Homeostasis & Response

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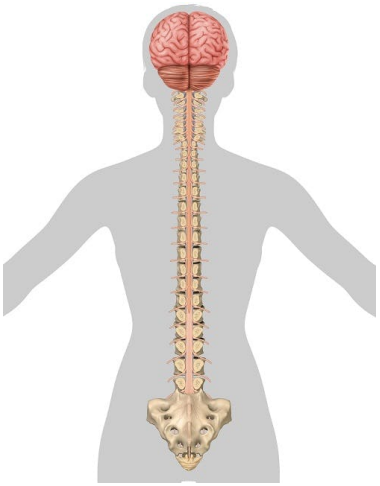
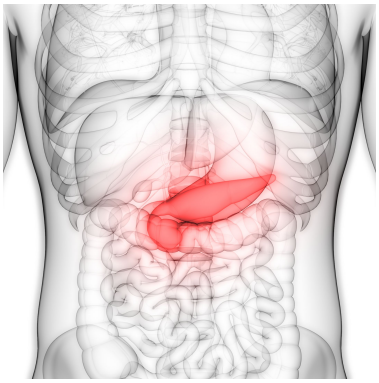
What is Homeostasis?

Homeostasis is the regulation of a constant internal environment. The conditions are maintained to ensure optimum conditions for metabolism and changes in response to both internal and external fluctuations.

The conditions inside our body must be carefully controlled if it is to function effectively. **Homeostasis** is the maintenance of a **constant internal environment in the body**. The **nervous system** and **hormones** are responsible for controlling this. The body's control systems are all automatic and involve both nervous and chemical responses. It has many important parts, including:

- **Receptors** detect a stimulus, which is a change in the environment, such as temperature change.
- **Coordination centres** in the brain, spinal cord and pancreas. They receive information from the receptors, process the information and instigate a response.
- **Effectors**, such as muscles or glands create the response. Glands often release a hormone, which would restore the optimum condition again. Examples: a muscle contracting to lift a leg or a gland releasing a hormone into the blood.

Brain		**Coordinates information from the receptor cells and sends signals to the muscles and glands.**
Spinal Cord		**Coordinates messages from the brain and receptor cells and coordinates reflexes.**

Pancreas		**Coordinates the glucose levels in the blood.**

Body temperature

Body temperature is one of the factors that are controlled during homeostasis. The human body maintains the temperature that **enzymes** work best, which is around 37°C. This process is controlled by the thermoregulatory centre, which is contained in the hypothalamus in the brain, and it contains receptors sensitive to the temperature of the blood. The skin also has temperature receptors and sends nervous impulses back to the thermoregulatory centre.

What if you get too hot?

When we get too hot:

- **Sweat glands** in the skin release more sweat. The sweat evaporates, transferring heat energy from the skin to the environment.

Blood vessels leading to the skin capillaries become wider - they **dilate** - allowing more blood to flow through the skin, and more heat to be lost to the environment. This is called **vasodilation**.

What if you get too cold?

When we get too cold:

- Skeletal muscles **contract** rapidly and we **shiver**. These contractions need energy from **respiration**, and some of this is released as heat.

Blood vessels, which lead to the skin capillaries, become narrower - they constrict – which allows less blood to **flow** through the skin and conserve the core body temperature. This is called **vasoconstriction**.

The hairs on the skin also help to control body temperature. The hairs lie flat when we are warm, and rise when we are cold.

If we are too cold nerve impulses are sent to the hair erector muscles which contract. This raises the skin hairs and traps a layer of insulating air next to the skin.
Skin hairs lie flat when we are hot and stand upright when we are cold
The control of body temperature is an example of a **negative feedback mechanism**. It regulates the amount of:

- shivering (rapid muscle contractions release heat)
- sweating (evaporation of water in sweat causes cooling)
- blood flowing in the skin capillaries

The amount of blood flowing through the skin capillaries is altered by vasoconstriction and vasodilation.

	Too cold	**Too hot**
Process	Vasoconstriction	Vasodilation
Arterioles	Get narrower	Get wider
Blood flow in skin capillaries	Decreases	Increases
Heat loss from skin	Decreases	Increases

ACTIVITY ONE

Directions: *After reading the information above, answer the questions below.*

1. **What is homeostasis?**

_____

_____

2. **What function does the receptors carry out?**

_____

_____

3. **What is vasoconstriction?**

_____

_____

_____

_____

4. **What happens if the body is too hot?**

_____

_____

5. **Where are the coordination centers?**

_____

ACTIVITY TWO

Directions: *Circle T if the statement is True or F if the statement is False for each sentence.*

1. **Skin hairs lie flat when we are hot and stand upright when we are cold. T OR F**
2. **When we get too hot our sweat glands release less sweat. T OR F**
3. **Body temperature is not a factor in homeostasis. T OR F**
4. **Effectors create a response. T OR F**
5. **Receptors receive the message. T OR F**

ACTIVITY THREE

Directions: *Fill in the blanks*

1. **Vasodilation is**_____

_____

2. **The control of body temperature is an example of a**

   _____.

3. **The human body maintains the temperature that _____work best, which is around 37°C.**
4. **Glands often release a _____, which would restore the optimum condition again.**
5. **The amount of blood flowing through the skin capillaries is altered by**

   _____ **and** _____.

REFERENCES

BBC Bitesize. (n.d.). *Body temperature and the thermoregulatory centre - homeostasis in humans - AQA - GCSE biology (single science) revision - AQA*. https://www.bbc.co.uk/bitesize/guides/zxgmfcw/revision/1