Plant Responses and Hormones Notes

Science Exams Sorted www.scienceexamssorted.co.uk

Plant hormones can cause changes in growth and development of a plant or fruit. These changes can give the plant an advantage by moving it towards a useful substance or by having its fruit ripen at the same time of year.

Let's look at how this works and how it can be used. Plant growth responses are called **tropisms**. What is a tropism?

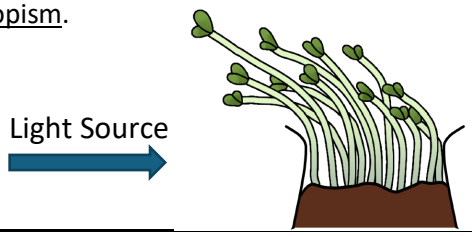
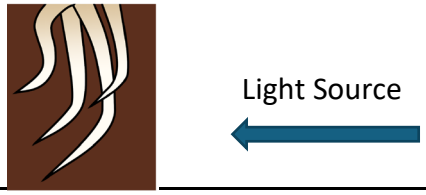
A tropism: a growth in response to a stimulus.

The stimulus could be something the plant needs to grow. The main stimuli are **sunlight and gravity**.
There are two categories of tropism, a positive tropism and a negative tropism.

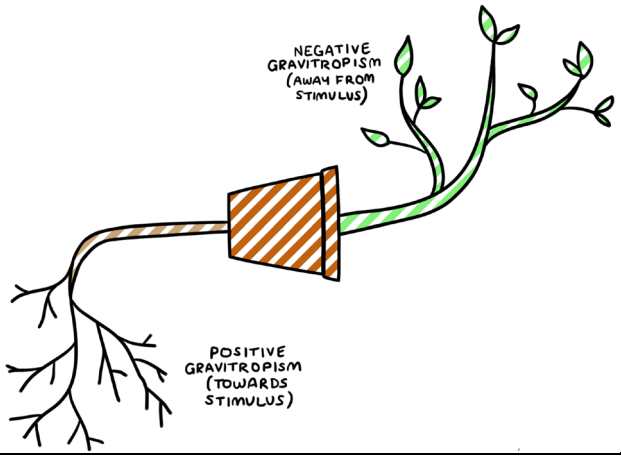
A positive tropism: where part of the plant grows **towards** the stimulus.

A negative tropism: where part of the plant grows **away** from the stimulus.

Let's now look at each type of tropism in detail. Let's begin with phototropism 😊

Phototropism	
Positive Phototropism	**Negative Phototropism**
What is it? Where part of the plant grows towards a source of light.	**What is it?** Where part of the plant grows away from a source of light.
What part does it? The stem and leaves.	**What part does it?** The roots.
Why does it do it? To try to get as much sunlight as possible for photosynthesis.	**Why does it do it?** This ensures roots grow down into the soil to anchor the plant and to find water and mineral ions. Also to prevent the roots from drying out.
The image below is of a plant showing positive phototropism. 	The image below is of the roots of a plant showing negative phototropism. 

Gravitropism	
Positive Gravitropism	**Negative Gravitropism**
What is it? Where part of the plant grows towards gravity.	**What is it?** Where part of the plant grows away from gravity.
What part does it? The roots.	**What part does it?** The stems and leaves.
Why does it do it? This ensures roots grow down into the soil to anchor the plant and to find water and mineral ions. Also to prevent the roots from drying out	**Why does it do it?** To try to get as much sunlight as possible for photosynthesis.



But that causes these tropisms? In a word… **Auxins** 😊

Auxins

Auxins: are a group of plant hormones which affect the growth and elongation of cells.
They are produced in the meristems.

Meristems: are regions of plants where stem cells are found and where cell division takes place. Meristems are found on the tips of shoots and the tips of roots.

How do auxins cause a plant to change direction? Stop!! How we answer this question depends on which part of the plant (shoots or roots) the question has asked about!

This is quite a popular question in paper 2. Typically worth 3 marks. Let's look at how to answer this question 😊

Let's look at how auxins work in shoots first…

1. The auxin gathers on the side of the shoot not facing the stimulus.
2. This build-up of auxin causes cell elongation on this side.
3. This causes the plant to bend and face the stimulus.

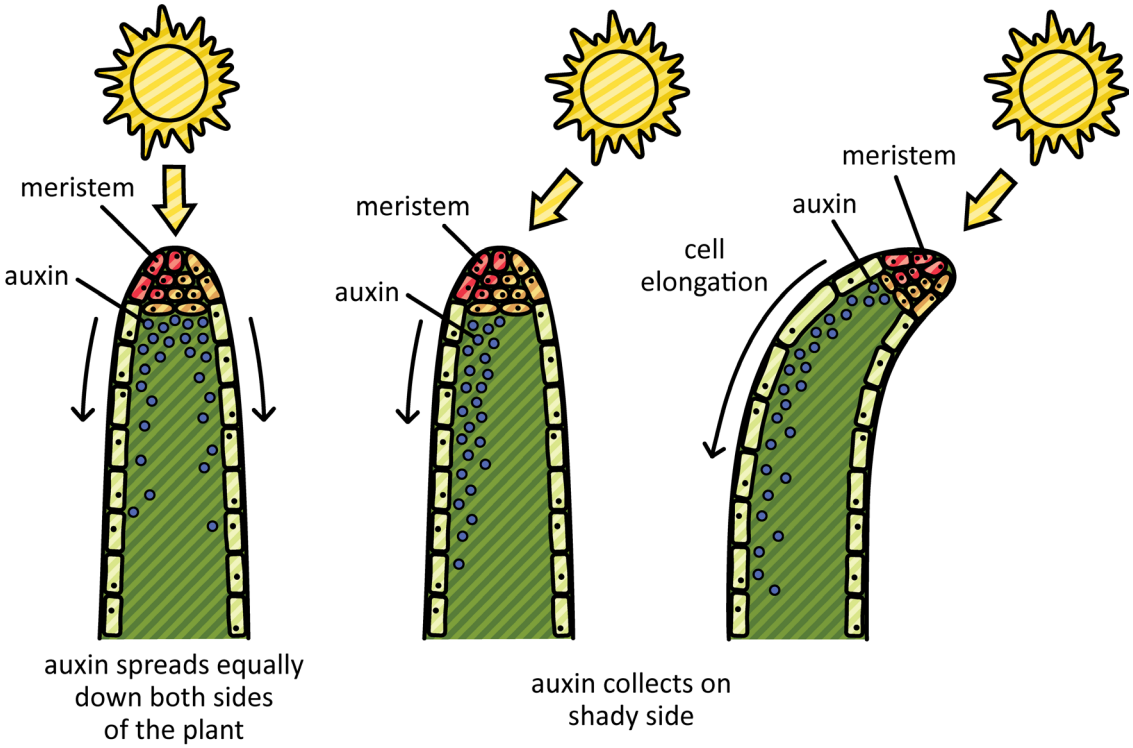
Now let's look at how it works for the roots…

1. The auxin gathers on the lower side of the root due to gravity.
2. This build-up of auxin **inhibits** (stops) cell elongation on this side.
3. Because the upper side grows faster, this causes the root to bend downwards towards gravity.

Remember, which one you write about will depend on what the question is asking. Please make sure that you read the question carefully. We can't say that enough.

Exam note: If the tips are removed from growing shoots, they cannot produce auxin, so phototropism cannot occur. If the tips are covered, light cannot break down the auxin, so phototropism cannot then occur either.

The figure below shows auxin causing a plant shoot to bend in positive phototropism.



Using Plant Hormones

Plant hormones have many uses, with most being in the production of food and in gardening.

Use	Description
Weed killers	Selective weed killer contains **artificial auxins** that cause broad leaved plants like dandelions to grow too quickly and die. They do not affect narrow leaf plants like wheat.
Rooting powder	The **auxin** in rooting powder makes stem cuttings quickly develop roots.
Controlling fruit ripening	Some fruits are picked before they are ripe, this can reduce the damage to the fruit during transport. **Ethene** gas can be used to ripen fruit.
Dormancy	Gibberellins are used to end dormancy. Dormancy is the period in which a seed or plant is waiting for ideal conditions for growth like the number of hours of day light in spring. Gibberellins trick the plant or seed into ending its dormancy and growing at any time of the year. Gibberellins can also be used to produce seedless fruit and help in flower formation.