

Biology Knowledge Organiser

B10 - The human nervous system

Homeostasis

Unless chemical and physical conditions in the body are kept within strict limits, cells die. Thus, our bodies constantly and automatically regulate the internal conditions in the body to maintain optimum functions. This regulation is called **homeostasis**. It is vital for proper enzyme functioning, and indeed all cell functions.

Some factors that need controlling by homeostasis in the human body:

- Blood glucose concentration
- Body temperature
- Water levels
- Nitrogen levels.

The regulation that takes place can be carried out by the **nervous system**, the **endocrine system** (which produces hormones), or a combination of the two. These automatic control systems we use for homeostasis all include:

- Receptor cells – these detect changes in the environment. Changes are called **stimuli**.
- Coordination centres – these receive information from receptor cells (electrical or chemical information) and process the information. Examples include the brain, spinal cord and pancreas.
- Effectors – these are muscles or glands, which carry out the responses as directed by the control centre. Muscles contract and glands release chemicals, such as hormones.

The human nervous system

The nervous system is a network of neurones (nerve cells), bundled into nerves. It includes the nerves all over the body and the **central nervous system**, which consists of the **brain** and **spinal cord**. The nervous system allows us to react to the surroundings and control our behaviour. It can act involuntarily (in **reflexes**) or voluntarily.

Information from receptors, in the form of electrical impulses, passes along neurones to the central nervous system (CNS for short); the CNS coordinates the response by transmitting electrical impulses to the effectors (see above).

A reflex arc causes reflex actions, which are rapid and automatic (automatic because they don't involve the conscious part of the brain).

Key Terms	Definitions
Homeostasis	Regulating the internal conditions of the body in response to internal or external changes, to maintain optimum conditions for the body's functioning
Endocrine system	The network of hormone-producing glands in the body. Hormones are chemical messengers that travel in the bloodstream to their target tissues.
Blood glucose	Glucose (a simple sugar) is transported in the blood, as all cells require it for respiration. The concentration of blood glucose must be kept within very tight limits at all times.
Stimulus	A change in the environment, detected by a receptor cell. E.g. light, sound, chemicals (smells and tastes), pressure, pain, temperature etc.
Nerve	A nerve is just a collection of many nerve cells; nerve cells are called neurones . Neurones transmit (carry) information as electrical impulses .

The reflex arc and reflex actions

Reflex actions, for instance pulling your hand away from a pain stimulus, follow a simple pathway.

1. The **receptor** detects the **stimulus** and passes electrical impulses along the **sensory neurone** to the CNS (the spinal cord part, in this case).
2. There is a junction (tiny gap) between the sensory neurone and the **relay neurone** called a **synapse**. Here, a chemical is released that diffuses across the gap and causes an electrical impulse to pass along the relay neurone.
3. There is another synapse between the relay neurone and the **motor neurone**, again a chemical is released that causes the electrical impulse to pass along the motor neurone.
4. The impulse arrives at the **effector** – in this example, a muscle that contracts to pull your hand away from the source of pain.

