

Plant hormones

Revision notes • How auxin controls phototropism and gravitropism, plus gibberellins, ethene and the uses of plant hormones by growers.

For AQA GCSE Biology 8461 and Combined Science: Trilogy 8464. **Triple only** is not in Combined Science. **Higher tier** is only on the Higher paper.

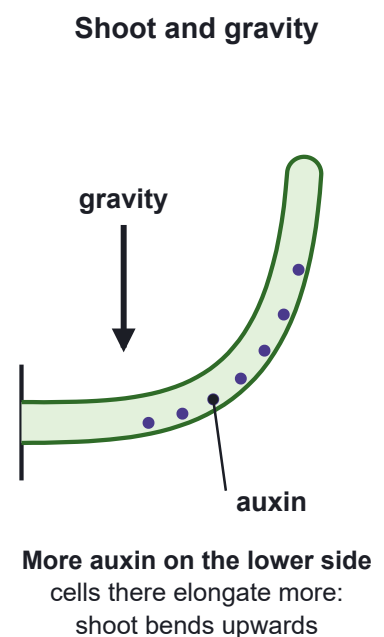
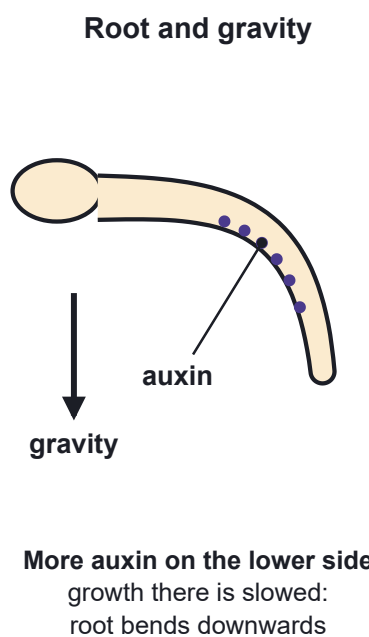
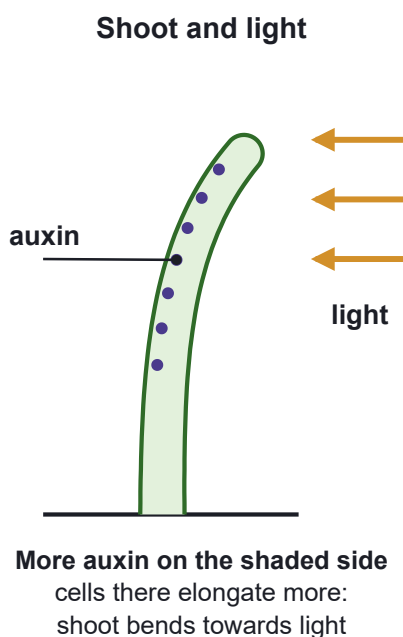
Plant hormones Spec 4.5.4 Triple only

Plant hormones, phototropism and gravitropism Spec 4.5.4.1

Plants produce **hormones** to coordinate and control **growth** and **responses to light (phototropism)** and **gravity (gravitropism or geotropism)**.

Unequal distributions of auxin cause **unequal growth rates** in plant roots and shoots.

Auxin and plant responses			
Response	Where auxin builds up	Effect on growth	Result
Shoot growing towards light	On the shaded side of the shoot	Cells on the shaded side elongate more	The shoot bends towards the light
Root growing downwards	On the lower side of the root	Growth of cells on the lower side is slowed down	The root bends downwards, in the direction of gravity
Shoot growing upwards	On the lower side of the shoot	Cells on the lower side elongate more	The shoot bends upwards, away from gravity



Unequal distribution of auxin causes unequal growth, so shoots bend towards light and away from gravity, and roots bend towards gravity.

Higher tier

Gibberellins and ethene

Higher tier

- **Gibberellins** are important in **initiating seed germination**.
- **Ethene** controls **cell division and ripening of fruits**.

Higher tier

You do not need to know how gibberellins and ethene work.

Exam tip: Always say that the auxin is unequally distributed. Then say which side has more auxin and what that does to growth on that side.

Required practical: Required practical activity 8: investigate the effect of light or gravity on the growth of newly germinated seedlings. Record results as both length measurements and as careful, labelled biological drawings.

1. Germinate seeds (for example cress) on damp cotton wool or filter paper in a dish.
 2. For light: place identical seedlings in a box with a slit that lets light in from one side only. Keep a control set in even light all round.
 3. For gravity: fix seedlings in a dish, turn the dish on its side so the roots point sideways and keep it in the dark. Keep a control set upright.
 4. Measure the length of the shoot (and root) with a ruler at regular intervals, and make a labelled drawing of each seedling to show the direction of growth.
 5. Compare the treated seedlings with the control seedlings.
- Independent variable: the direction of the light, or the position of the seedling (gravity).
 - Dependent variable: the direction and length of growth.
 - Control variables: the type and age of seedling, temperature and the amount of water. Keep the gravity test in the dark so light does not affect the result.
 - Safety: wash your hands after handling seedlings and compost, and do not eat any seeds or seedlings.
 - Typical results: shoots bend towards the light; roots bend down; shoots grow upwards even in the dark.

Uses of plant hormones Spec 4.5.4.2

Plant growth hormones are used in **agriculture and horticulture** to control plant growth.

Uses of plant hormones	
Hormone	Use
Auxins	As weed killers ; as rooting powders ; for promoting growth in tissue culture
Ethene	In the food industry to control ripening of fruit during storage and transport
Gibberellins	To end seed dormancy ; to promote flowering ; to increase fruit size

Using hormones as weed killers can affect biodiversity. Killing weeds helps the crop grow, but it also reduces the number of other plant species in the area, and so the animals that depend on them.

Exam tip: Match the hormone to its use: auxin for weed killer, rooting powder and tissue culture; ethene for ripening; gibberellins for dormancy, flowering and fruit size.

Quick check

1. Which hormone causes unequal growth in roots and shoots?
2. Why does a shoot bend towards light?
3. What do the terms phototropism and gravitropism mean?
4. **Higher tier** Name one use of gibberellins.

Quick check answers

Plant hormones

1. Auxin.
2. Auxin builds up on the shaded side, so cells there grow more and the shoot bends towards the light.
3. Phototropism is a growth response to light. Gravitropism (geotropism) is a growth response to gravity.
4. Any one of: ending seed dormancy, promoting flowering, increasing fruit size.