

The iris can dilate the pupil (aperture) to let in more light in dim conditions

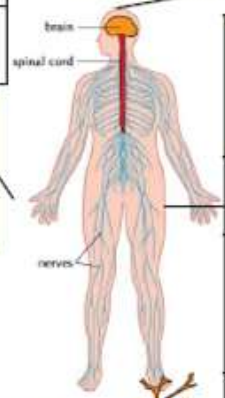
Structures of the eye	Retina	Light sensitive cell layer.
	Optic nerve	Carries impulse to brain.
	Sclera	Protects the eye.
	Cornea	Transparent layer that covers the pupil and iris.
	Iris	Pigmented layer, controls size of pupil.
	Ciliary muscles	Controls thickness of lens.
Suspensory ligaments	Connects lens to ciliary muscles.	

Sense organ containing receptors sensitive to light intensity and colour

Human control systems include	Cells called receptors	Detect stimuli (changes in environment).
	Coordination centres	e.g. brain, spinal cord and pancreas that receive information from receptors.
	Effectors	Muscles or glands, which bring about responses to restore optimum levels.

Detect stimuli (changes in environment).
e.g. brain, spinal cord and pancreas that receive information from receptors.
Muscles or glands, which bring about responses to restore optimum levels.

Enables humans to react to their surroundings and to co-ordinate their behaviour



Information from receptors passes along cells (neurons) as electrical impulses to the central nervous system (CNS)

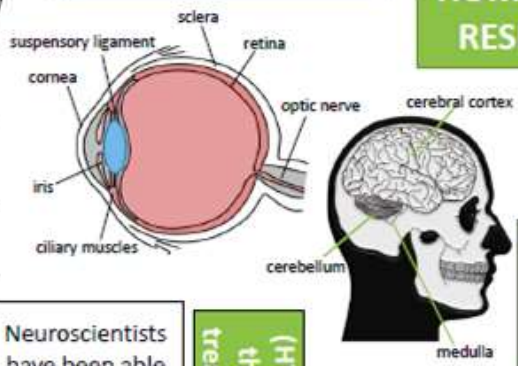
The CNS is the brain and the spinal cord.

Coordinates the response of effectors; muscles contracting or glands secreting hormones

The Eye (Bio only)

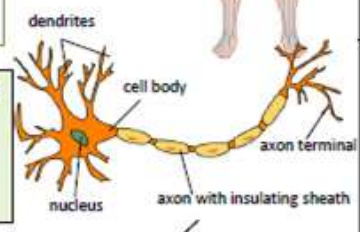
AQA GCSE HOMEOSTASIS AND RESPONSE part 1

The human nervous system



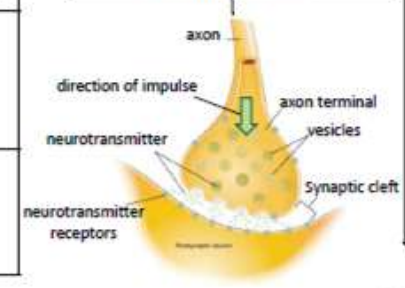
The Brain (Bio only)

The brain controls complex behaviour. It is made of billions of interconnected neurones.



Typical motor neurone

Synapse (gap where two neurones meet).



Accommodation is the process of changing the shape of the lens to focus

Near object	Far object
Ciliary muscles contract, suspensory ligaments loosed, lens get thicker, light is more refracted.	Ciliary muscles relax, suspensory ligaments pulled tight, lens pulled thin, light is only slightly refracted.

Neuroscientists have been able to map regions of the brain by studying patients with brain damage, electrical stimulation and MRI.

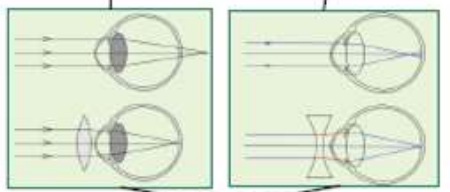
(HT) The complexity and delicacy of the brain makes investigating and treating brain disorders very difficult



The brain has different regions that carry out different functions.

Cerebral cortex	Largest part of the human brain. Higher thinking skills e.g. speech, decision making.
Cerebellum	Balance and voluntary muscle function e.g. walking, lifting.
Medulla	Involuntary (automatic) body functions e.g. breathing, heart rate.

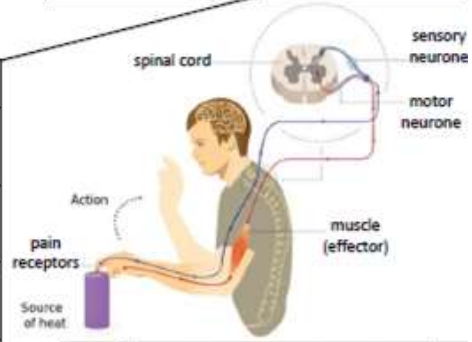
Hyperopia (long sightedness)	Myopia (short sightedness)
Treated using a convex lens so the light is focused on the retina.	Treated using a concave lens so light is focused on the retina.



New technologies now include hard/soft contact lens, laser surgery to change the shape of the cornea and a replacement lens in the eye.

Treating brain damage and disease
e.g. **Lobotomy - cutting part of the cerebral cortex**
Benefit: thought to alleviate the symptoms of some mental illnesses.
Risks: bleeding in the brain, seizures, loss of brain function. Procedure was abandoned in the 1950s due to risk.

Reflex arc	Receptor	Detect stimuli.
	Sensory neurone	Long axon carries impulse from receptor to spinal cord.
	Synapse	Gap where neurones meet. Chemical message using neurotransmitter.
	Relay neurone	Allows impulses to travel between sensory and motor neurones in the spinal cord.
	Motor neurone	Long axon carries impulse from receptor to effector.
Effector	Muscle or gland that carries out response.	



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

AQA GCSE HOMEOSTASIS AND RESPONSE PART 2

Response to internal and external change

Controls in the human body	<i>Blood glucose concentration</i>	These automatic control systems may involve nervous responses or chemical responses.
	<i>Body temperature</i>	
	<i>Water levels</i>	

The regulation of internal conditions of a cell or organism to maintain optimum conditions for function.

Homeostasis maintains optimal conditions for enzyme action and all cell functions.

Homeostasis

Water and nitrogen balance (Biology only)

If body cells lose or gain too much water by osmosis they do no function efficiently.	<i>Uncontrolled water/ion/urea loss</i>	Water exhaled in lungs, water, ions and urea in sweat.
	<i>Controlled water/ion/urea loss</i>	Via the kidneys in urine.

Kidney failure is treated by organ transplant or dialysis.

Kidney function	<i>Maintain water balance of the body.</i>	Produce urine by filtration of the blood and selective reabsorption of glucose, ions and water.
		A dialysis machine removes urea from the blood by diffusion while maintaining ion and glucose levels.

(HT only) ADH	<i>Acts on kidney tubules to control water levels.</i>	Released by pituitary gland when blood is too concentrated. Water is reabsorbed back into the blood from the kidney tubules (NEGATIVE FEEDBACK).
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(HT only) digestion of proteins results in excess amino acids. In the liver they are de-aminated to form toxic ammonia which is converted to urea



Thermoregulatory centre (hypothalamus)

Control of body temperature (Biology only)

Monitoring body temperature	<i>Thermoregulatory centre</i>	Contains receptors sensitive to the temperature of the blood.
	<i>Skin</i>	Contains temperature receptors, sends nervous impulses to the thermoregulatory centre.

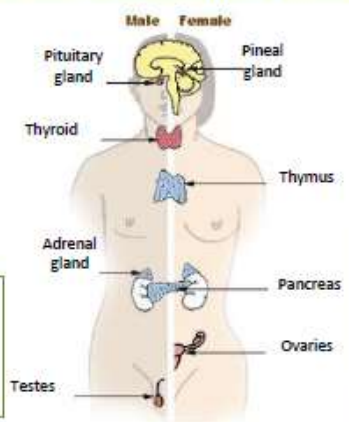
Body temperature	<i>Too high</i>	Blood vessels dilate (vasodilation), sweat produced from sweat glands.
	<i>Too low</i>	Blood vessels constrict (vasoconstriction), sweating stops, muscles contract (shivering).

(HT) Thermal energy is lost from blood near the surface of the skin, sweat evaporates transferring thermal energy.

(HT) Thermal energy loss at the surface of the skin is reduced, respiring muscles cells transfer chemical to thermal energy.



Human endocrine system



Endocrine system
Composed of glands which secrete chemicals called hormones directly into the bloodstream.
The blood carries the hormone to a target organ where it produces an effect. Compared to the nervous system effects are slower but act for longer.

Pituitary gland
'Master gland'; secretes several hormones into the blood
Stimulates other glands to produce hormones to bring about effects.

Control of blood glucose concentration

Negative feedback (HT only)	<i>Adrenaline</i>	Produced in adrenal glands, increases breathing/heart rate, blood flow to muscles, conversion glycogen to glucose. Prepares body for 'fight or flight'.
	<i>Thyroxine</i>	Produced in the thyroid gland, stimulates the basal metabolic rate. Important in growth and development.

Increasing thyroxine levels prevent the release of thyroid stimulating hormone which stops the release of thyroxine.

Blood glucose concentration	
<i>Monitored and controlled by the pancreas</i>	
Too high	(HT only) Too low
Pancreas produces the hormone insulin, glucose moves from the blood into the cells. In liver and muscle cells excess glucose is converted to glycogen for storage.	Pancreas produces the hormone glucagon that causes glycogen to be converted into glucose and released into the blood.

(HT) Rising glucose levels inhibit the release of glucagon in a negative feedback system. Insulin is released to reduce glucose levels and which cause the pancreas to release glucagon

Diabetes	
<i>Type 1</i>	<i>Type 2</i>
Pancreas fails to produce sufficient insulin leading to uncontrolled blood glucose levels. Normally treated by insulin injection.	Obesity is a risk factor. Body cells no longer respond to insulin. Common treatments include changing by diet and increasing exercise.

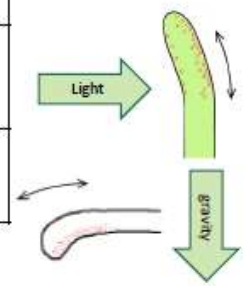
FSH and LH are used as 'fertility drugs' to help someone become pregnant in the normal way

Hormones are used in modern reproductive technologies to treat infertility

Plants produce hormones to coordinate and control growth

Plant responses using hormones (auxins)

<i>Light (phototropism)</i>	Light breaks down auxins and they become unequally distributed in the shoot. The side with the highest concentration of auxins has the highest growth rate and the shoot grows toward the light.
<i>Gravity (geotropism or gravitropism)</i>	Gravity causes an unequal distribution of auxins. In roots the side with the lowest concentration has the highest growth rate and the root grows in the direction of gravity. In new shoots from a seedling the unequal distribution of auxins causes the shoot to grow away from gravity.



In Vitro Fertilisation (IVF) treatment.

Involves giving a mother FSH and LH to stimulate the maturation of several eggs

The eggs are collected from the mother and fertilised by sperm from the father in a laboratory.

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The fertilised eggs develop into embryos.

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At the stage when they are tiny balls of cells, one or two embryos are inserted into the mother's uterus (womb).

(HT only) Gibberellins are important in initiating seed germination.

(HT only) Ethene controls cell division and ripening of fruits.

The use of hormone to treat infertility (HT only)

Plant hormones

Use of plant hormones (HT only)

Plant growth hormones are used in agriculture and horticulture

<i>Auxins</i>	Weed killers, rooting powders, promoting growth in tissue culture.
<i>Ethene</i>	Control ripening of fruit during storage and transport.
<i>Gibberellins</i>	End seed dormancy, promote flowering, increase fruit size.

AQA GCSE HOMEOSTASIS AND RESPONSE PART 3

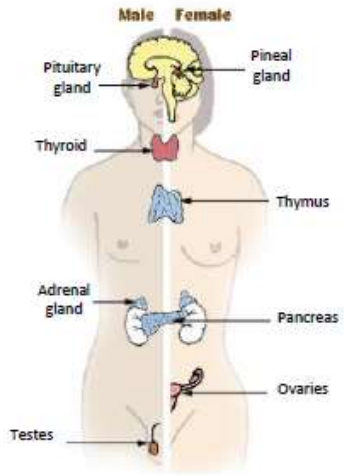
Potential disadvantages of IVF

Emotional and physical stress.
Success rates are not high.
Multiple births risk to mother and babies.

Hormones in human reproduction

During puberty reproductive hormones cause secondary sexual characteristics to develop

<i>Oestrogen (main female reproductive hormone)</i>	<i>Testosterone (main male reproductive hormone)</i>
Produced in the ovaries. At puberty eggs begin to mature releasing one every 28 days – ovulation.	Produced in the testes stimulating sperm production.

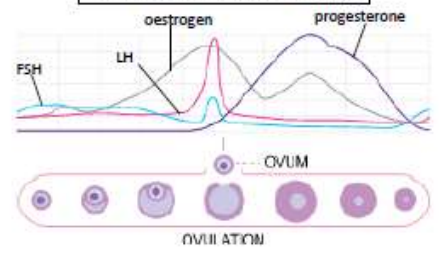


Contraception

Fertility can be controlled by hormonal and non hormonal methods

<i>Oral contraceptives</i>	Contain hormones to inhibit FSH production so that no eggs mature.
<i>Injection, implant, skin patch</i>	For slow release of progesterone to inhibit the maturation and release of eggs for months or years.
<i>Barrier methods</i>	Condoms or diaphragms which prevent sperm reaching the egg.
<i>Intrauterine devices</i>	Prevent implantation of an embryo or release a hormone.
<i>Spermicidal agents</i>	Kill or disable sperm.
<i>Abstaining</i>	Avoiding intercourse when an egg may be in the oviduct.
<i>Surgery</i>	Male or female sterilisation.

(HT only) a graph of hormone levels over time



Menstrual cycle	<i>Follicle stimulating hormone (FSH)</i>	Causes maturation of an egg in the ovary.	(HT) FSH stimulates ovaries to produce oestrogen.
	<i>Luteinising hormone (LH)</i>	Stimulates release of an egg.	(HT) Oestrogen stops FSH production and stimulates LH production in pituitary gland.
	<i>Oestrogen and progesterone</i>	Maintain uterus lining.	