

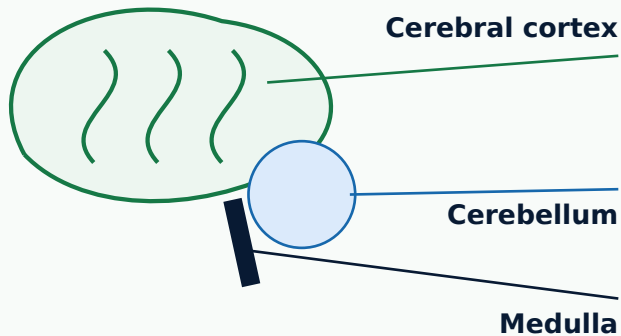
B5 Brain, eye and coordination

Separate Biology Paper 2 extras | AQA 8461 | Core: Foundation + Higher

Supplement to shared content: revise the main topic sheets as well.

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Brain structure and function



The brain contains billions of interconnected neurones and coordinates complex behaviour.

Cerebral cortex: consciousness, intelligence, memory and language.

Cerebellum: coordinates muscular activity and balance.

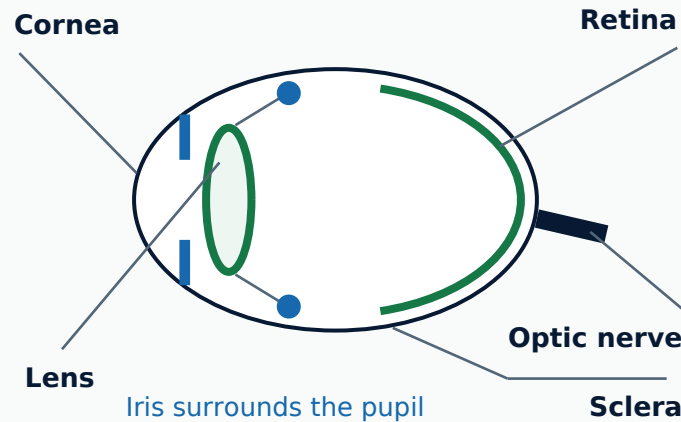
Medulla: controls unconscious activities such as breathing and heart rate.

Temperature control centre

The **thermoregulatory centre** in the brain monitors blood temperature. Skin receptors detect external temperature and send impulses to it.

Too hot: sweating and vasodilation. Too cold: shivering and vasoconstriction. Detailed mechanisms are Higher content.

The eye: receptor organ



Retina: light-sensitive receptor cells detect light intensity and colour. The optic nerve carries impulses to the brain.

Cornea: refracts light. **Lens:** changes shape to focus light onto the retina. **Sclera:** tough outer layer; protects the eye and supports its shape.

Iris: controls pupil size and therefore light entry. **Ciliary muscles** and **suspensory ligaments** alter lens shape.

Pupil reflex

Bright light: circular iris muscles contract and radial muscles relax; pupil narrows. Dim light: the reverse; pupil widens.

The pupil is a hole, not a muscle. Pupil size controls light entry; accommodation controls focus.

Accommodation and sight defects

Focus on	Ciliary muscles / ligaments / lens
Near object	Contract / loosen / thicker and more curved: more refraction.
Distant object	Relax / tighten / thinner and less curved: less refraction.

Accommodation changes lens shape so images of objects at different distances focus on the retina.

Correcting focus

Myopia (short-sightedness): distant objects focus in front of the retina. A concave (diverging) lens corrects it.

Hyperopia (long-sightedness): nearby objects would focus behind the retina. A convex (converging) lens corrects it.

Spectacles and contact lenses refract light. Other treatments include laser surgery to change cornea shape, and replacing the lens.

Exam precision: name the muscles, state the tension of the ligaments, then link lens shape to the amount of refraction.

B5 Kidneys, tropisms and practical skills

Separate Biology Paper 2 extras | AQA 8461 | Core: Foundation + Higher

Supplement to shared content: revise the main topic sheets as well.

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Kidneys and water balance

Water leaves in exhaled air, sweat and urine. Ions and small amounts of urea also leave in sweat. Sweat losses cannot be adjusted to maintain water/ion balance.

Cells can gain or lose too much water by osmosis if blood water/ion balance is wrong.

Blood plasma filtered



Useful substances reabsorbed



Urine: urea + excess water / ions

Kidneys filter the blood and selectively reabsorb **all glucose**, required ions and required water. Urine contains urea plus excess water and ions.

Kidney failure

Dialysis: wastes and excess ions/water move out of blood across a partially permeable membrane. Repeated treatment is needed; diet and fluid intake may be restricted.

Transplant: a donor kidney can restore normal regulation, but surgery, shortage of donors and rejection are risks. Immunosuppressant drugs reduce rejection but increase infection risk.

Tropisms and auxin

Tropism: a directional growth response to a stimulus. Auxins control growth responses to light and gravity.

Light



A shoot grows towards light (**positive phototropism**) and away from gravity (**negative gravitropism**). Unequal auxin distribution causes unequal growth.

In shoots, auxin promotes cell elongation. With light from one side, the shaded side elongates more, bending the shoot towards the light.

Roots show positive gravitropism. High auxin concentration inhibits elongation in roots: the lower side grows less, so the root bends down.

Do not generalise: a concentration of auxin can have different effects in roots and shoots.

Required Practical 8: seedlings

Aim: investigate how light or gravity affects newly germinated seedlings; record effects with careful drawings and measurements.

Use equal-aged seedlings of the same species on moist material. Compare one-sided light with an evenly lit control; keep water, temperature and time equal.

For gravity, place seedlings horizontally in darkness to remove directional light. Compare with suitable controls. A rotating clinostat can prevent a constant directional gravity stimulus.

Mark starting positions; measure shoot/root length and direction or angle at fixed intervals. Use several seedlings per condition and repeat. Record units and calculate means.

Result	Explanation
Shoot bends to light	Shaded side elongates more.
Root bends down in dark	Lower side elongates less.

Evaluate: keep moisture equal; avoid damaged seedlings; compare change, not just final size. Use drawings with a scale. Wash hands after handling plant material.

B5 Higher mechanisms and applications

Separate Biology Paper 2 extras | AQA 8461 | Higher Tier only

Supplement to shared content: revise the main topic sheets as well.

Brain evidence and heat balance

Localising brain function: link damaged regions to lost abilities; electrically stimulate regions and observe responses; use MRI scans to study brain structure.

Brain research and treatment are difficult: the organ is complex, delicate and poorly regenerates. Damage can have serious or permanent effects; treatments require risk-benefit decisions.

Too hot

Vasodilation: skin blood vessels widen, increasing blood flow near the surface and energy transfer to the surroundings.

Sweating: sweat evaporates, transferring energy from the skin. Evaporation, not simply producing sweat, cools the body.

Too cold

Vasoconstriction: skin blood vessels narrow, reducing surface blood flow and energy transfer.

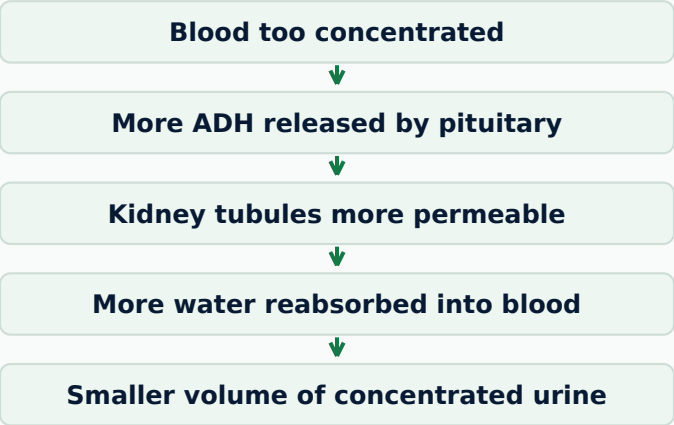
Shivering: rapid muscle contractions increase respiration and energy release, warming the body.

Blood vessels widen/narrow; they do not move nearer the skin. These responses use negative feedback.

Urea and ADH control

Digested proteins supply amino acids. Excess amino acids cannot be stored. The liver **deaminates** them to form ammonia, which is toxic and is converted to urea.

Urea travels in the blood to the kidneys, where it is removed in urine. **Liver makes urea; kidneys excrete it.**



ADH is released by the pituitary when blood is too concentrated. It increases water reabsorption by changing kidney tubule permeability.

When blood is too dilute: less ADH, less water reabsorbed, and a larger volume of dilute urine. Negative feedback returns water concentration towards normal.

Plant hormones in agriculture

Hormone	Function and uses
Auxin	Controls growth. Uses: selective weedkillers, rooting powders, and promoting growth in tissue culture.
Gibberellins	Initiate seed germination. Uses: end seed dormancy, promote flowering, and increase fruit size.
Ethene	Controls cell division and fruit ripening. Used to control ripening during transport, storage and sale.

Selective weedkiller: an auxin-like chemical disrupts growth in susceptible broad-leaved weeds while leaving cereal crops or grasses largely unharmed at the correct dose.

Rooting powder: encourages cuttings to develop roots, allowing rapid cloning of useful plants.

Exam precision: pair a named hormone with its effect and the practical benefit. Ethene is a gas; auxin and gibberellin are not interchangeable.