# **Response and Regulation**



## The nervous system

We have 5 sense organs which contain **receptor cells**. These receptor cells **detect external stimuli** and send an **electrical signal** along **neurones** to the **central nervous system** (CNS) made up of the **brain** and **spinal cord** to coordinate a **response**.

Stimulus	
Light	
Sound	
Chemical smells	
Chemical tastes	
Pain, pressure, temperature	
	Light Sound Chemical smells Chemical tastes

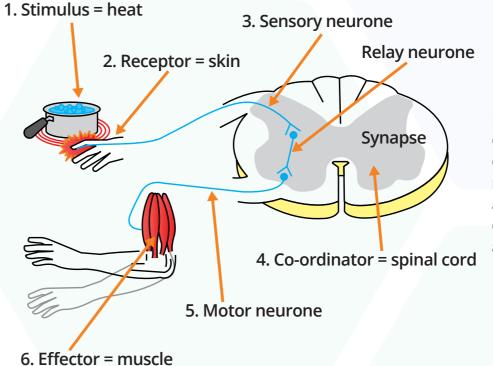
A reflex response is always:

- Rapid
- Automatic

and is generally protective.

## A The reflex arc - Higher tier

This is the path taken by an electrical impulse from stimulus to response by an effector (muscle or gland). Withdrawal action reflex is shown here where an automatic reaction to the hot pan causes a quick withdrawal from the area.



Negative feedback - Any change from the balance in optimal internal conditions results in the body's hormonal and nervous systems compensating for the change and restoring the balance.

#### **Homeostasis**

Homeostasis is the maintenance of a constant internal environment.

# **Regulating Glucose**

The amount of glucose in your blood is controlled by **hormones (chemical messengers)** that **travel in blood** from the gland where they are produced, in this case the **pancreas** to the target organ, in this case the **liver**.

Eating increases glucose in blood.

Pancreas detects increase and releases the hormone insulin into the blood.

Insulin travels to liver and liver turns glucose into insoluble glycogen for storage.

Glucose level decreases to normal levels.

Exercising decreases glucose in the blood.

Pancreas detects the decreases and releases the hormone glucagon into the blood.

Glucagon tells the liver to turn stored glycogen into glucose and release into the blood.

Glucose levels in blood increases to normal levels.

## **Diabetes**

Diabetes is a condition where you are unable to control your own blood glucose levels. In **Type I diabetes** the body does not release insulin. In **type II diabetes** the body cells do not respond to the chemical signal from insulin.

### **Symptoms:**

Glucose in urine detected by a Benedict's test.

#### **Treatments:**

\*Injecting insulin \*pancreas transplants

\*low sugar/ carbohydrates diet

## The eye-BIOLOGY ONLY

Two reflex actions studied occur in the eye. Blinking and the pupil reflex.

iris – muscles that alter size of pupil to control amount of light entering

cornea – clear part of sclera allows light to enter and refracts light entering pupil – hole in

centre of iris which allows light to enter

lens – changes shape to focus light onto retina Sclera - protective, tough white outer coat

choroid – a pigmented layer which absorbs light to prevent reflection, also contains blood vessels

> Retina- light sensitive layer, an image is formed here, impulses sent to optic nerve

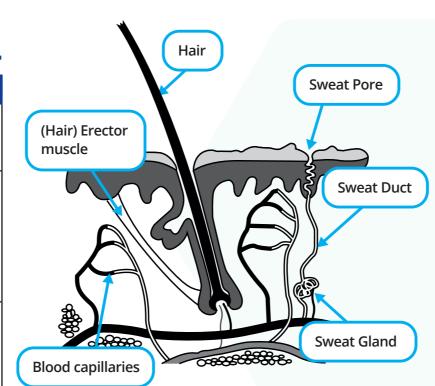
blind spot – where the optic nerve leaves the eye, there are no light sensitive cells optic nerve – carries impulses from retina to brain

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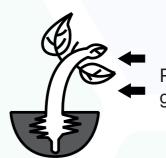
## **Regulating temperature**

Too hot	Too cold
Hairs lie flat.	Hairs stand on end to trap a layer of insulating air over skin reducing heat loss
Sweating- A layer of liquid sweat made by sweat glands, carried up by sweat ducts and released by sweat pores onto the skin and evaporates removing heat energy.	Shivering- Involuntary contraction of the muscles increases respiration and the release of heat energy.
Vasodilation- Blood vessels in the skin widen so more heat from the blood is lost to the environment.	Vasoconstriction- Blood vessels in the skin get narrower so less heat is lost from the blood to the environment.



## **Phototropism- Biology only**

A tropism is a growth response in a plant to a one directional stimulus. It is caused by the release of the hormone auxin.



Positive phototropismgrowth towards light



Positive gravitropism root growth down into the ground- with gravity.

# **Lifestyle factors**

**Diet-** A diet high in sugars and carbohydrates can lead to obesity and type II diabetes.

**Drug and alcohol abuse** can lead to dependence and **addiction** where people suffer **withdrawal** symptoms if they are unable to consume it.

Alcohol causes immediate **slowing of reaction times** and in the long term can cause **liver**, **circulatory and heart disease**.