

2 Scientists investigate the effect of pollution on the growth of plant shoots.

This is their method.

- expose a sample of 500 seeds to pollution
- leave another sample of 500 seeds free from pollution
- allow the seeds to germinate and produce shoots
- after one day, squash 100 shoots from each sample
- using a microscope, count the number of cells in each shoot

The scientists squash 100 shoots from each sample every day for five days.

The table shows their results.

Time after germination in days	Mean number of cells in shoot tissue $\times 10^3$	
	Exposed to pollution	Free from pollution
1	45	45
2	38	120
3	40	150
4	38	140
5	42	145

(a) Plot a line graph of this data on the grid.

Use a ruler to join the points with straight lines.

(5)



(b) What is the dependent variable in this investigation?

(1)

- ☐ A germination rate
- ☐ B number of cells
- ☐ C pollution level
- ☐ D time after germination

(c) The scientists conclude that pollution reduces the growth of shoots by affecting cell division.

(i) Name the type of cell division affected by pollution in this investigation.

(1)

(ii) To make sure their conclusion is valid, the scientists control abiotic variables while the seeds are germinating.

Discuss two abiotic variables that the scientists control.

(4)

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(iii) State one biotic factor that the scientists should control.

(1)

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(Total for Question 2 = 12 marks)



9 Plants manufacture carbohydrates by photosynthesis.

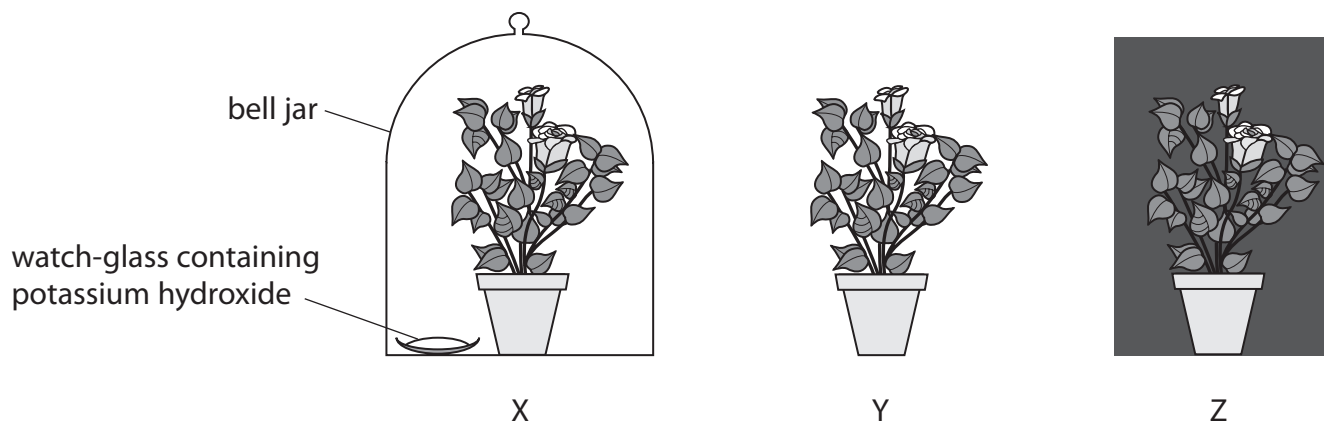
(a) Write the balanced chemical symbol equation for photosynthesis.

(2)

(b) A student investigates the need for light and carbon dioxide in photosynthesis.

This is his method.

- keep three plants, X, Y and Z, in the dark for 24 hours
- place plant X in a bell jar with a watch-glass containing potassium hydroxide
- leave plants Y and Z exposed to the atmosphere
- place plants X and Y in the light
- place plant Z in the dark



(i) Explain why the student keeps all three plants in the dark for 24 hours at the beginning of the investigation.

(2)

(ii) State the function of the potassium hydroxide.

(1)



(c) The student tests leaves from plants X and Y for starch using iodine solution.

(i) What is the colour of the leaves from plant X after the test?

(1)

- ☐ A white
- ☐ B orange
- ☐ C blue-black
- ☐ D brick red

(ii) What is the colour of the leaves from plant Y after the test?

(1)

- ☐ A white
- ☐ B orange
- ☐ C blue-black
- ☐ D brick red

(d) The student sets up another plant in the same conditions as plant X, but replaces the potassium hydroxide with water.

Explain why this improves the student's investigation.

(2)

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(Total for Question 9 = 9 marks)



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