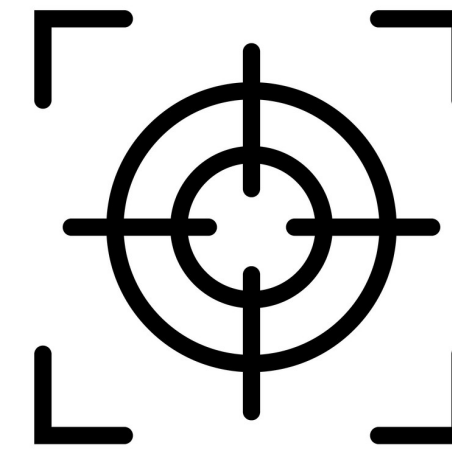


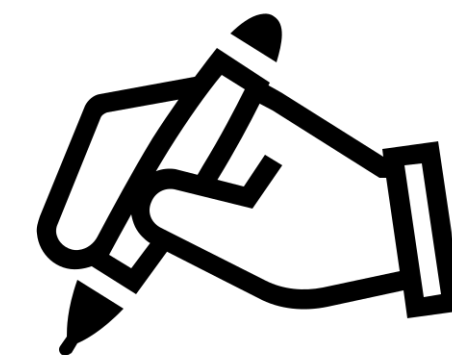
# Topic 11: Nervous System

# Chapter Analysis



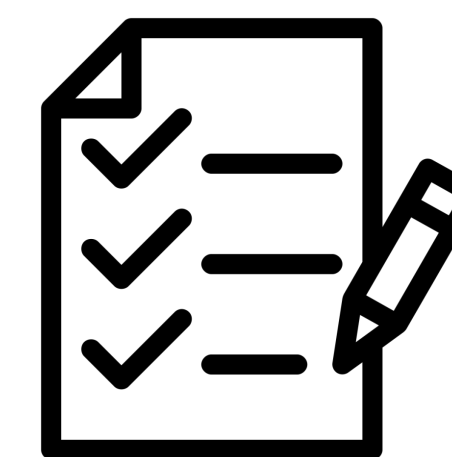
## **FOCUS**

- one of the three chapters under umbrella topic of Co-ordination and Response in Humans
- together with eyes and hormones



## **EXAM**

- commonly tested in MCQ and structured questions
- Tested twice in Section B



## **WEIGHTAGE**

- Constitute to 4% in Paper 2 in the past 5 years

**Key Concept**

**brain, spinal cord and nerves**

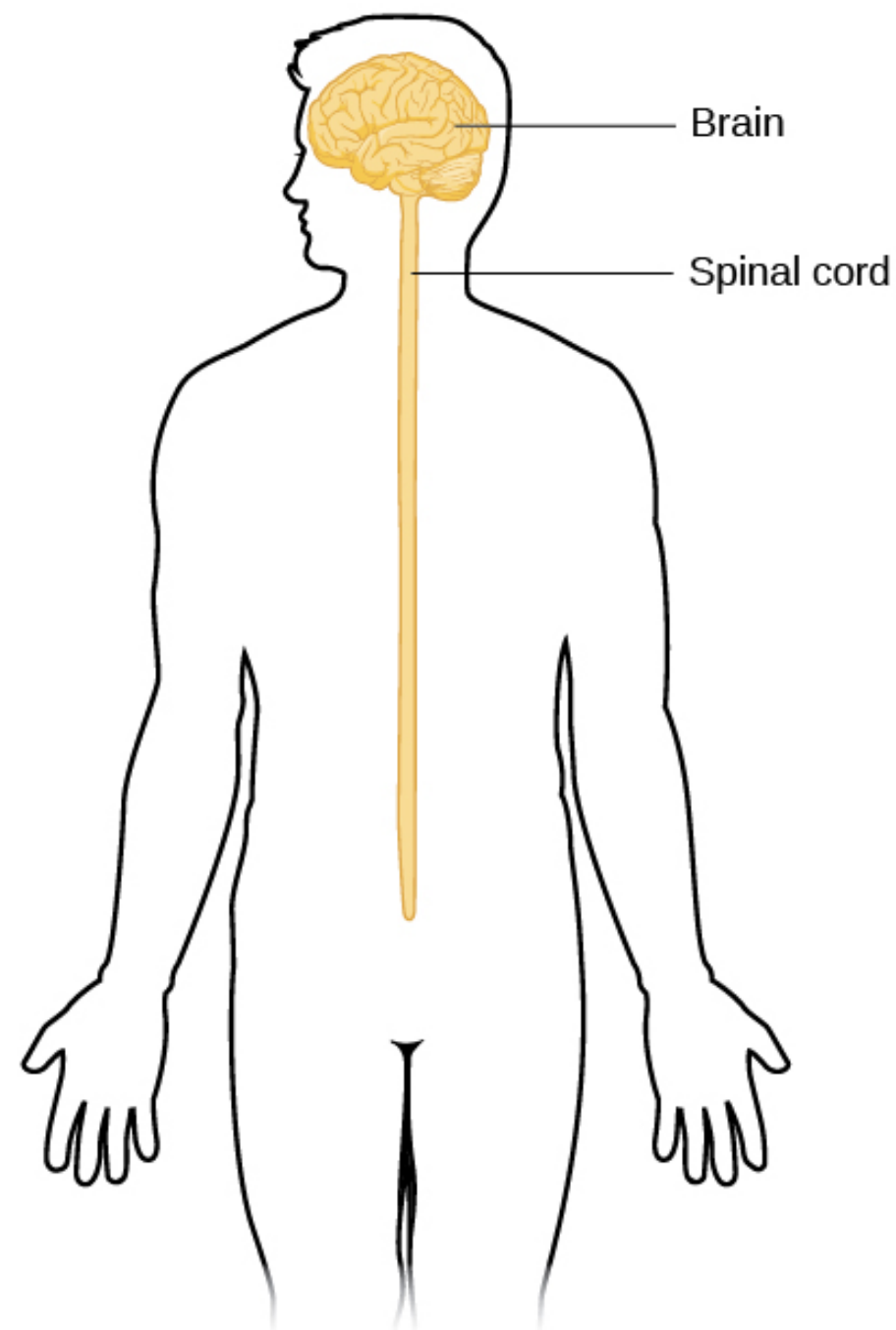
**neurones**

**reflex action**

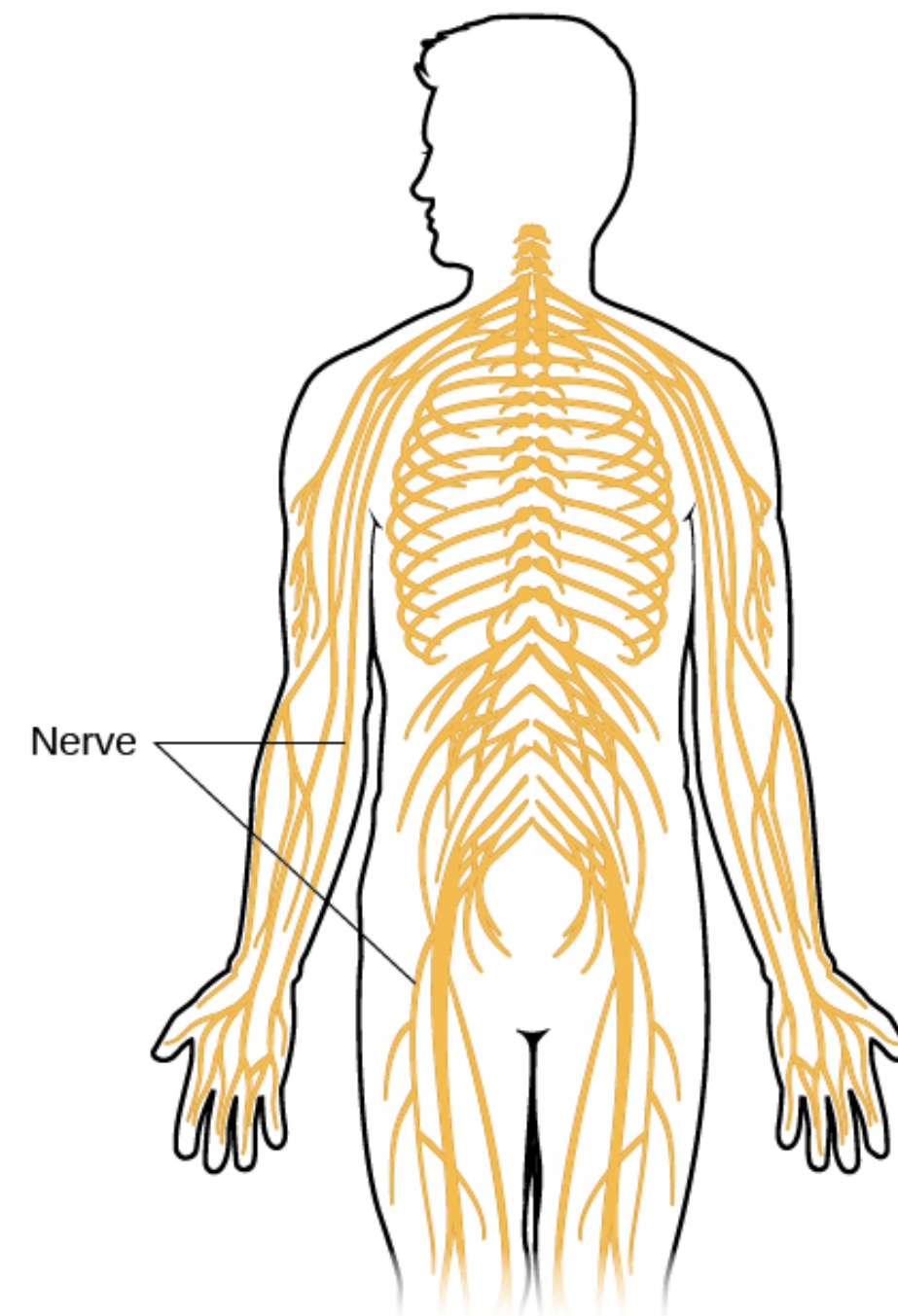


# human nervous system

Central Nervous System



Peripheral Nervous System



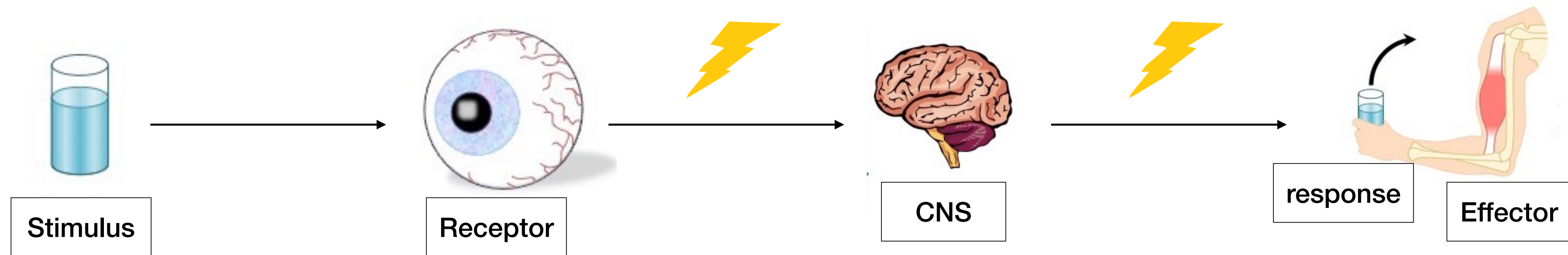
Human Nervous System consists of

- i. **Central Nervous System (CNS)** consists of the brain and the spinal cord
- ii. **Peripheral nervous system (PNS)** consists of the nerves connecting the central nervous system and the rest of the body

The role of nervous system:

- Help the body to **adjust rapidly to any changes** in the environment
- Enable the various parts of the body to **coordinate with one another quickly**
- Control **involuntary actions**, actions that cannot be consciously controlled, such as heartbeat, peristalsis, vasoconstriction and reflex actions
- Control **voluntary actions**, actions that are consciously controlled, such as picking up the cookie on the table

# human nervous system

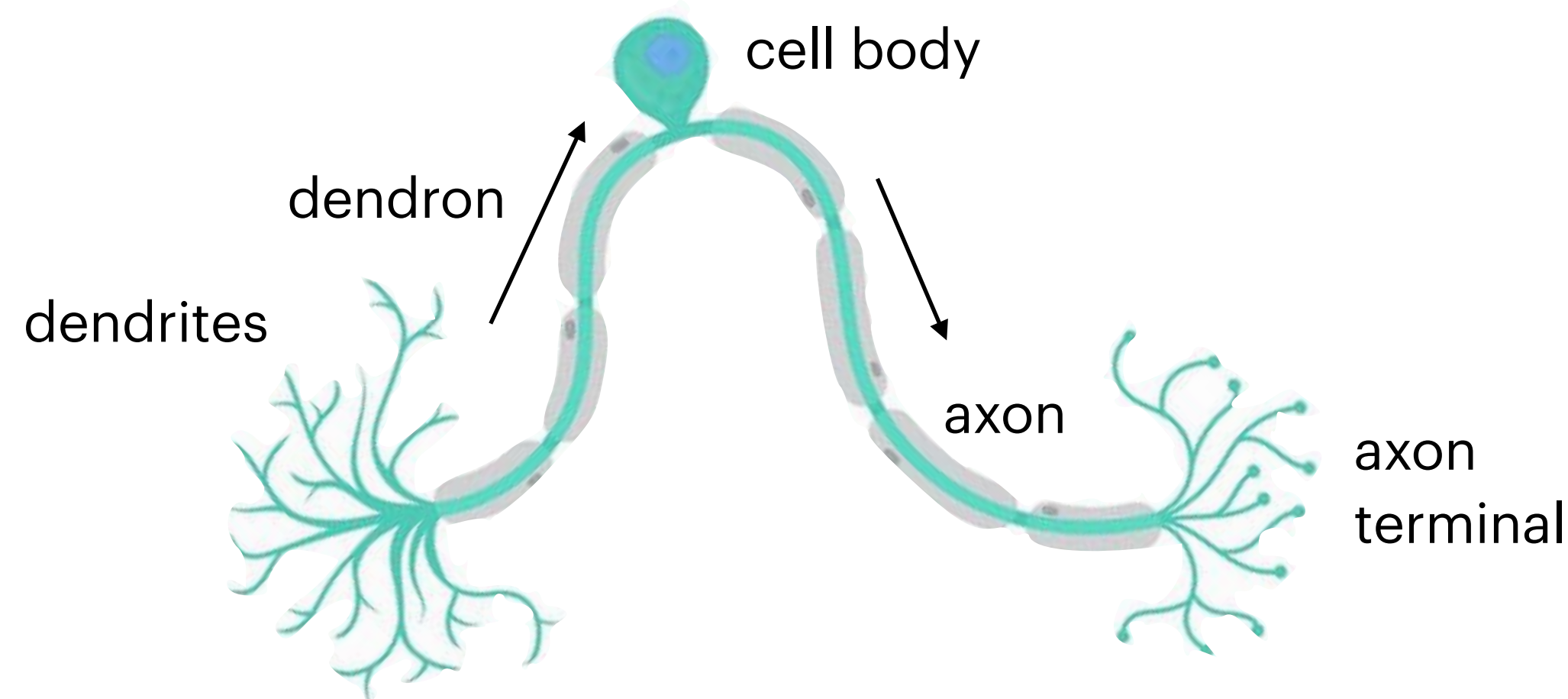


**Stimulus** is a **change in environment** which is **detected by receptors**

Receptor will produce **electrical** messages called **nerve impulses** to send to the central nervous system by **neurones**

CNS then transmits nerve impulses to effector to react to the changes in surroundings)

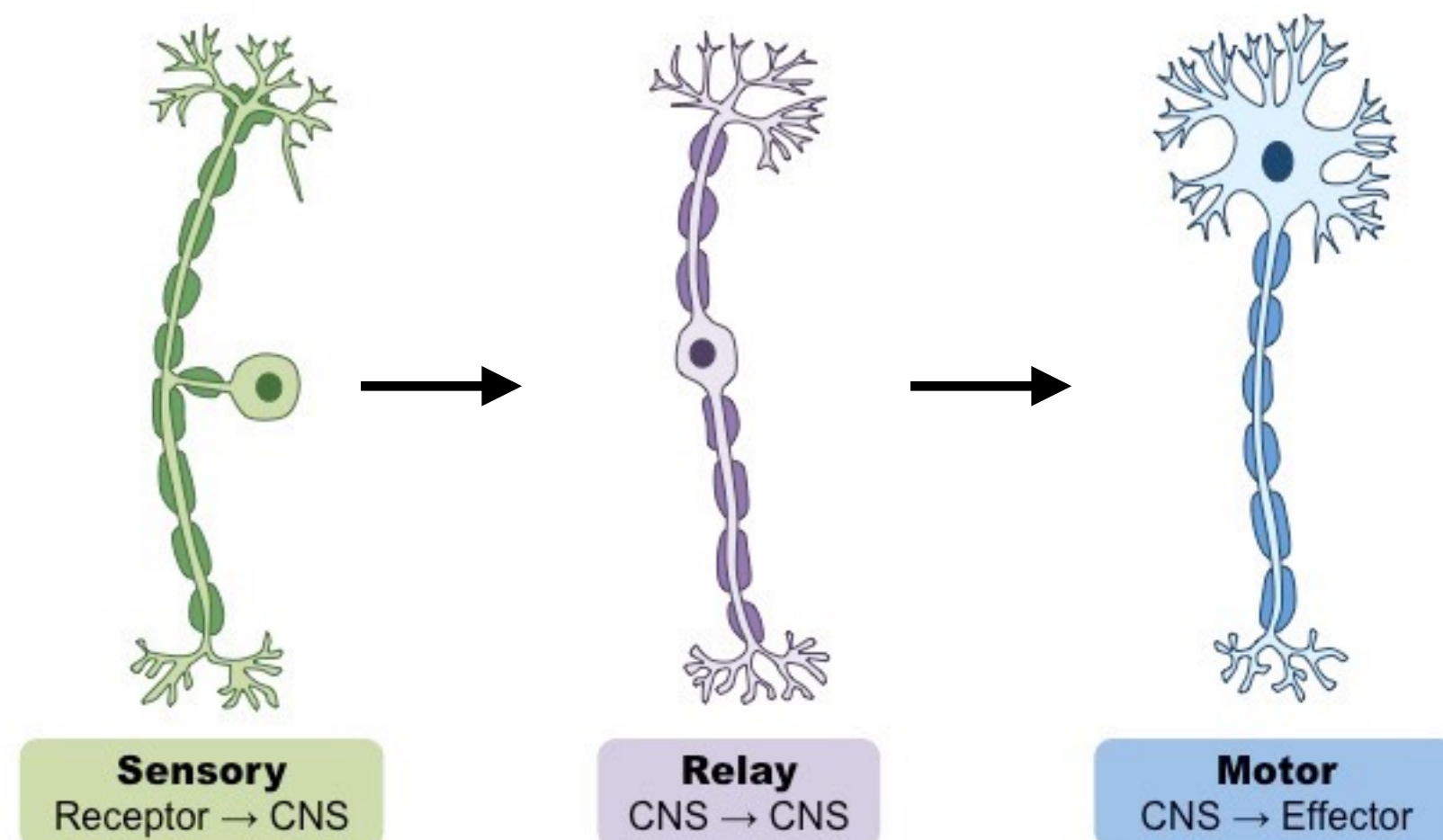
# Nerves



- Nerve is a bundle of **neurones** or **nerve cells** that **transmit nerve impulses**
- All neurones have
  - (a) A large **cell body** containing the nucleus and organelles.
  - (b) **Dendrons** are nerve fibre that conduct **nerve impulse towards the cell body** of the neurone
  - (c) **Axons** are nerve fibre that conduct **nerve impulses away** from the cell body.
  - (d) At the terminal ends of axons and dendrons, the nerve fibre branches. These branches are known as dendrites. Where the axon is connected to muscles, these branches are also known as motor end plates.

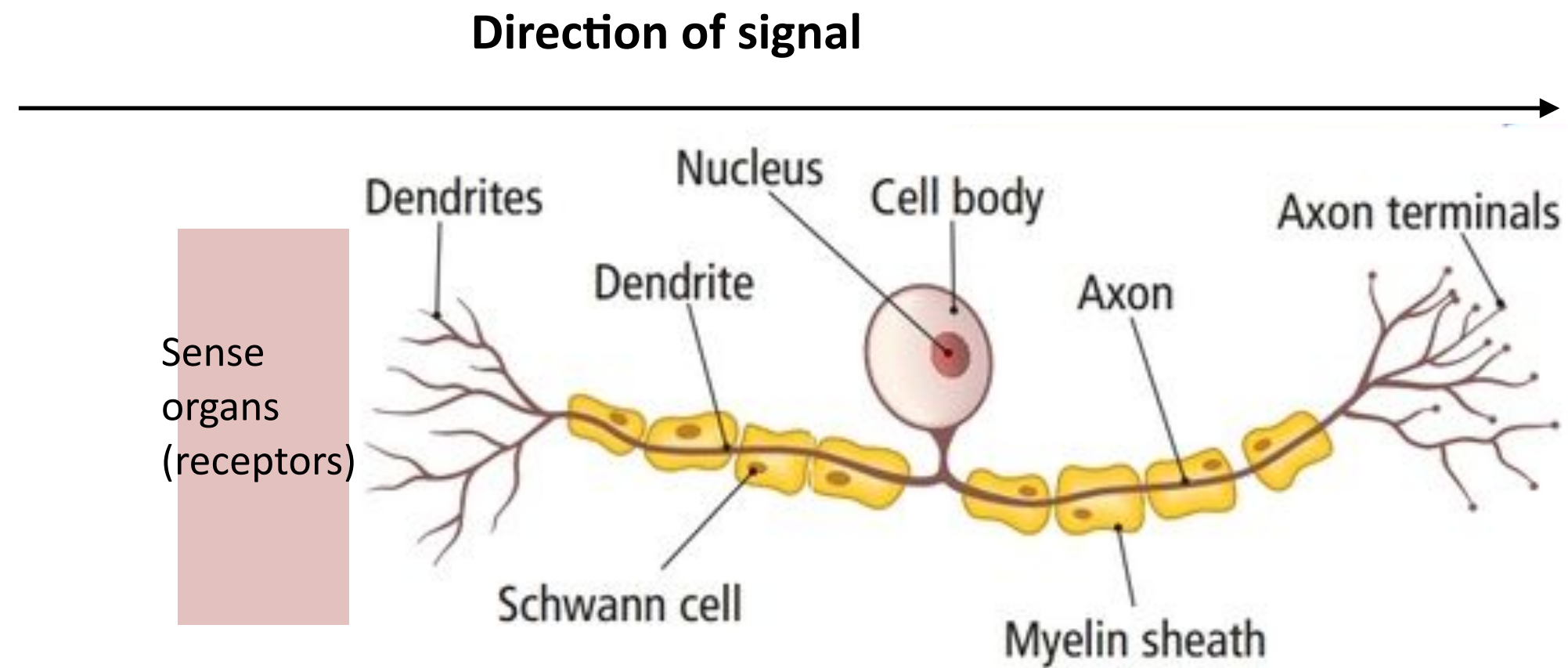
Three types of neurones

1. **Sensory neurones** - Transmits nerve impulses from receptors / sense organs to CNS
2. **Relay neurones** - Transmit nerve impulses from the sensory neurones to the motor neurones; found within the CNS
3. **Motor neurones** - Transmit nerve impulses from the CNS to the effector muscle cells or gland cells

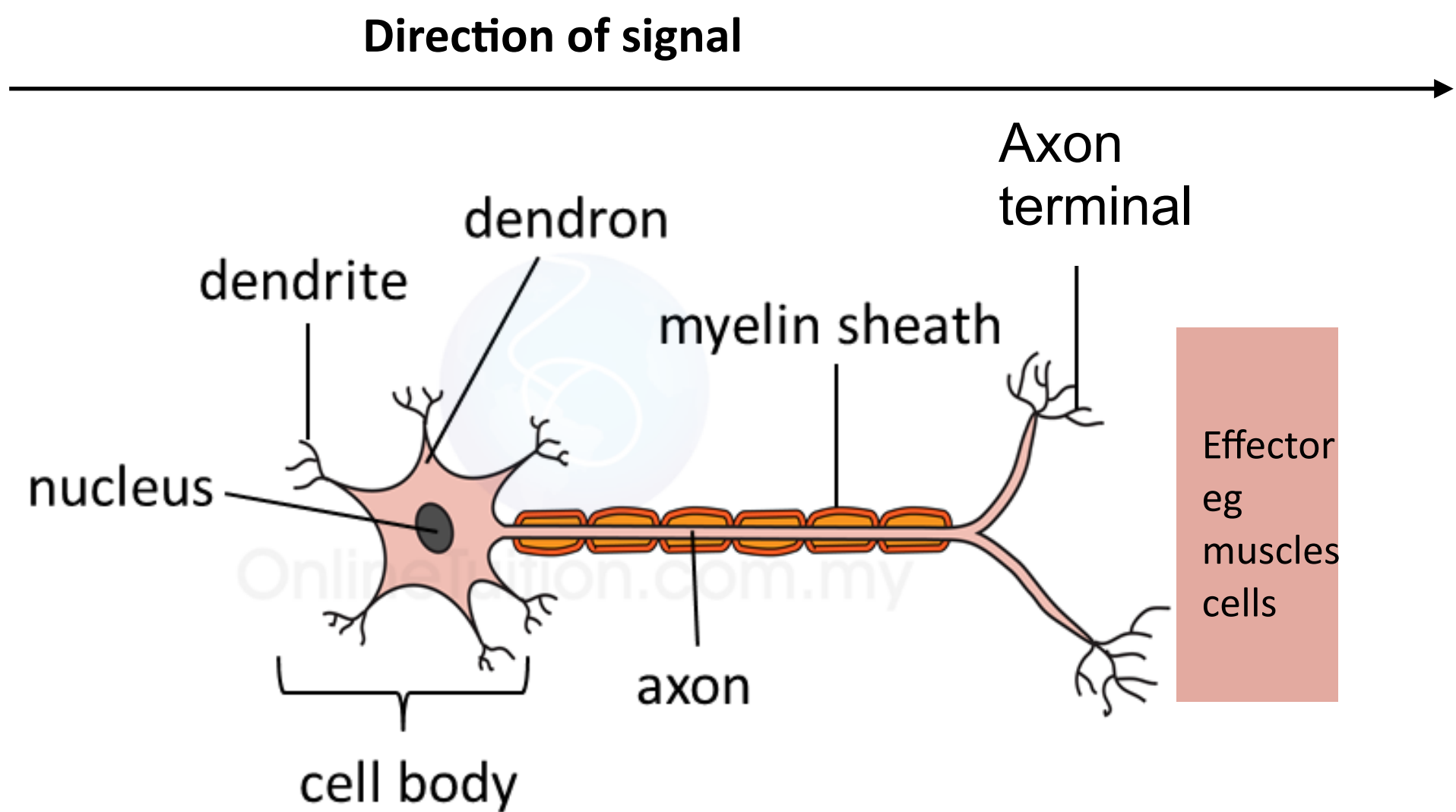


# structure of neurones

Sensory Neurones

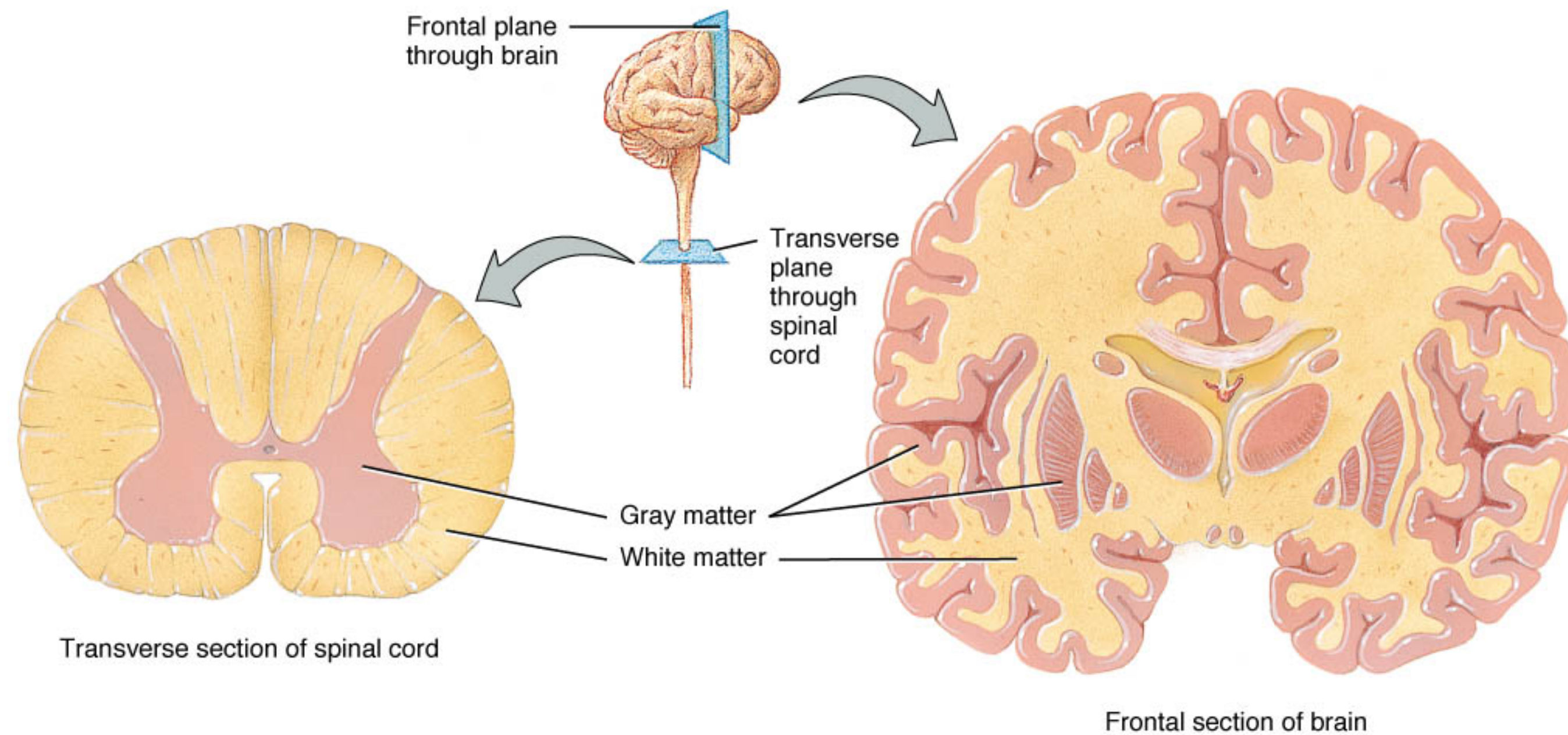


Motor Neurones



	Sensory Neurones	Motor Neurones
Cell body	smooth and rounded	Relatively large and irregular shape
Dendron	Long	Short
Axon	Short	Long
Axon terminals	Transmit nerve impulses to relay neurones	Transmit nerve impulses to the effector

# brain and spinal cord



**Grey matter** consists mainly of the **cell bodies of neurons**.

- It forms the outer layers of the brain and the central parts of the spinal cord.

**White matter** consists mainly of **nerve fibres (dendrons and axons)**.

- It forms the central parts of the brain, and the outer layers of the spinal cord.



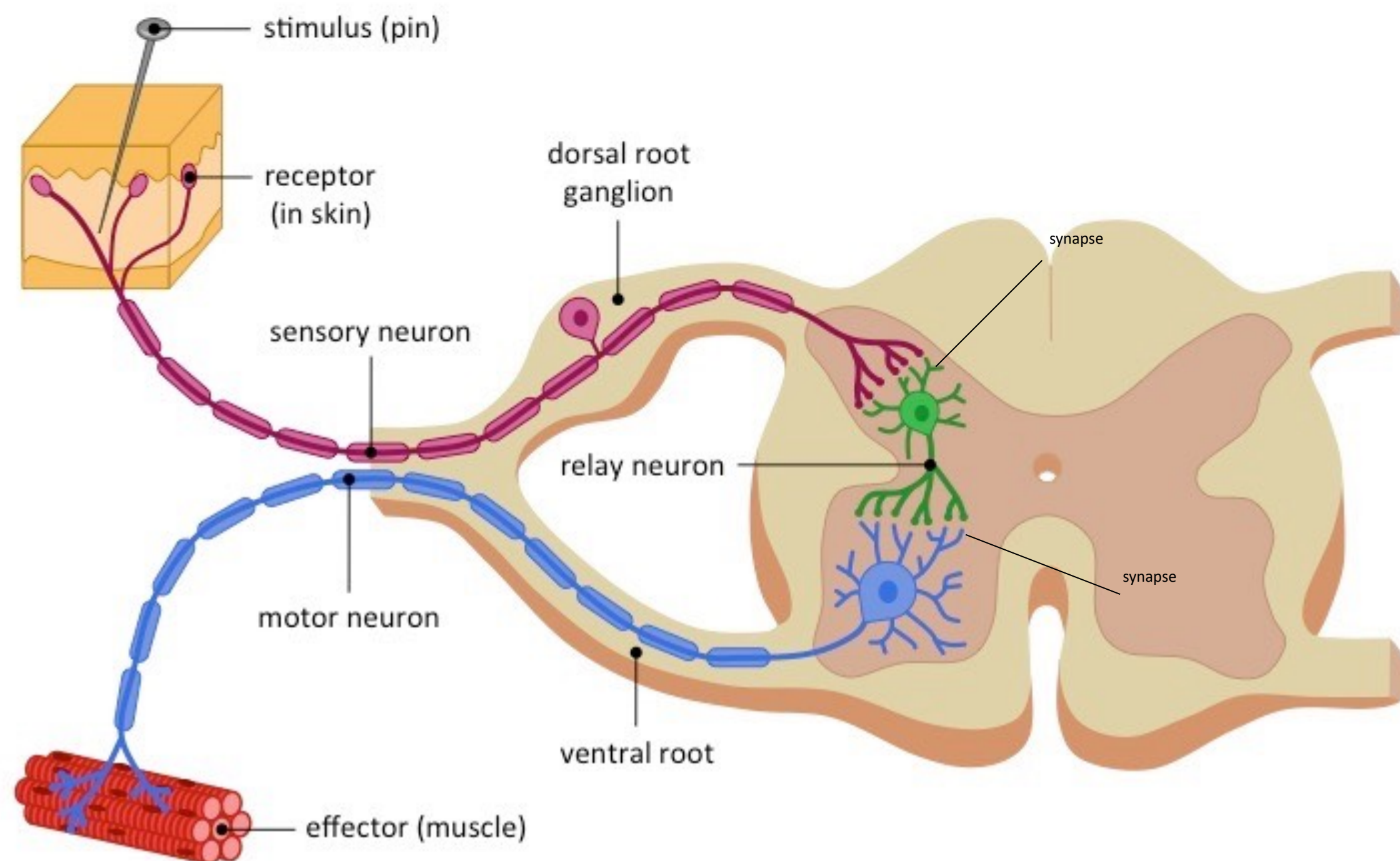
# reflex arc

- **Reflex actions** are involuntary responses to a specific stimulus
- **Reflex arc** is the pathway which nerve impulses travel during reflex actions

Receptor → Sensory neurone → Intermediate neurone / relay neurone →  
Motor neurone → Effector

1. **Receptors** in the skin detect the stimulus such as pricked by a needle or touching a hot object
2. **Nerve impulses** are produced which are **transmitted by the sensory neurone to the spinal cord.**
3. In the spinal cord, the nerve impulses are **transmitted across a synapse to a relay neurone** and then **across another synapse to the motor neurone.** \*
4. Nerve impulses travel along the motor neurone to the **motor end plate**, then the effector
5. The **effector muscles contract** causing the hand to withdraw

\* When nerve impulses arrive at the spinal cord from sensory neurone, nerve impulses are also sent to the brain. The brain will interpret the impulses, and the cold sensation or pain will be felt



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