

Homeostasis in plants

Question Paper 1

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Homeostasis
Sub Topic	Homeostasis in plants
Booklet	Theory
Paper Type	Question Paper 1

Time Allowed : 58 minutes

Score : / 48

Percentage : /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

- 1 The monkey flower, *Mimulus guttatus*, is cross-pollinated by bumblebees. It does not normally self-pollinate.

Since the number of bumblebees in many parts of the world is falling, an experiment was carried out in Kansas to investigate the effects on these plants of the loss of pollinators.

- 1600 *Mimulus* plants were grown in a field.
- 1600 *Mimulus* plants were grown in a glasshouse which bumblebees could not enter.

Seeds were repeatedly collected and sown for several generations at each site.

At first, the plants in the glasshouse produced few seeds, but after five generations the plants were able to self-pollinate and the number of seeds produced was almost the same as that of the plants in the field.

After five generations, the flowers of the plants in the glasshouse were significantly smaller than those of the plants in the field.

- (a) Explain why offspring produced by cross-pollination and self-pollination differ in their genetic variation.

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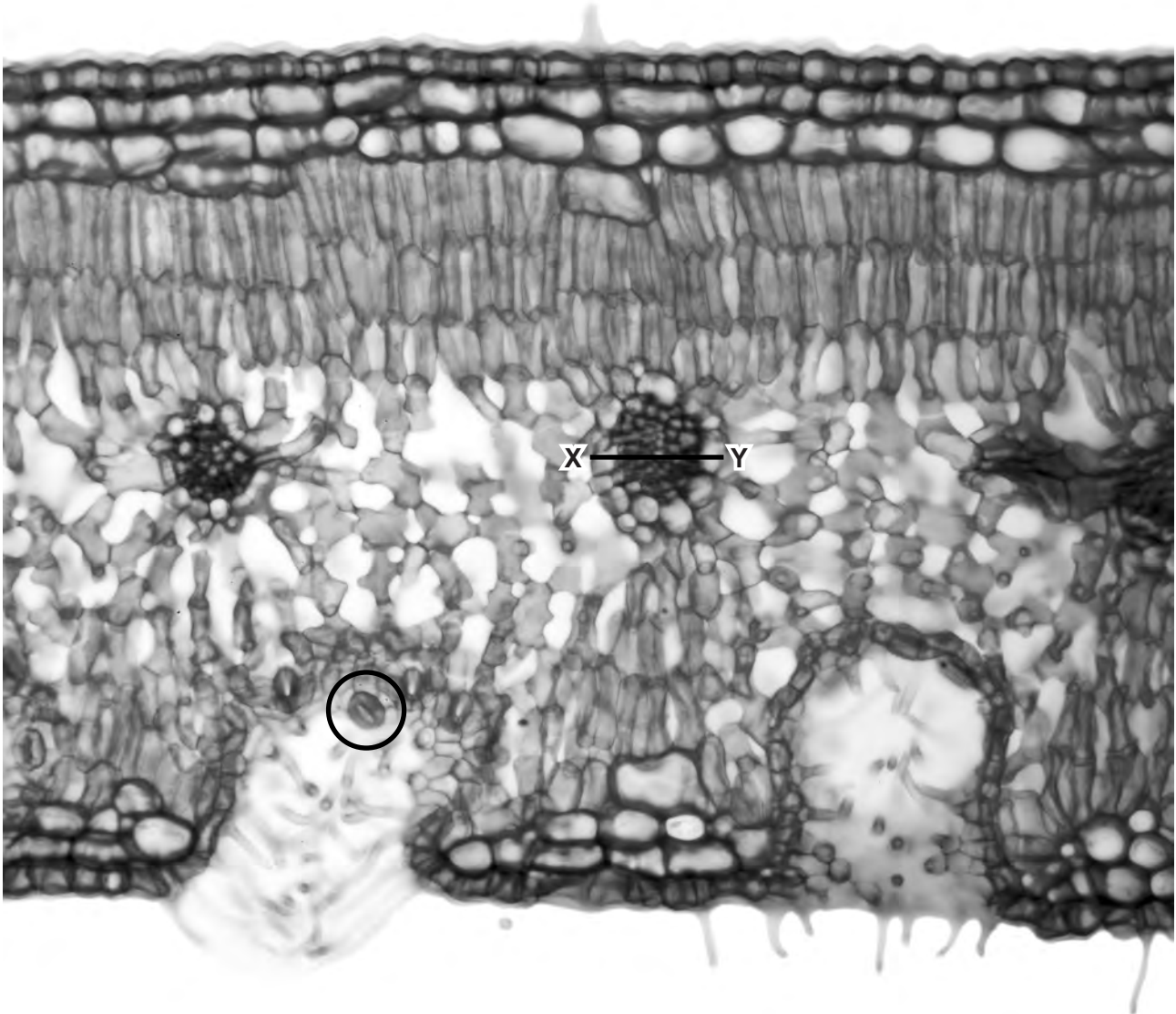
..... [3]

- (b) Suggest how smaller flowers could lead to an increase in self-pollination.

.....

..... [1]

- 2 Fig. 4.1 is a light micrograph of a section through a leaf of the xerophytic plant *Nerium oleander*. An area containing one of the plant's stomata is circled.



Magnification $\times 60$

Fig. 4.1

- (a) List three adaptations, visible in Fig. 4.1, which are characteristic of xerophytic plants.

1.
2.
3.

3 Fig. 8.1 shows a diagram of a stoma, its guard cells and adjacent epidermal cells.

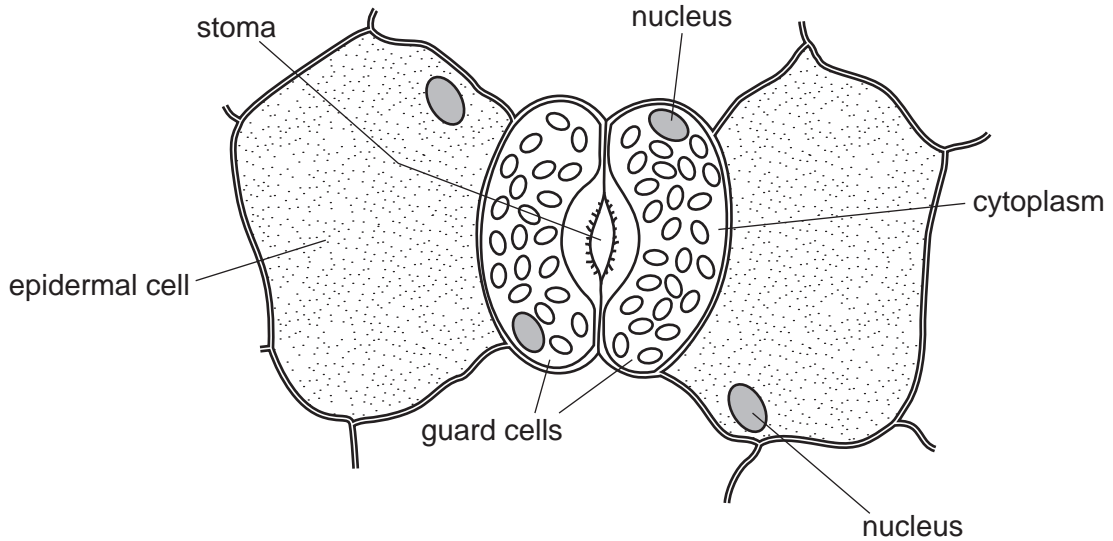


Fig. 8.1

(a) Guard cells have chloroplasts while epidermal cells do not have chloroplasts.

State **one other** difference, visible in Fig. 8.1, between guard cells and epidermal cells.

.....
 [1]

(b) During stomatal closure:

(i) state precisely where abscisic acid (ABA) binds

..... [1]

(ii) identify the ion that diffuses from the guard cells to epidermal cells

..... [1]

(iii) compare the relative water potential of the guard cells with that of epidermal cells

..... [1]

(iv) describe the change in volume of the guard cells.

..... [1]

(c) The following experiment was carried out to investigate the effect of light intensity on the rate of photosynthesis of a water plant, *Elodea*.

- *Elodea* was cut into three pieces, each 10 cm long.
- Each piece of *Elodea* was placed in a glass tube, containing 0.5% sodium hydrogencarbonate solution, which was then sealed with a bung.
- Tube **A** was placed 10 cm away from a lamp.
- Tube **B** was placed 5 cm away from a lamp.
- Tube **C** was placed in a dark room.
- An oxygen sensor was used to measure the percentage of oxygen in the solutions at the start of the experiment and again at 5, 10 and 20 minutes.

The results are shown in Fig. 8.2.

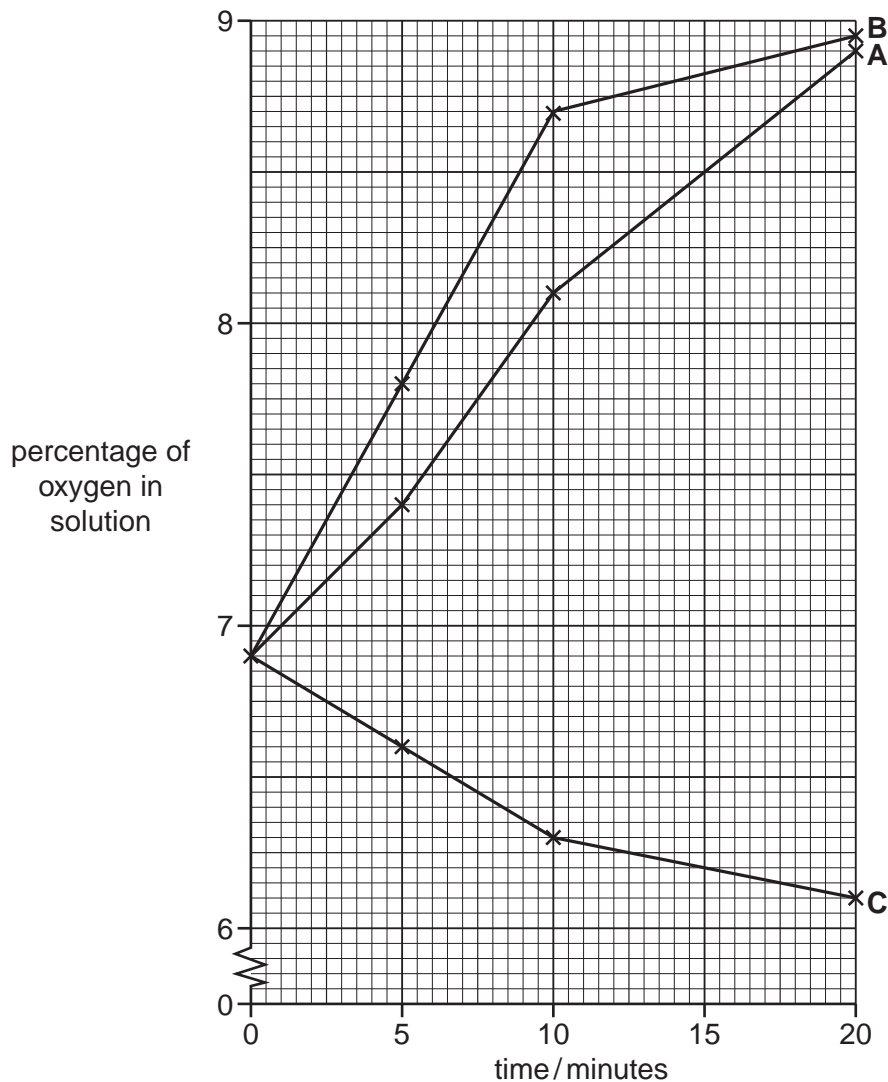


Fig. 8.2

- (i) State why sodium hydrogencarbonate solution was used.

.....
..... [1]

- (ii) Calculate the mean rate of oxygen production for tube **A** for the 20 minutes of the experiment.

Show your working.

answer [2]

- (iii) Compare the results for tubes **A** and **B**.

.....
.....
.....
..... [2]

- (iv) Explain the results for tube **C**.

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.....
.....
..... [2]

- (v) Suggest what factor, which may have an effect on the rate of photosynthesis, was **not** taken into account in this experiment.

..... [1]

- (d) Fig. 8.3 shows the relationship between the light-dependent and light-independent reactions in a chloroplast.

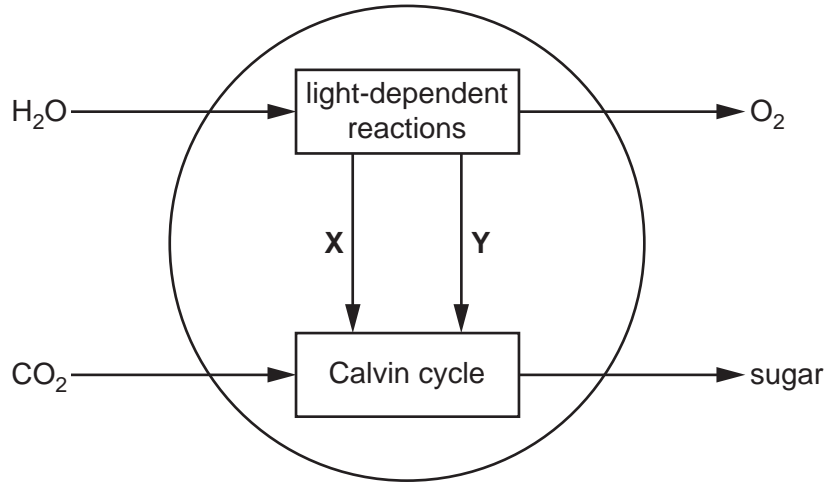


Fig. 8.3

Name the substances **X** and **Y** in Fig. 8.3.

X

Y [2]

[Total: 15]

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