AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.3.3 PLANT DISEASE

SCORE	PERCENTAGE
/96	%

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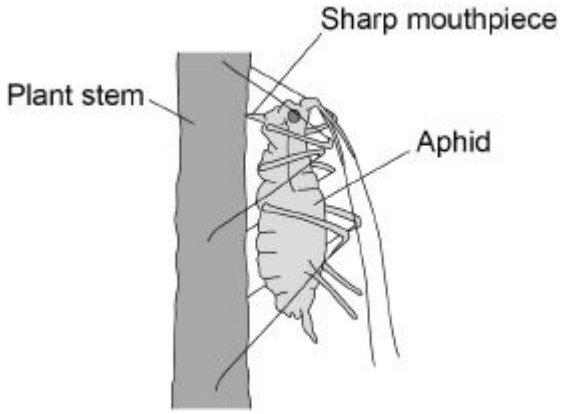
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Q1.

Aphids are small insects that carry pathogens.

Figure 1 shows an aphid feeding from a plant stem.

Figure 1



(a) An aphid feeds by inserting its sharp mouthpiece into the stem of a plant.

After feeding, the mouthpiece of an aphid contains a high concentration of dissolved sugars.

Which part of the plant was the aphid feeding from?

Tick **one** box.

- Palisade layer ☐
- Phloem ☐
- Stomata ☐
- Xylem ☐

(1)

(b) What is the process that transports dissolved sugars around a plant?

Tick **one** box.

- Filtration ☐
- Respiration ☐

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Translocation ☐

Transpiration ☐

(1)

(c) Plants infected with aphids have stunted growth.

Explain **one** way the removal of dissolved sugars from the stem of the plant causes stunted growth.

_____

_____

_____

_____

_____

(2)

(d) Most aphids do not have wings when they hatch. After several generations, some aphids hatch which have wings and can fly.

Explain the advantage to the aphid of being able to fly.

_____

_____

_____

_____

_____

(2)

(e) The leaves of some plants release oils onto their surface.

Suggest how the production of oil on the surface of a leaf may protect the plant from aphids.

_____

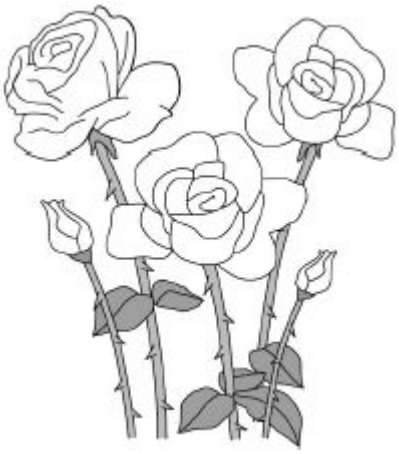
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(1)

Figure 2 shows part of a rose plant.

Figure 2

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(f) Give **one** adaptation shown in **Figure 2** that helps the rose plant defend itself.

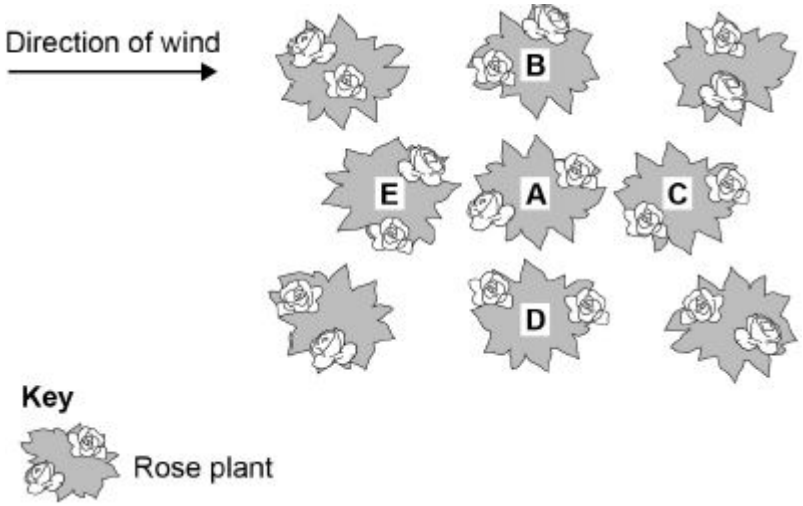
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(1)

Figure 3 shows a plan of a garden containing rose plants.

Figure 3



(g) Plant **A** has the fungal disease rose black spot.

Which plant in **Figure 3** is the fungus likely to spread to first?

Give a reason for your answer.

Plant _____

Reason _____

_____

_____

_____

(2)

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(h) Suggest **one** way the gardener could reduce the spread of rose black spot to the other plants in the garden.

_____

_____

(1)

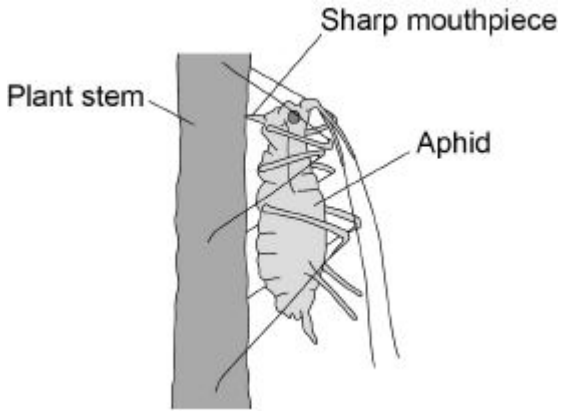
(Total 11 marks)

Q2.

Plants can be infected by fungi, viruses and insects.

Aphids are small insects that carry pathogens.

The diagram below shows an aphid feeding from a plant stem.



(a) An aphid feeds by inserting its sharp mouthpiece into the stem of a plant.

Give the reason why the mouthpiece of an aphid contains a high concentration of dissolved sugars after feeding.

_____

_____

(1)

(b) Plants infected with aphids may show symptoms of magnesium deficiency.

Magnesium deficiency symptoms include:

- yellow leaves
- stunted growth.

Explain how a deficiency of magnesium could cause these symptoms.

_____

_____

_____

_____

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_____

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(5)

(c) A farmer thinks a potato crop is infected with potato virus Y (PVY).

The farmer obtains a monoclonal antibody test kit for PVY.

To make the monoclonal antibodies a scientist first isolates the PVY protein from the virus.

Describe how the scientist would use the protein to produce the PVY monoclonal antibody.

_____

_____

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(4)

(Total 10 marks)

Q3.

Rose black spot is a disease of roses.

(a) What type of microorganism causes rose black spot?

Tick **one** box.

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A bacterium ☐

A fungus ☐

A protist ☐

A virus ☐

(1)

(b) Explain how different **types of organism** defend themselves against microorganisms.

_____

_____

_____

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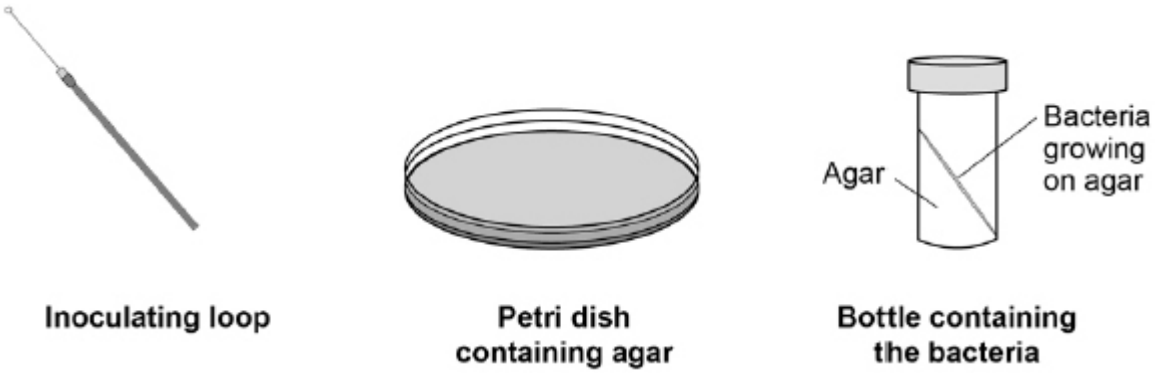
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(6)

(c) A student tried to grow some bacteria in the laboratory.

The diagram shows some of the apparatus used.



Inoculating loop | **Petri dish containing agar** | **Bottle containing the bacteria**

This is the method used.

1. Remove the lid of the Petri dish.
2. Remove the lid of the bottle containing the bacteria.
3. Use the inoculating loop to remove some of the bacteria from the bottle.
4. Spread the bacteria over the agar using the inoculating loop.

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5. Put the lid back on the Petri dish.
6. Put the Petri dish into an incubator at 25 °C for 24 hours.

Steps 1−5 could cause the sample of the bacteria on the petri dish to be contaminated.

Give **three** improvements to the method to prevent contamination.

1. _____

_____

2. _____

_____

3. _____

_____

(3)

(d) Why did the student grow the bacteria at 25 °C rather than at 40 °C?

Tick **one** box.

So the bacteria grew more quickly	☐
So the bacteria grew more slowly	☐
To prevent the growth of a harmful pathogen	☐
To save money	☐

(1)

(Total 11 marks)

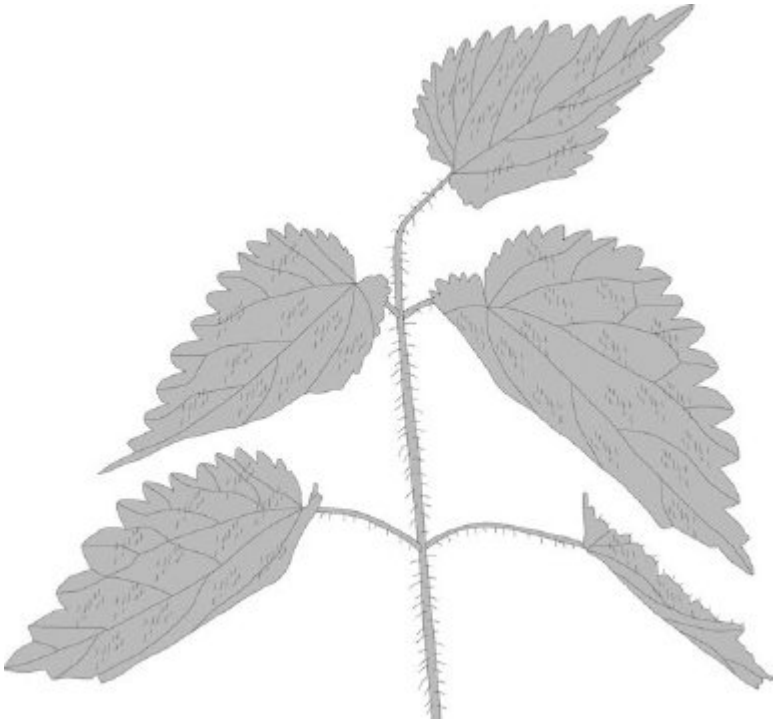
Q4.

Plants have adaptations to help defend themselves and to help them survive.

Figure 1 shows a nettle plant.

Figure 1

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(a) Explain how the nettle is adapted for defence and protection.

_____

_____

_____

_____

_____

_____

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_____

(3)

(b) Witch hazel is another plant adapted for defence.

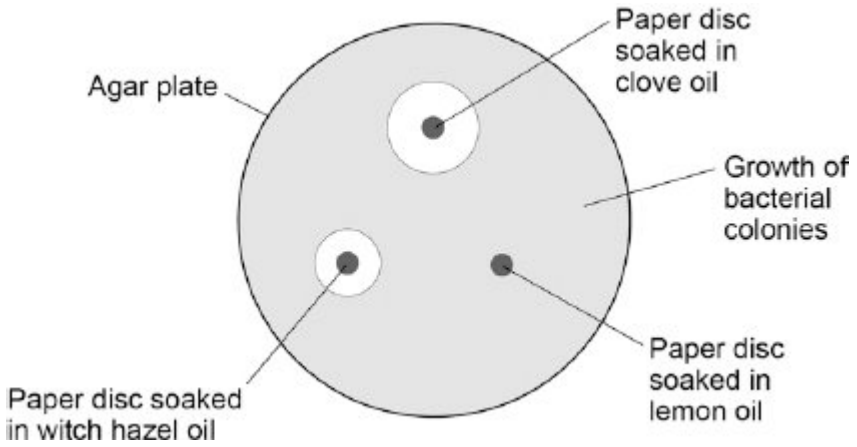
Witch hazel produces oil with antiseptic properties. The oil prevents bacteria from attacking the plant.

A student investigated how effective three different plant oils were at preventing the growth of bacteria.

Figure 2 shows the results.

Figure 2

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Which plant oil is the most effective at preventing the growth of bacteria?

Give a reason for your answer.

Oil _____

Reason _____

_____

(2)

(c) The student tested tea tree oil using the same method.

The results showed tea tree oil was the most effective at preventing bacterial growth.

The student concluded that tea tree oil could be used to treat bacterial infections instead of antibiotics.

Give **one** reason why this is **not** a valid conclusion.

_____

_____

(1)

(Total 6 marks)

Q5.

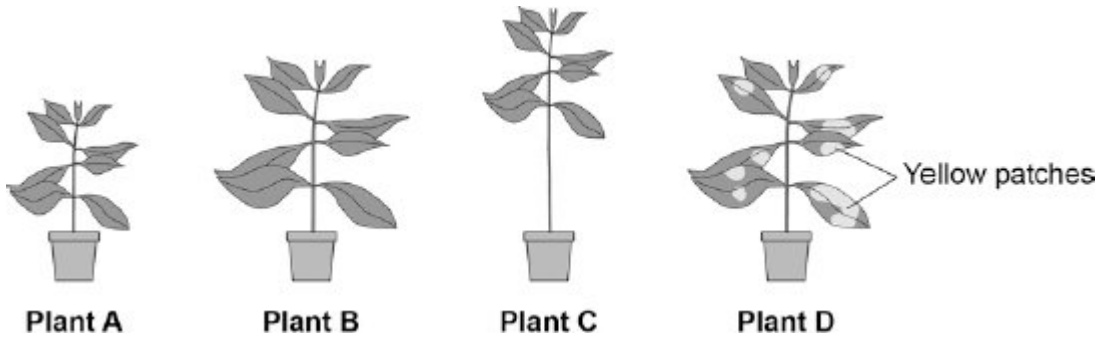
To be healthy, plants need the right amount of mineral ions from the soil.

The diagram below shows four plants.

The plants were grown in four different growing conditions:

- sunny area, with nitrate and magnesium added to the soil
- sunny area, with magnesium but **no** nitrate added to the soil
- sunny area, with nitrate but **no** magnesium added to the soil
- dark area, with nitrate and magnesium added to the soil.

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(a) Which plant was grown with no **nitrate?**

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(b) Which plant was grown with no **magnesium?**

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(c) Give **one** variable that was kept constant in this experiment.

_____

_____

(1)

(d) Plants need other minerals for healthy growth such as potassium ions and phosphate ions.

A farmer wanted to compare the percentage of minerals in two types of manure.

- Cow manure from her own farm.
- Chicken manure pellets she could buy.

The table below shows data for each type of manure.

	Phosphate ions in %	**Potassium ions in %**
Cow manure	0.4	0.5
Chicken manure pellets	2.5	2.3

Suggest **one** advantage and **one** disadvantage of using the chicken manure pellets compared to the cow manure.

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Advantage _____

_____

Disadvantage _____

_____

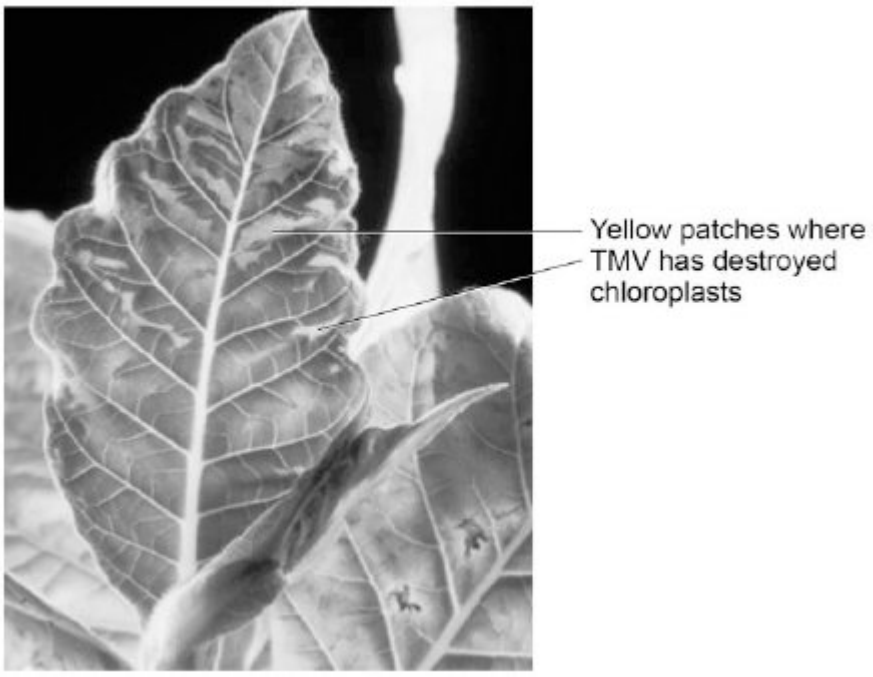
(2)

(Total 5 marks)

Q6.

Tobacco mosaic virus (TMV) is a disease affecting plants.

The diagram below shows a leaf infected with TMV.



© Nigel Cattlin/Visuals Unlimited/Getty Images

(a) All tools should be washed in disinfectant after using them on plants infected with TMV.

Suggest why.

_____

_____

(1)

(b) Scientists produced a single plant that contained a TMV-resistant gene.

Suggest how scientists can use this plant to produce **many** plants with the TMV-resistant gene.

_____

_____

(1)

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(c) Some plants produce fruits which contain glucose.

Describe how you would test for the presence of glucose in fruit.

_____

_____

_____

_____

(2)

(d) TMV can cause plants to produce less chlorophyll.

This causes leaf discoloration.

Explain why plants with TMV have stunted growth.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 8 marks)

Q7.

A gardener is looking at the plants in his greenhouse.

(a) Some of the plants have a disease.

Give **two** ways the gardener could identify the pathogen infecting the plants.

1. _____

_____

2. _____

_____

(2)

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(b) Plants can become unhealthy if they do not have essential mineral ions.

Describe the appearance of plants with:

- **nitrate** deficiency
- **magnesium** deficiency.

Nitrate deficiency _____

_____

Magnesium deficiency _____

_____

(2)

(c) Plants need other mineral ions.

- Potassium ions are needed for healthy root growth.
- Phosphate ions are needed for healthy flowers and fruits.

The gardener makes his own garden compost.

The percentage (%) of minerals in his compost was compared with two fertilisers he could buy.

The data are shown in the table below.

	Percentage (%) mineral content			
	Nitrate ions	**Phosphate ions**	**Potassium ions**	**Cost in £ / kg**
Garden compost	0.5	0.3	0.8	0.00
Fertiliser S	5.0	1.3	6.6	4.99
Fertiliser T	3.0	12.0	6.0	9.99

The gardener buys Fertiliser **S**.

Explain why he chose Fertiliser **S**.

_____

_____

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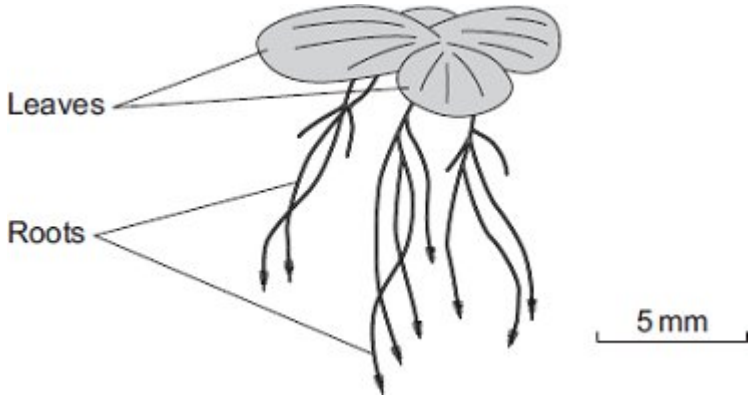
(4)

(Total 8 marks)

Q8.

Duckweed is a plant. Duckweed grows in ponds. The leaves of duckweed float on the surface of the water and its roots hang down in the water.

The drawing shows a duckweed plant.



(a) Duckweed roots absorb nitrate ions from the water.
The nitrate ions help the duckweed to grow.

Draw a ring around the correct answer to complete the sentence.

Duckweed needs nitrate ions to make

- carbohydrate.
- fat.
- protein.

(1)

(b) Some students grew duckweed plants in three different solutions of mineral ions, **A**, **B** and **C**, and in distilled water (**D**).

Table 1 shows the concentrations of mineral ions in each of **A**, **B**, **C** and **D** at the start of the investigation.

Table 1

Mineral ion	**Concentration of mineral ions in mg per dm^3 at the start of the investigation**

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	A	B	C	D
Nitrate	1000	4	4	0
Phosphate	300	0	0	0
Magnesium	200	84	24	0

The students counted the number of duckweed leaves in **A**, **B**, **C** and **D** at the start of the investigation and after 28 days.

Table 2 shows their results.

Table 2

	A	B	C	D
Number of leaves at start	4	4	4	4
Number of leaves after 28 days	50	27	14	6

(i) Using **Table 1** and **Table 2**, describe the effect of magnesium ions on the growth of duckweed.

_____

_____

(1)

(ii) Solution **A** contained the highest concentration of nitrate ions.

One student said, 'The results show that nitrate ions are needed for the growth of duckweed.'

What evidence in **Table 2** supports what the student said?

_____

_____

(1)

(c) The students measured the growth of the duckweed by counting the number of leaves.

(i) Suggest a better method of measuring the growth of the duckweed.

_____

_____

(1)

(ii) Suggest why your method is better than the students' method.

_____

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_____

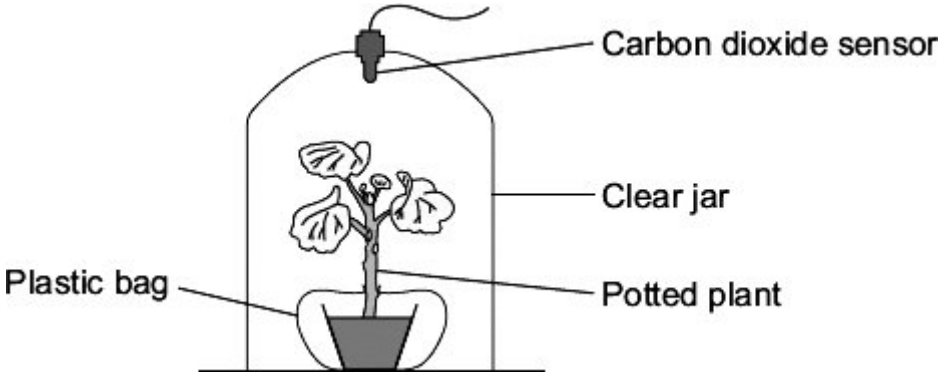
(1)

(Total 5 marks)

Q9.

A student measured the concentration of carbon dioxide in the air around a potted plant on two different days.

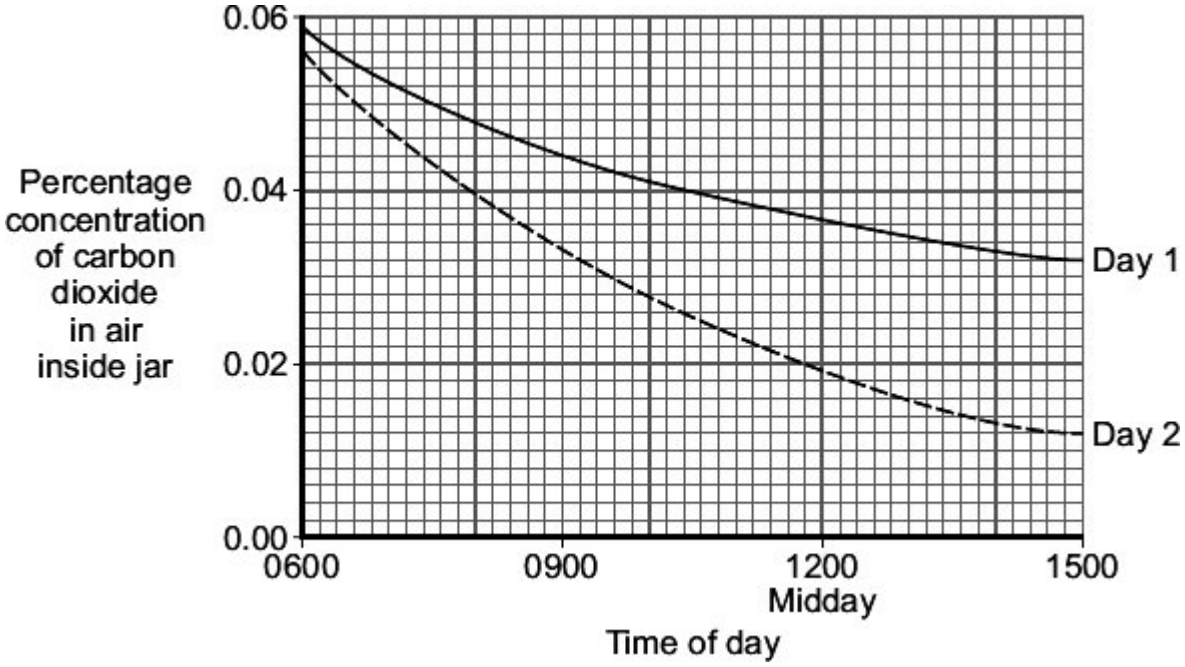
The diagram shows the student's apparatus.



There was a plastic bag round the plant pot to stop microorganisms in the soil affecting the concentration of gases in the air inside the jar.

The apparatus was put near a window.

The graph shows the results.



(a) **Day 1** was cloudier than **Day 2.**

What evidence from the graph shows that **Day 1** was cloudier?

Explain your answer.

_____

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_____

_____

_____

(2)

(b) A potted plant sometimes develops yellow leaves.

The development of yellow leaves could be due to the lack of a mineral ion.

Suggest the mineral ion that could be lacking.

_____

(1)

(Total 3 marks)

Q10.

People often grow pondweed in fishponds to *oxygenate* the water.

(a) Name the process that the pondweed uses to produce oxygen.

_____

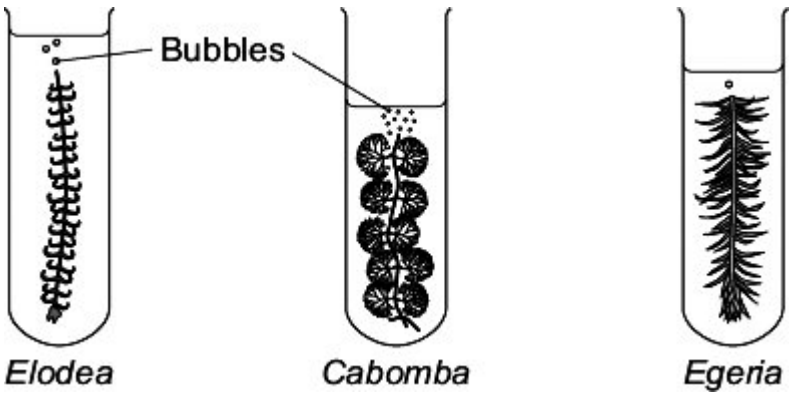
(1)

(b) A student investigated oxygen production in three different pondweeds, *Elodea*,*Cabomba* and *Egeria*.

The student:

- cut a piece of pondweed from an *Elodea* plant
- put the pondweed into a tube of water
- counted the bubbles given off in one minute
- did the experiment again using a piece of pondweed from a *Cabomba* plant
- did the experiment a third time using a piece of pondweed from an *Egeria* plant.

The diagram shows the student's investigation.



The table shows the results.

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Pondweed	Number of bubbles produced in 1 minute
Elodea	17
Cabomba	28
Egeria	8

(i) The student said:

"I suggest that people grow *Cabomba* in garden ponds to oxygenate the water fastest."

Give **three** variables the student should have controlled to make sure his conclusion was valid.

Use information from the student's method and the diagram.

1. _____

_____

2. _____

_____

3. _____

_____

(3)

(ii) The three pondweeds all cost about the same.

Suggest **one** other factor that people with fishponds might think about before deciding which type of pondweed to use.

_____

(1)

(c) A person grows *Cabomba* in his pond.

The *Cabomba* plants develop yellow leaves.

Which mineral ion would stop the leaves turning yellow?

_____

(1)

(Total 6 marks)

Q11.

Plants need mineral ions for healthy growth.

(a) Which part of a plant takes in mineral ions?

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Tick (✓) **one** box.

Flower ☐

Leaf ☐

Root ☐

(1)

(b) Leaves are usually green.

(i) What is the green substance in leaves?

Draw a ring around your answer.

chlorophyll **glucose** **starch**

(1)

(ii) The green substance in leaves is important to plants.

Explain why.

_____

_____

_____

_____

(2)

(c) A shortage of mineral ions can affect a plant.

Draw **one** line from each mineral ion to the effect of its shortage.

Mineral ion	**Effect of its shortage**
Magnesium	Yellow leaves
Nitrate	Stunted growth

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White flowers

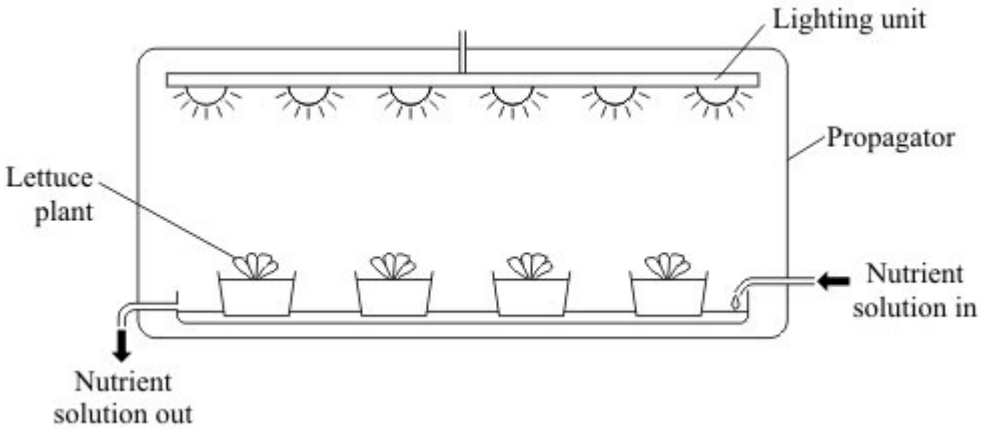
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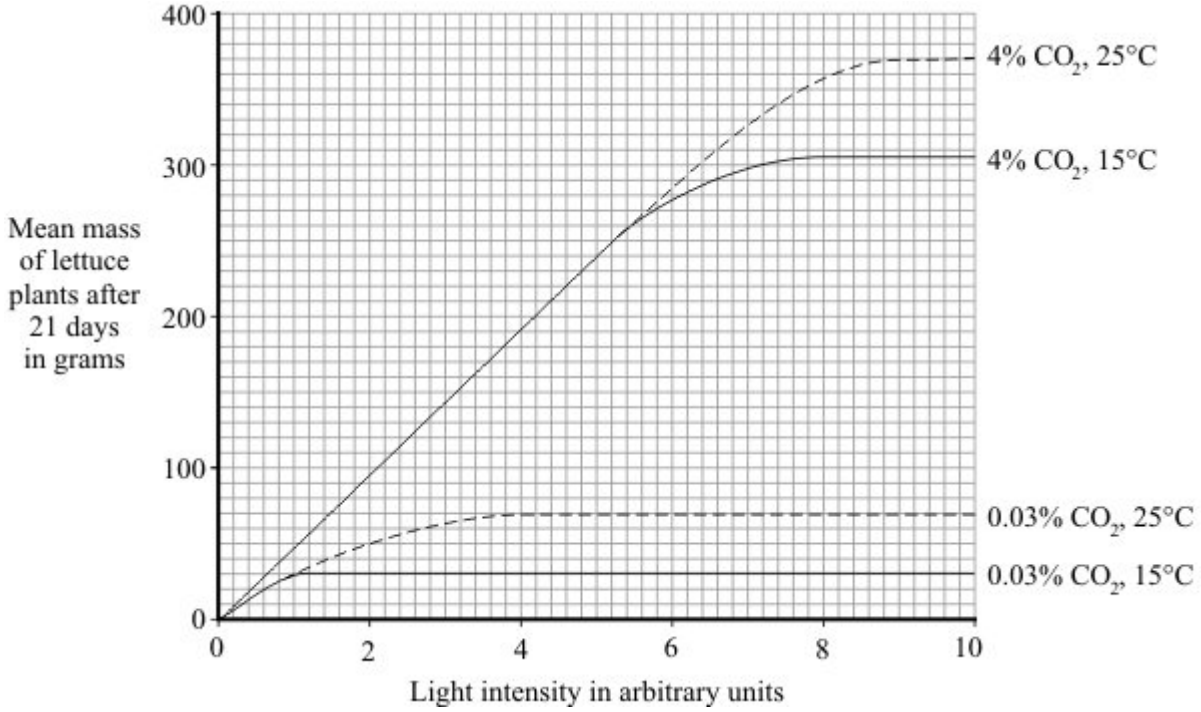
Q12.

Changing the conditions in which plants grow affects how fast they grow.

The diagram shows a propagator in which scientists can control temperature, light intensity and carbon dioxide concentration.



The graph shows the effects of changing the temperature, light intensity and carbon dioxide concentration on the growth of lettuce plants.



(a) Describe and explain the effect of increasing light intensity on the mean mass of lettuce plants at 4% carbon dioxide and 15 °C.

_____

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_____

_____

_____

_____

_____

_____

(3)

(b) Growers wish to make maximum profits from their lettuces.

What do they need to consider before making decisions about the growing conditions for their lettuces?

_____

_____

_____

_____

(2)

(c) The nutrient solution contains nitrate ions and magnesium ions.

Complete the table to show the functions of these ions in plants and their deficiency symptoms.

Ion	Function in plants	Deficiency symptoms
Nitrate	_____ _____ _____	_____ _____ _____
Magnesium	_____ _____ _____	_____ _____ _____

(4)

(Total 9 marks)

Q13.

Nitrate fertilisers are important in agriculture. They help to increase crop yields and so make food cheaper to buy. Some of the nitrate fertilisers run off into rivers and get into

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drinking water. The problem is that the nitrates can react with iron in our blood. This reduces the blood's ability to carry oxygen. If the amount of nitrate in drinking water is too high, it can cause 'blue baby syndrome', in which babies look blue due to lack of oxygen.

The table shows the amount of nitrate fertilisers used and the crop yield.

Nitrate fertilisers in kilograms per hectare of land	0	150	250
Crop yield in tonnes per hectare of land	5	8	7

Use the information above to suggest what should be done, by farmers and government, to prevent 'blue baby syndrome'. Explain the reasons for your suggestions.

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_____

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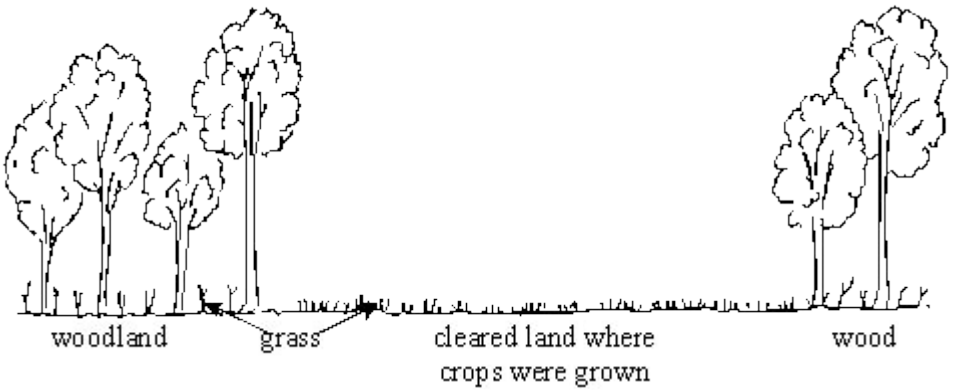
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(Total 3 marks)

Q14.

In some developing countries woodland is cut down and burned. The ash acts as fertiliser. Crops are grown for three years. The land is then left as it is too poor to grow any more crops.



(a) In the original woodland trees and plants died and grew for hundreds of years. When cleared the land grew crops for only three years. Explain this difference in as much detail as you can.

_____

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_____

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_____

(3)

(b) What could farmers do to make crops grow on the cleared land for more than three years?

_____

_____

(2)

(Total 5 marks)

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