

Coordination, homeostasis and plant responses

Revision notes • How organisms respond to change using a stimulus, receptor and effector, what homeostasis is, and how plants respond to light and gravity.

For Pearson Edexcel International GCSE Biology 4BI1 and Science (Double Award) 4SD0. **Biology only** is not in the Double Award and is only examined on Paper 2.

Coordination, homeostasis and plant responses Spec 2.80-2.85

Responding to change: stimulus, receptor, effector Spec 2.80, 2.82

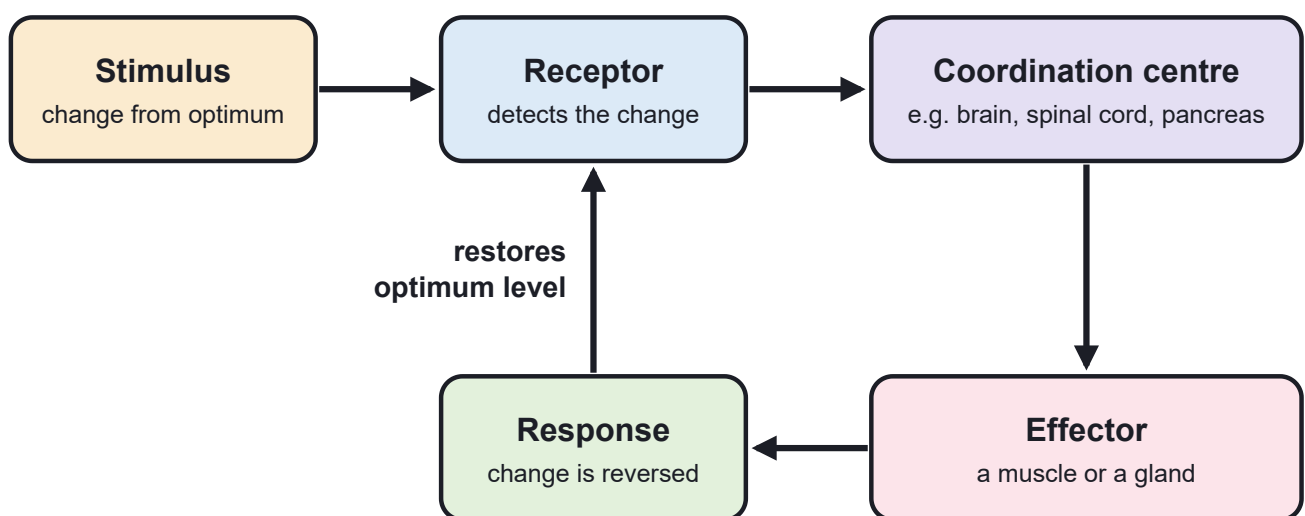
Organisms must respond to changes in their environment to survive. A change in the environment is a **stimulus**. Animals and plants both respond to stimuli, but they do it in different ways.

- Animals use the **nervous system** (fast, electrical impulses) and **hormones** (chemical messengers in the blood).
- Plants respond mainly by changing the way they **grow**, using plant hormones.

A **co-ordinated response** needs three parts: a stimulus, a receptor and an effector.

The parts of a co-ordinated response		
Part	What it does	Example
Stimulus	A change in the environment	A hot object touching the hand
Receptor	A cell or organ that detects the stimulus	Temperature receptors in the skin
Effector	A muscle or gland that carries out the response	A muscle that contracts to pull the hand away

In animals, a coordination centre (such as the brain or spinal cord) usually links the receptor to the effector. It receives information from the receptor and sends signals to the effector.



A control system in homeostasis: **stimulus** → **receptor** → **coordination centre** → **effector** → **response**. Here the response reverses the change and restores the optimum level.

Common mistake: Effectors are muscles or glands only. Do not write that the brain or a receptor is an effector.

Homeostasis Spec 2.81

Homeostasis

The maintenance of a constant internal environment.

Conditions inside the body change when we eat, exercise, or move between hot and cold places. The body responds to keep the conditions inside the body **constant**.

Two examples of homeostasis

Condition	Example of a change
Body water content	Sweating, or drinking a lot
Body temperature	Hot or cold surroundings, or exercise

This matters because **enzymes and cells work best in a narrow range of conditions**. If conditions move too far from normal, reactions in cells slow down or stop.

Exam tip: Constant does not mean the level never changes. It means the body brings it back to a set level, so say 'kept within narrow limits'.

Plant tropisms and auxin Spec 2.83, 2.84, 2.85

Plants respond to stimuli, such as light and gravity. They respond by growing in a particular direction. A growth response to a stimulus is called a **tropism**. Growth towards the stimulus is positive. Growth away from the stimulus is negative.

- **Phototropism**: growth in response to light.
- **Geotropism** (also called gravitropism): growth in response to gravity.

Tropisms of shoots and roots

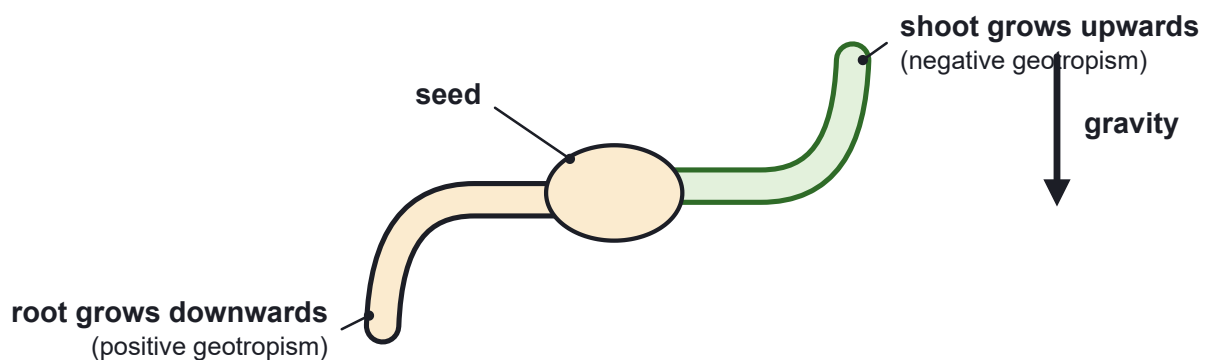
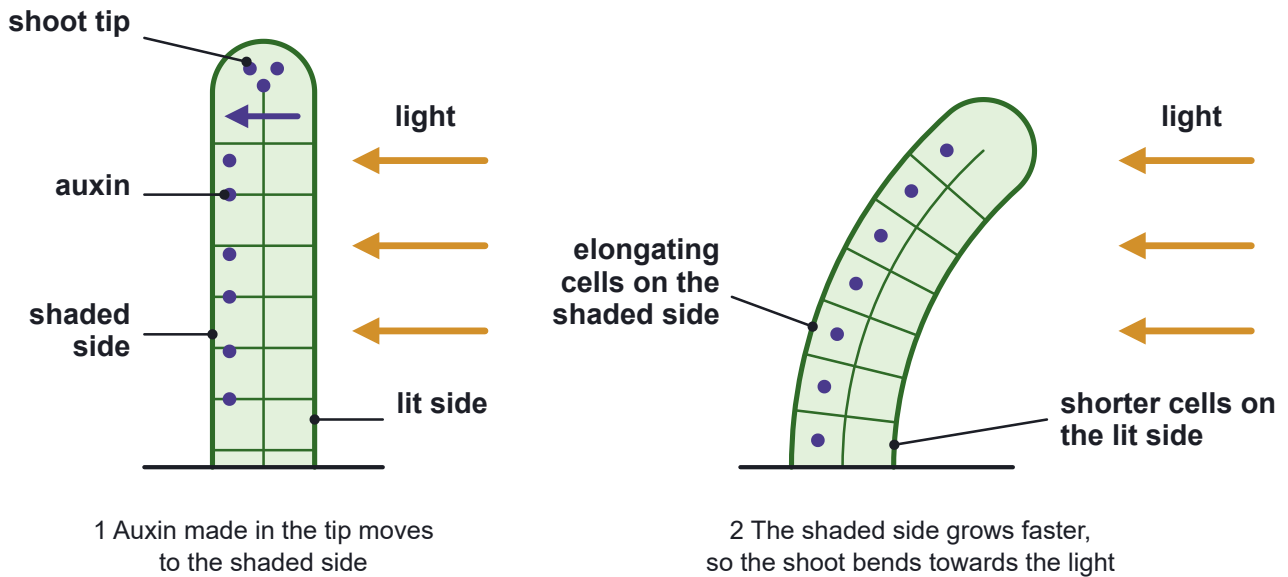
	Response to light	Response to gravity
Shoot (stem)	Positive phototropism (grows towards light)	Negative geotropism (grows upwards, away from gravity)
Root	Negative phototropism (grows away from light)	Positive geotropism (grows downwards, towards gravity)

These responses help the plant. Shoots grow towards light to take in more light for photosynthesis. Roots grow down into the soil, where they take in water and ions.

The role of auxin in phototropism of stems

Auxin is a plant hormone. It is made in the tip of the shoot and controls growth by making cells **elongate** (get longer).

1. Auxin is made in the tip of the shoot.
2. When light shines from one side, auxin moves to the shaded side of the shoot.
3. Auxin makes the cells on the shaded side elongate more, so they grow faster than the cells on the lit side.
4. The shoot bends towards the light.



3 Geotropism: the shoot grows up and the root grows down

Phototropism: auxin moves to the shaded side, those cells **elongate more** and the shoot bends towards the light.

Geotropism: shoots grow up and roots grow down.

Exam tip: Tell the story in order: where auxin is made, where it moves to, what it does to cell growth there, and which way the shoot bends as a result.

Quick check

1. What three parts are needed for a co-ordinated response?
2. What is homeostasis?
3. Give two examples of homeostasis.
4. Which way do roots respond to gravity?
5. Where does auxin move to when light shines on a shoot from one side?

Quick check answers

Coordination, homeostasis and plant responses

1. A stimulus, a receptor and an effector.
2. The maintenance of a constant internal environment.
3. Control of body water content and control of body temperature.
4. Roots grow downwards: positive geotropism.
5. To the shaded side, where it makes cells elongate.