

Plant disease

Revision notes • How plant diseases are detected and identified, ion deficiency conditions, and the physical, chemical and mechanical defences of plants.

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 disease **Spec 4.3.3** **Triple only**

Detection and identification of plant diseases **Spec 4.3.3.1**

Higher tier

Detecting plant disease

Higher tier

Plant diseases can be detected by:

Higher tier

- stunted growth
- spots on leaves
- areas of decay (rot)
- growths
- malformed stems or leaves
- discolouration
- the presence of pests.

Higher tier

Identifying plant disease

Higher tier

Identification can be made by:

Higher tier

- reference to a gardening manual or website
- taking infected plants to a laboratory to identify the pathogen
- using **testing kits that contain monoclonal antibodies**.

Higher tier

Exam tip: A testing kit works because the monoclonal antibody binds only to an antigen from the specific pathogen. Say this to explain why the result is reliable.

Plant pathogens and pests

Plants can be infected by a range of viral, bacterial and fungal pathogens as well as by insects. Your knowledge of plant diseases is restricted to:

- **tobacco mosaic virus** as a viral disease
- **black spot** as a fungal disease
- **aphids** as insects. Aphids are insect pests that feed on plants.

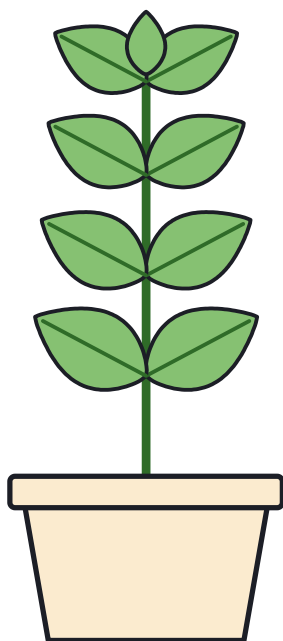
Ion deficiency conditions

Plants can be damaged by a range of ion deficiency conditions.

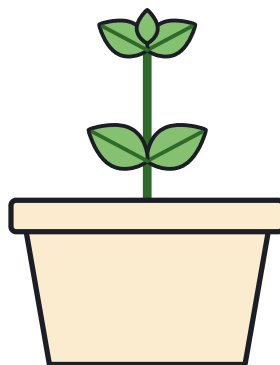
Ion deficiency conditions		
Ion missing	Why the plant needs it	Effect on the plant
Nitrate	Needed for protein synthesis, and therefore growth	Stunted growth
Magnesium	Needed to make chlorophyll	Chlorosis (yellow leaves)

Knowing about ion deficiencies allows horticulturists to provide the optimum conditions for plants. Your knowledge of ions is limited to nitrate and magnesium.

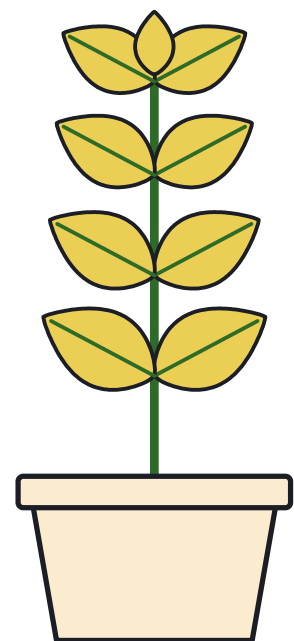
Common mistake: Chlorosis is a lack of chlorophyll, which makes leaves yellow. In the exam, link chlorosis to magnesium and stunted growth to nitrate.



Healthy



**Lacks nitrate:
stunted growth**



**Lacks magnesium:
yellow leaves (chlorosis)**

Lack of **nitrate** causes **stunted growth**; lack of **magnesium** causes **chlorosis** (yellow leaves).

Plant defence responses Spec 4.3.3.2

Plants have defences that resist the invasion of microorganisms and deter animals that might eat them. You need to be able to describe physical and chemical responses, and mechanical adaptations.

Plant defence responses

Type	Examples
Physical defences against microorganisms	Cellulose cell walls; a tough waxy cuticle on leaves; layers of dead cells around stems (bark on trees) which fall off
Chemical defences	Antibacterial chemicals; poisons to deter herbivores
Mechanical adaptations	Thorns and hairs deter animals; leaves which droop or curl when touched; mimicry to trick animals

Layers of dead cells around the stem, such as bark, act as a barrier. They fall off, which helps to remove any pathogens that have settled on them.

Mimicry means looking like something else so that animals are tricked, for example into avoiding the plant.

Exam tip: Group your answer under physical, chemical and mechanical, and give a specific example for each. A plain 'plants have thorns' needs the idea 'to deter animals'.

Quick check

1. Which ion deficiency causes stunted growth, and why?
2. Which ion deficiency causes chlorosis?
3. Name three physical plant defences.
4. Give two mechanical adaptations of plants.

Quick check answers

Plant disease

1. Nitrate. Nitrate ions are needed for protein synthesis and therefore growth.
2. Magnesium, because magnesium ions are needed to make chlorophyll.
3. Cellulose cell walls, a tough waxy cuticle on leaves, and layers of dead cells around stems.
4. Any two of: thorns and hairs, leaves that droop or curl when touched, mimicry.