

Tropic responses

Revision notes · Gravitropism and phototropism, how auxin controls shoot growth, and how to investigate tropisms.

For Cambridge IGCSE Biology 0610 (and 0970, which has the same content). **Supplement** is Extended content, only examined on Papers 2 and 4.

Tropic responses Spec 14.5

Phototropism, gravitropism and auxin Spec 14.5.1, 14.5.2, 14.5.4, 14.5.5

Gravitropism is a response in which parts of a plant grow towards or away from gravity.

Phototropism is a response in which parts of a plant grow towards or away from the direction of the light source.

Gravitropism	A response in which parts of a plant grow towards or away from gravity.
Phototropism	A response in which parts of a plant grow towards or away from the direction of the light source.

Tropisms in shoots and roots		
Plant part	Response to light	Response to gravity
Shoot	Grows towards light	Grows away from gravity (upwards)
Root	Grows away from light	Grows towards gravity (downwards)

Supplement

Chemical control of plant growth

Supplement

Phototropism and gravitropism of a shoot are examples of the **chemical control of plant growth**. The chemical is a plant hormone called **auxin**.

Supplement

- Auxin is made in the shoot tip.
- Auxin diffuses through the plant from the shoot tip.
- Auxin is unequally distributed in response to light and gravity.
- Auxin stimulates cell elongation.

Supplement

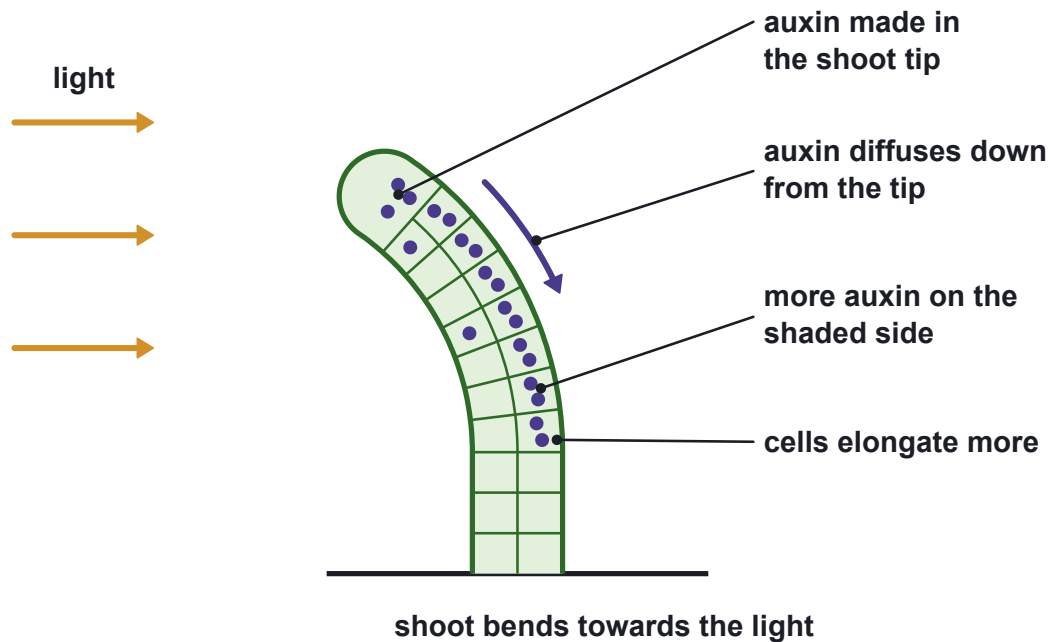
Phototropism of a shoot: when light shines from one side, auxin builds up on the shaded side. Cells on the shaded side elongate more than cells on the lit side, so the shoot bends towards the light.

Supplement

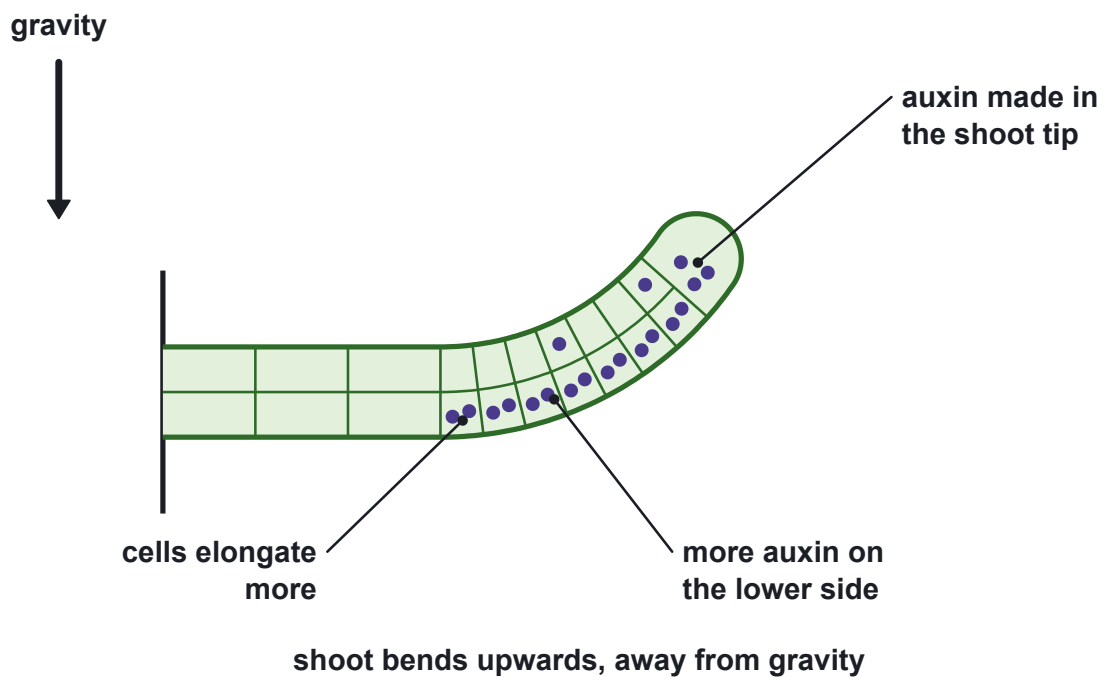
Gravitropism of a shoot: when a shoot is on its side, auxin builds up on the lower side. Cells on the lower side elongate more, so the shoot bends upwards, away from gravity.

Supplement

Phototropism of a shoot



Gravitropism of a shoot



Auxin in shoots: more auxin on one side makes the cells on that side elongate more.

Supplement

*Exam tip: Always say auxin is unequally distributed, and that it makes cells **elongate**. Do not say auxin makes cells 'divide' or that the shoot 'grows towards' without saying which side has more auxin.*

Investigating tropisms Spec 14.5.3

You can investigate **gravitropism** and **phototropism** in the shoots and roots of young seedlings, such as cress or bean seedlings. Grow them on damp cotton wool or filter paper in clear dishes so the roots can be seen.

Phototropism

1. Grow seedlings of the same species and age in identical clear dishes on damp cotton wool or filter paper, with equal water.
2. Put one set in a box with a slit or hole so light reaches them from one side only.
3. Put a control set in the same conditions but with light from all sides, or in the dark.
4. Leave for several days, then record the direction of growth of the shoots and roots, with a sketch or by measuring the angle.

Gravitropism

1. Place germinating seeds on damp cotton wool or paper in a dish, and fix the dish upright so the seeds are held in place.
2. Keep one dish upright and turn another on its side. Keep both in the dark so light does not affect the result.
3. Leave for several days, then record the direction of growth of the shoots and roots.

Typical results

Plant part	Light from one side	Dish turned on its side (dark)
Shoot	Bends towards the light	Bends upwards
Root	Bends away from the light	Bends downwards

Practical skill: Change only one variable. For gravitropism keep the seedlings in the dark, and for phototropism keep their position fixed. Keep temperature and water the same, and use several seedlings so one odd result does not mislead you.

Quick check

1. Define phototropism.
2. In which direction does a root grow in response to gravity?
3. **Supplement** Where is auxin made in a shoot?
4. **Supplement** What does auxin do to shoot cells?

Quick check answers

Tropic responses

1. A response in which parts of a plant grow towards or away from the direction of the light source.
2. Towards gravity (downwards).
3. In the shoot tip.
4. It stimulates cell elongation.