AQA B5 Homeostasis and Response: Nervous Control COMBINED FOUNDATION (page 1 of 2)

Key word	Definition
Homeostasis	The regulation of internal conditions of a cell or organism
Stimulus	An environmental change
Negative feedback	Is how changes in the body get reversed back to the optimal conditions
Receptor	A cell that detects stimuli
Coordination centre	Receives and processes information (brain, spinal cord, pancreas)
Central nervous system	The brain and spinal cord
Neurone	A cell that transmits electrical impulses
Effector	A gland or muscle that causes a response
Response	Restores optimum conditions
Synapse	A gap between two neurones
Reflex	A fast, automatic nervous action that doesn't use the conscious part of the brain

The Sense Organs	
Sense Organ	**Receptors sensitive to…**
ears	Sound and changes in position for balance
eyes	Light
skin	Touch, pressure, pain, temperature
nose and tongue	Chemicals for smell and taste

Required Practical - Reaction Time

The Nervous System Voluntary Response Pathway

This system enables humans to react to their surroundings and coordinate their behaviour.

Information from receptors passes along cells (neurones) as electrical impulses to the central nervous system (CNS). The CNS coordinates the response of the effectors which may be muscles contracting or glands secreting hormones.

Pathway	Example
stimulus	Lights switch on
receptor	Cells in retina (eye)
sensory neurone	Carries impulse to coordinator
coordinator	Central nervous system (CNS) – brain or spinal cord
motor neurone (very long)	Carries impulse to effector
effector (muscle or gland)	Muscles connected to iris
response	Pupils get smaller

Homeostasis is the **regulation** of the **internal conditions** of a cell or organism to **maintain optimum conditions** for function, in response to internal and external changes. Homeostasis maintain:

- Blood glucose concentration
- Body temperature
- Water concentration in blood

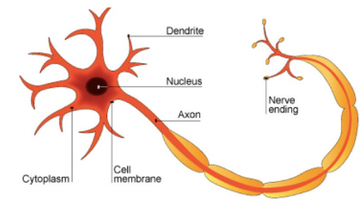
Homeostasis control systems involve:

Receptor cells	Coordination centres	Effectors
These detect stimuli (changes in the environment)	E.g. brain, spinal cord and pancreas that receive information from receptors	Muscles or glands, which bring about a response to restore optimum levels

Neurone

Neurones are specialised cells that carry electrical impulses. They have:

- A long axon so the impulse can be carried a long distance
- Dendrites / branches so that neurones can connect together



Reflexes

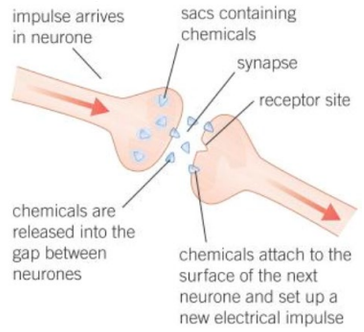
Reflex actions are **automatic** and **rapid**; they do not involve the conscious part of the brain and can **protect** humans from harm. They involve a **relay neurones.**

Reflex Arc Pathway

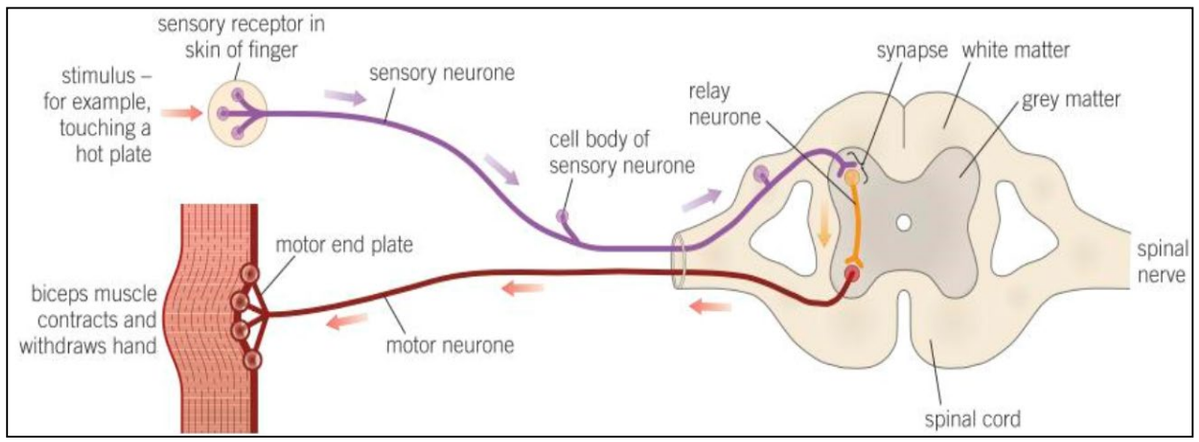
Pathway	Example
stimulus	Touch hot plate
receptor	Cells in finger
sensory neurone	Long - carries impulse from receptor to relay neurone in spinal cord
relay neurone	Allows impulses to travel between the sensory neurone and the motor neurone in the spinal cord
motor neurone	Long carries impulse to effector
effector	Biceps muscle contracts
response	Withdraw hand

Synapse

This is a gap where neurones meet. A chemical diffuses across the synapse and binds to a receptor on the next neurone. This causes an electrical impulse to be sent.



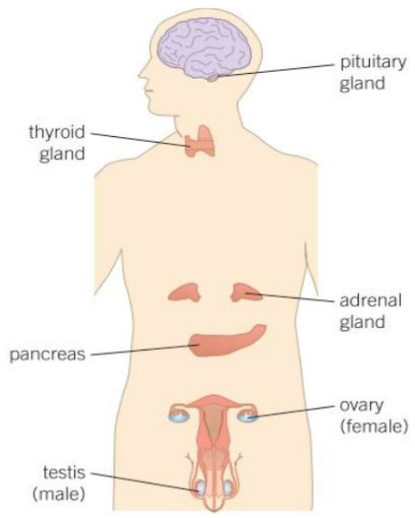
The Reflex Arc



AQA B5 Homeostasis and Response: Hormonal Control COMBINED FOUNDATION (page 2 of 2)

The human **endocrine system** is made of glands, which release chemicals called **hormones** directly into the **bloodstream**. The blood carries the hormone to a **target organ** where it produces an effect. Examples of these controls include blood glucose concentration, body temperature and water levels.
Compared to the nervous system the effects are slower but act for longer.

Endocrine Gland	Role of its Hormones
pituitary	The 'Master Gland'; secretes several hormones into the blood to stimulate other glands to release hormones
thyroid	Controls metabolic rate
pancreas	Controls glucose levels
adrenal	Prepares body for stress
ovaries	Makes the main female reproductive hormone oestrogen. Causes secondary sex characteristics to develop. Involved in menstrual cycle.
testes	Makes the main male reproductive hormone testosterone. Causes secondary sex characteristics to develop and stimulates sperm production in testes.



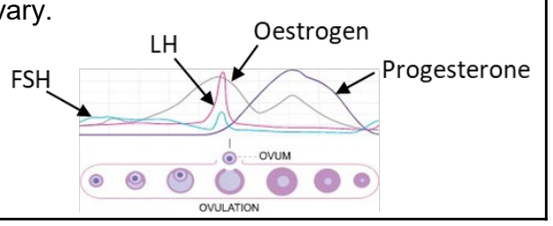
Menstrual cycle

Day 1-5: Menstruation. The uterus lining breaks down and leaves via the vagina.

Day 6-13: Uterus lining gets thicker. One egg cell in the ovary starts to mature.

Day 14: Ovulation. One egg cell is released from one ovary.

Day 15 – 30: If the egg cell is fertilised, it implants in the uterus lining.
If the egg cell is not fertilised, the uterus lining breaks down and the period begins.



Hormones controlling the menstrual cycle

Hormone	Gland	Role of the Hormone	Interaction with other hormones
follicle stimulating hormone (FSH)	Pituitary gland	Matures an egg in the ovary.	Stimulates oestrogen
luteinising hormone (LH)	Pituitary gland	Stimulates release of an egg (**ovulation**)	
oestrogen	Oestrogen	Stimulates uterus lining to develop.	Stimulates LH Inhibits FSH
progesterone	Oestrogen	Maintains uterus lining.	Inhibits LH

Thyroxine

Produced in thyroid gland, increases basal metabolic rate. It is important for growth and development. Thyroxine production is controlled by negative feedback.

Adrenaline

Produced in adrenal glands. Increases breathing/heart rate and blood flow to muscles. Prepares the body for 'fight or flight'.

Blood glucose concentration is monitored and controlled by the **pancreas.** It is controlled by negative feedback

Blood glucose too High	Pancreas produces the hormone **insulin.** This causes: • glucose to move from the blood into the cells • the liver and muscle cells to convert glucose in to **glycogen** for storage.
Blood glucose too low	Pancreas produces the hormone **glucagon.** This causes glycogen to be broken down into glucose.
Type 1 diabetes	Pancreas fails to produce enough insulin leading to uncontrolled blood glucose levels. **Treatment:** by insulin injection.
Type 2 diabetes	Body cells no longer respond to insulin. Obesity is a risk factor. **Treatment:** having a low sugar diet/low carbohydrate diet and increasing exercise.

Contraception

Fertility is the ability to have offspring. Fertility can be controlled by a variety of hormonal and non-hormonal methods of contraception

Name	How it works
oral contraceptive (pill)	Contains hormones to inhibit FSH so no eggs mature
injection, implant, patch	Releases progesterone slowly to inhibit the maturation and release of eggs
barrier methods - condoms/diaphragms	prevent sperm from reaching egg
intrauterine devices	Prevent implantation of an embryo
spermicidal agents	Kill or disable sperm
abstinence	Avoiding sex when an egg may be in the oviduct
surgery	Male or female sterilisation (surgery to stop you having offspring e.g. vasectomy in males)

IVF (In Vitro Fertilisation)

Hormones are used in modern reproductive technologies to treat infertility

- FSH and LH are given to the woman as fertility drugs to help several eggs mature
- Eggs are collected from mother
- Eggs are fertilised by fathers sperm in a lab
- The fertilised eggs develop into embryos
- One or two embryos are inserted into the mothers uterus (womb)

Disadvantages of IVF: Emotional and physical stress, low success rates, multiple births risk to mother and babies