Exercise walk-through

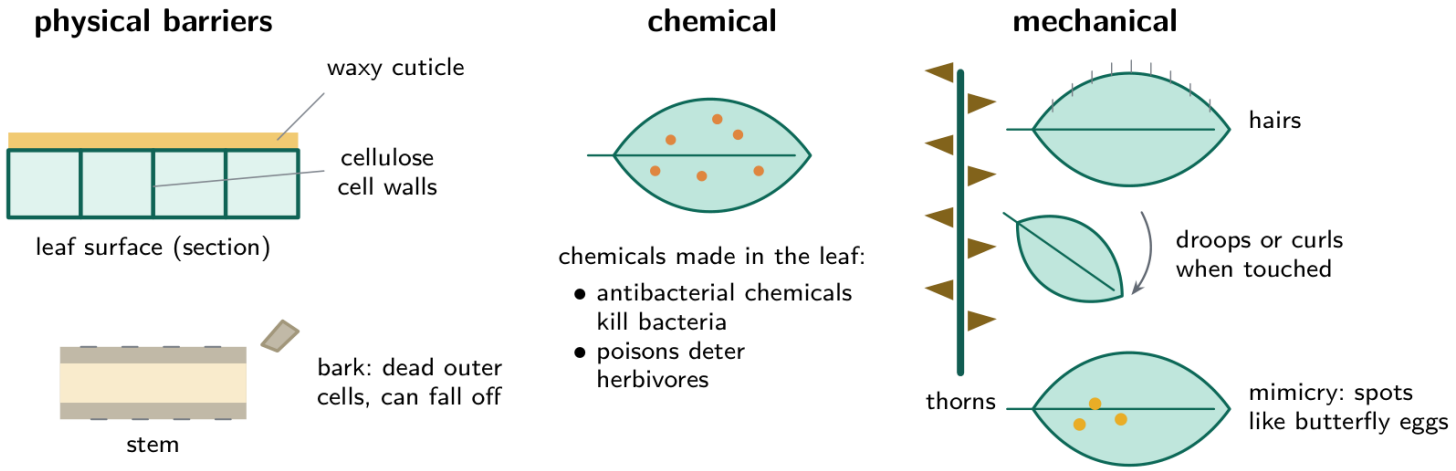
3.4
Plant disease – biology only (4.3.3)

AQA · GCSE · Biology

Plant diseases and defences (biology only)

- Physical: cellulose cell walls, a tough **waxy cuticle** on leaves, and a layer of dead cells (bark) on stems, which falls off with any pathogens on it.
- Chemical: antibacterial chemicals, and poisons that put off **herbivores** .
- Mechanical: thorns and hairs that stop animals eating the plant, leaves that droop or curl when touched, and mimicry, looking like something an animal will avoid.

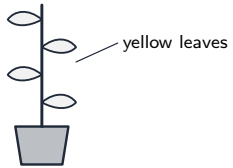
Figure: Plant diseases and defences (biology only)



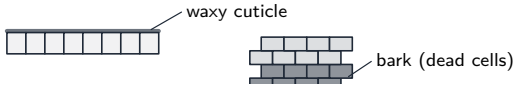
- Physical, chemical and mechanical plant defences; schematic, not to scale.
- Match each part of the diagram to the text.

Exercises 2.1·2.2

2.1 A plant has yellow leaves. Name the mineral ion it is probably short of. Explain why the leaves are yellow. [2]

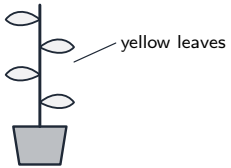


2.2 Give **two** physical defences that stop pathogens entering a plant. [2]



Exercises 2.1·2.2

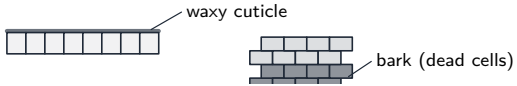
2.1 A plant has yellow leaves. Name the mineral ion it is probably short of. Explain why the leaves are yellow. [2]



2.1

- **magnesium**; magnesium is needed to make chlorophyll, so less chlorophyll is made

2.2 Give **two** physical defences that stop pathogens entering a plant. [2]

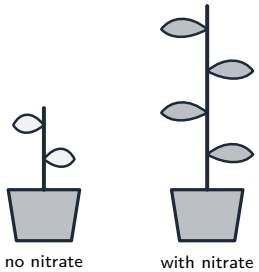


2.2

- any two: a waxy cuticle on leaves; cellulose cell walls; layers of dead cells on the stem (bark)

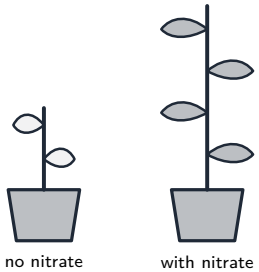
Exercise 3.1

3.1 A plant is grown in soil with no nitrate. Explain why it grows less than a plant given nitrate. [3]



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3.1

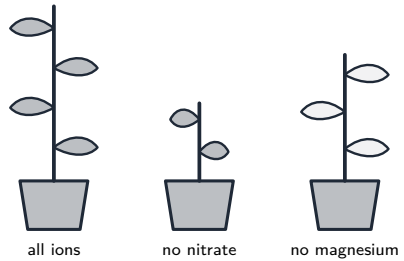
- nitrate is needed to make amino acids and so proteins
- proteins are needed to make new cells (for growth)
- so without nitrate the plant cannot make enough protein and its growth is stunted

Exercise 3.2 (a)

3.2 A student grows seedlings in three nutrient solutions for 4 weeks. The diagram shows the plants at the end.

solution	all ions	no nitrate	no magnesium
mean mass / g	24	9	15
leaves	large, green	small, pale	yellow

(a) Calculate the percentage decrease in mass when there is no nitrate. [2]

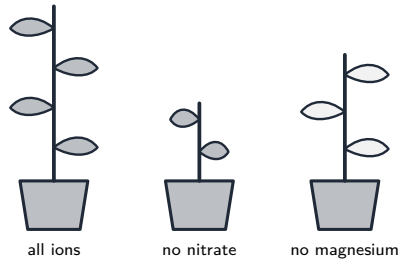


Exercise 3.2 (a)

3.2 A student grows seedlings in three nutrient solutions for 4 weeks. The diagram shows the plants at the end.

solution	all ions	no nitrate	no magnesium
mean mass / g	24	9	15
leaves	large, green	small, pale	yellow

(a) Calculate the percentage decrease in mass when there is no nitrate. [2]



(a) $\frac{24-9}{24} \times 100 = \mathbf{62.5}\%$

Exercise 3.2 (b)

3.2 A student grows seedlings in three nutrient solutions for 4 weeks. The diagram shows the plants at the end.

solution	**all ions**	**no nitrate**	**no magnesium**
mean mass / g	24	9	15
leaves	large, green	small, pale	yellow

(b) Explain why the plants with no magnesium have a lower mass. [3]

Exercise 3.2 (b)

3.2 A student grows seedlings in three nutrient solutions for 4 weeks. The diagram shows the plants at the end.

solution	**all ions**	**no nitrate**	**no magnesium**
mean mass / g	24	9	15
leaves	large, green	small, pale	yellow

(b) Explain why the plants with no magnesium have a lower mass. [3]

(b) without magnesium, less chlorophyll is made (the leaves are yellow); so less light is absorbed and there is less photosynthesis; so less glucose is made for growth

Exercise 3.2 (c)

3.2 A student grows seedlings in three nutrient solutions for 4 weeks. The diagram shows the plants at the end.

solution	all ions	no nitrate	no magnesium
mean mass / g	24	9	15
leaves	large, green	small, pale	yellow

(c) Describe how plants defend themselves against pathogens and against animals that eat them. Use examples. [6]

Exercise 3.2 (c)

3.2 A student grows seedlings in three nutrient solutions for 4 weeks. The diagram shows the plants at the end.

solution	all ions	no nitrate	no magnesium
mean mass / g	24	9	15
leaves	large, green	small, pale	yellow

(c) Describe how plants defend themselves against pathogens and against animals that eat them. Use examples. [6]

(c) points to include:

- physical: cellulose cell walls, a waxy cuticle and bark stop pathogens getting in
- chemical: antibacterial chemicals (e.g. in mint and witch hazel) kill pathogens
- chemical: poisons (e.g. in foxgloves and tobacco) stop animals eating the plant
- mechanical: thorns and hairs stop animals touching or eating the plant
- mechanical: leaves that droop or curl when touched; mimicry to trick insects
- each defence stops the pathogen entering, or the animal eating, so the plant survives

Levels: **5–6** a full, logical answer with correct biology and correct terms; **3–4** several correct points, partly linked; **1–2** one or two relevant points.