

14.2 Homeostasis in Plants

Question Paper

Course	CIEA Level Biology
Section	14. Homeostasis
Topic	14.2 Homeostasis in Plants
Difficulty	Hard

Time allowed: 30
Score: /24
Percentage: /100

Question 1a

A student who wanted to investigate stomata looked at a lower leaf surface under a microscope. Their field of view is shown in Fig. 1

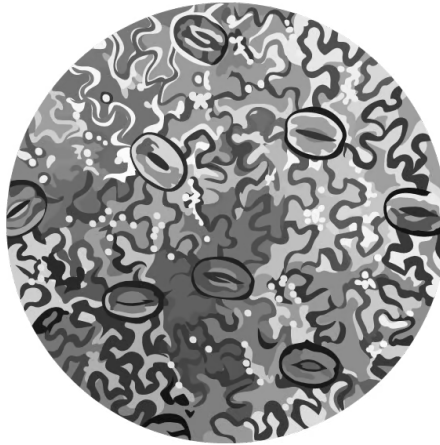


Fig. 1

The diameter of the microscope's field of view was 1.4 mm and the lower leaf had a total surface area of 220 mm². The area of a circle can be calculated using the following formula:

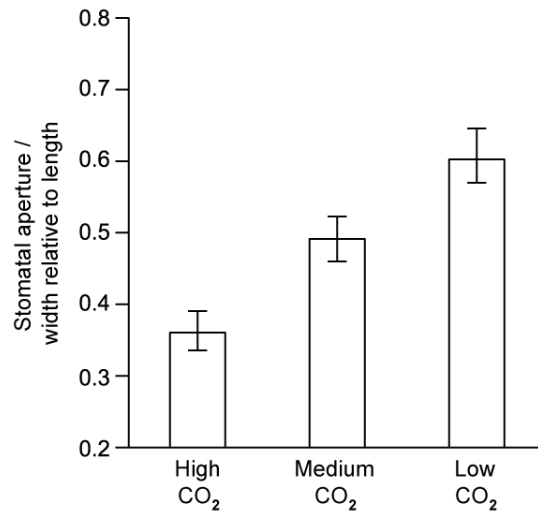
$$\pi r^2$$

Calculate the total number of stomata on the lower surface of the student's leaf. Give your answer to the nearest whole number.

[2 marks]

Question 1b

The student read about some research that had been carried out into the effect of atmospheric carbon dioxide on plant growth. Three different carbon dioxide levels were tested; high, medium, and low. The results relating to stomatal aperture are shown in Fig. 2. Note that the bars show standard deviation and that the term aperture refers to the opening between the guard cells.

**Fig. 2**

Describe what the student could conclude from Fig. 2 about the effect of atmospheric carbon dioxide on stomata.

[2 marks]**Question 1c**

Suggest an explanation for the results shown in Fig. 2

[3 marks]

Question 1d

The study done by the student in part b) also looked at the effect of carbon dioxide concentration on plant biomass. Fig. 3 shows the results.

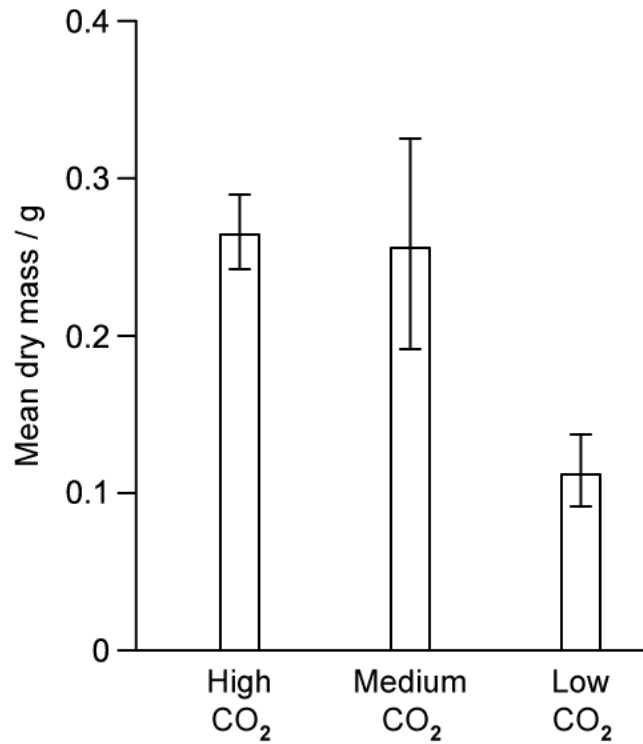


Fig. 3

The student concluded from Fig. 3 that the currently increasing carbon dioxide levels in the earth's atmosphere could have a positive effect on plant growth around the world.

Use Fig. 3 and your own knowledge to evaluate the student's conclusion.

[3 marks]

Question 2a

Fig.1 shows the percentage of stomata that are open over a 96 hour period.

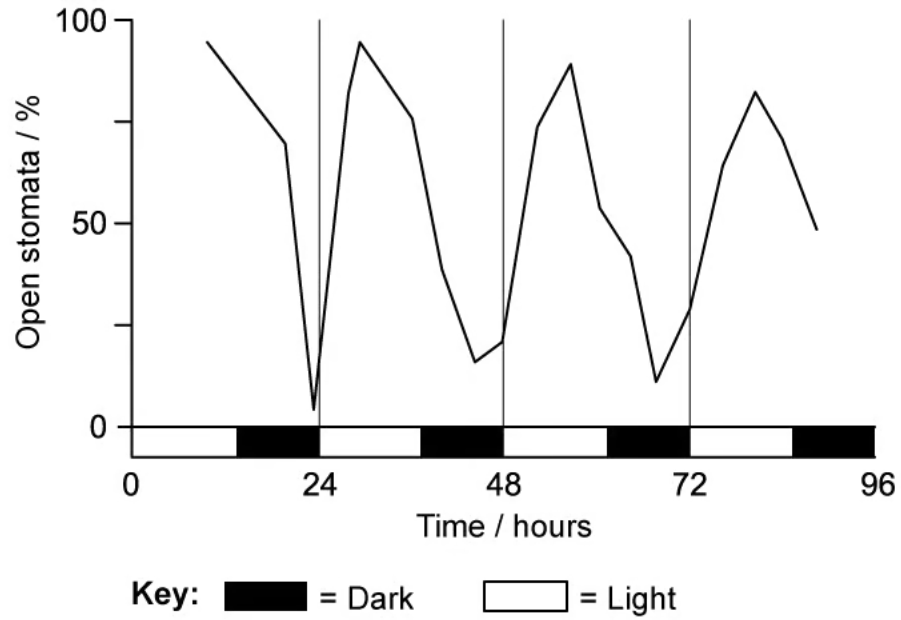


Fig. 1

(i)
Describe the opening and closing of stomata in Fig. 1.

[1]

(ii)
Other than the changing light intensity shown in Fig. 1, give **two** factors that could be contributing to the pattern described in part i).

[2]

[3 marks]

Question 2b

Outline why the pattern shown in Fig. 1 is advantageous to the plant.

[2 marks]

Question 2c

Research has shown that increased light intensity decreases the activity of the chemical abscisic acid (ABA) in plants.

Explain how each of the following circumstances would cause a decrease in ABA activity at increased light intensity:

(i)
Electrons from chlorophyll cause an ABA precursor molecule to be converted into a chemical called zeaxanthin.

[1]

(ii)
Glucose deactivates ABA.

[1]

(iii)
Enzymes that break down ABA are activated at high concentrations of oxygen.

[1]

[3 marks]

Question 2d

At low light intensity the level of ABA inside a plant increases.

Explain how this affects stomata.

[6 marks]

