourself with a supportive social circle that discourages drug use.
- Develop hobbies and interests that provide fulfillment and stress relief.

Building Resilience:

- Learn and practice stress management techniques such as mindfulness, exercise, or therapy.
- Seek professional help for mental health issues that may lead to drug use.

Avoiding Risky Situations:

- Stay away from environments where drugs are present or encouraged.
- Recognize peer pressure and learn to assertively say no

A close-up photograph of a baby's face, which is partially obscured by several thick slices of watermelon held in front of it. The baby has light-colored hair and is looking directly at the camera with a neutral expression. The background is a soft-focus green field.

ALWAYS AIM FOR EXCELLENCE

**BY ELLY KENEDDY NALITSO
0708838163- 0779031329**

1/14/2025

ELLY KENEDDY

