

- 6 (a) Plant responses to environmental changes are co-ordinated by plant growth substances (plant hormones).

Explain why plants need to be able to respond to their environment.

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- (b) The following investigation was carried out into the effects of plant growth substances on germination:

- a large number of lettuce seeds was divided into eight equal batches
- each batch of seeds was placed on moist filter paper in a Petri dish and given a different treatment.

The different treatments are shown in Table 6.1. Each tick represents one of the eight batches of seeds.

Table 6.1

	treatment	concentration of gibberellin (mol dm^{-3})			
		0.00	0.05	0.50	5.00
A	water	✓	✓	✓	✓
B	abscisic acid	✓	✓	✓	✓

The batches of seeds were left to germinate at 25 °C in identical conditions and the percentage germination was calculated.

Fig. 6.1 shows the results of this investigation.

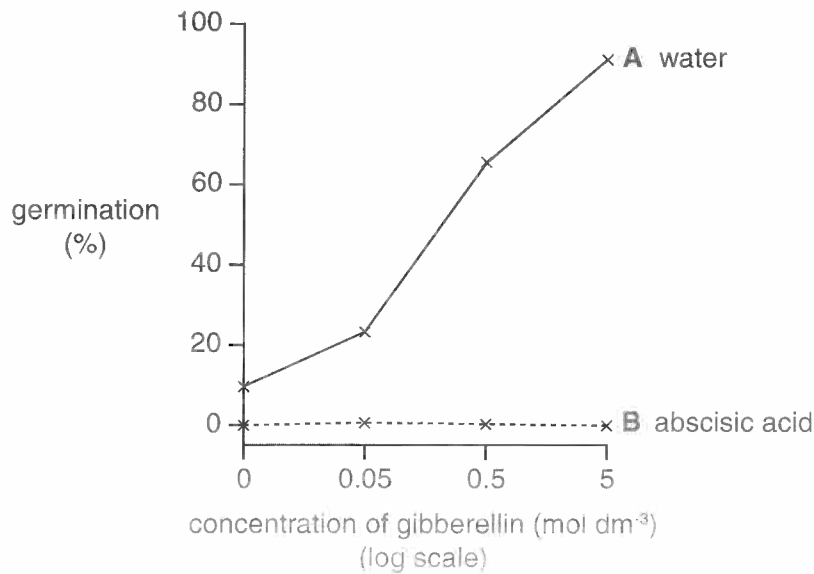


Fig. 6.1

(i) Describe, with reference to Fig. 6.1, the effects of the plant growth substances on the germination of lettuce seeds.

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(ii) Explain why all the lettuce seeds were kept at 25 °C.

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(iii) State **three** variables, **other than temperature**, that needed to be controlled in the investigation.

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3 [3]

(c) State **two** commercial uses of plant growth substances.

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[Total: 13]

3 Animals and plants respond to changes in their environment.

- (a)** Plants respond to changes in their environment using chemicals known as plant hormones or plant growth regulators.

A student carried out a two-part experiment to identify the contents of two unlabelled bottles, **J** and **K**. One bottle contained auxin and the other contained gibberellin.

In Part 1 of the experiment, 30 seedlings had their shoot tips removed. The 30 seedlings were then divided into three groups of 10 and treated as shown in Table 3.1 and Fig. 3.1.

Group	Treatment
1	no treatment applied
2	solution of J applied to cut stem at apex of seedling
3	solution of K applied to cut stem at apex of seedling

Table 3.1

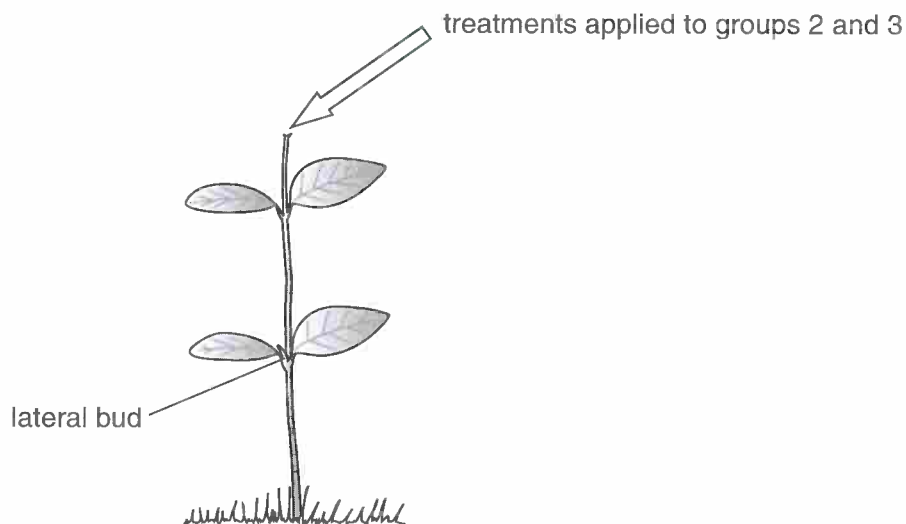


Fig. 3.1

All the seedlings were then exposed to light from **all** directions and left for seven days.

In Part 2 of the experiment, 30 coleoptiles had their tips removed. They were then divided into three groups of 10 coleoptiles and treated as shown in Table 3.2 and Fig. 3.2.

Group	Treatment
4	no treatment applied
5	solution of J applied to cut tip of coleoptile
6	solution of K applied to cut tip of coleoptile

Table 3.2

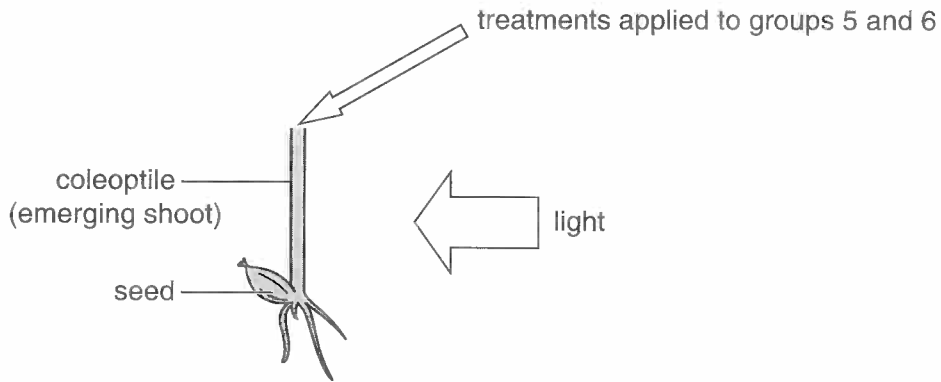


Fig. 3.2

The coleoptiles in groups 4, 5 and 6 were then exposed to light from **one direction**, as shown in Fig. 3.2, and left to grow for two days.

(i) Identify **three** variables that must be controlled in this experiment to produce valid results.

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- 3

[3]

(ii) Groups 1 and 4 were controls in this experiment.

Explain why these controls were necessary.

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- [1]

The observations at the end of each part of the experiment are shown in Table 3.3.

Group	Treatment	Observations
1	none	increase in stem length of 10mm and growth of lateral buds
2	J on cut stem apex	no growth of lateral buds
3	K on cut stem apex	increase in stem length of 40mm and growth of lateral buds
4	none	vertical growth of the coleoptiles
5	J on cut coleoptile tip	growth of the coleoptiles towards the light source
6	K on cut coleoptile tip	vertical growth of the coleoptiles

Table 3.3

(iii) Using the information from Table 3.3, identify the contents of bottles J and K and give reasons for your answer.

J

K

reasons

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(b) Fig. 3.3 is a diagram representing the neuromuscular junction in mammals.

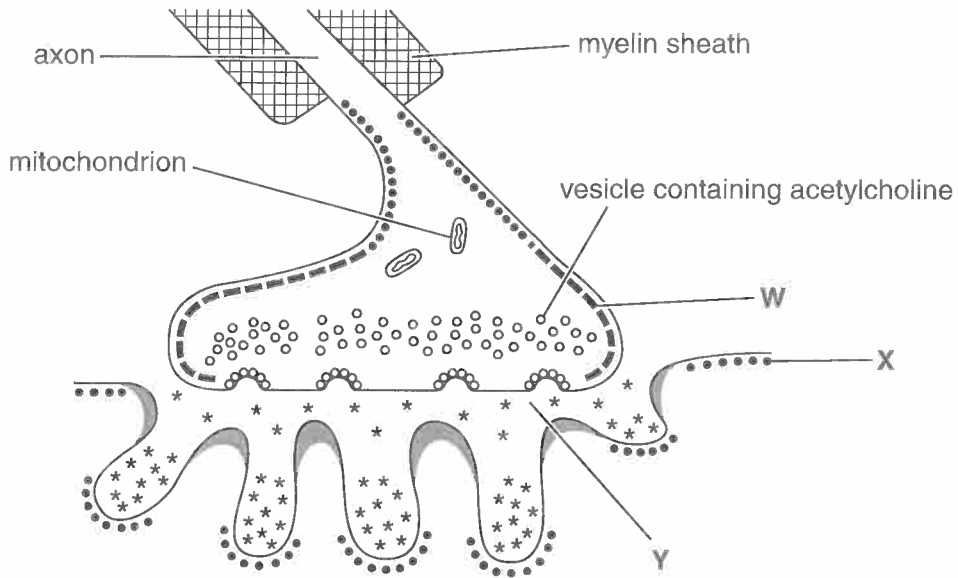


Fig. 3.3

(i) What type of molecule forms ion channels **W** and **X**?

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(ii) Identify region **Y**.

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(iii) Name the enzyme found in region **Y**.

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Question 3(c) begins on page 18

(c) As mammalian muscle uses energy to contract, it needs an energy supply.

Complete the following passage by choosing the best term to fill each gap.

Most ATP for muscle contraction is generated by aerobic respiration in organelles called Most of this ATP is produced by the stage of aerobic respiration called

If the oxygen supply is insufficient, ATP can also be obtained from anaerobic respiration, in which pyruvate is converted to the toxic product

A third source of ATP in muscle involves the transfer of a phosphate group to ADP from a substance called

During the contraction of skeletal muscle, energy from ATP is used to break the that hold the actin and together.

[6]

[Total: 16]

6 This question considers some similarities and differences in plant and animal biology.

(a) (i) Describe two **similarities** in the action of plant and animal hormones in **cell signalling**.

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(ii) Asexual reproduction and the ability to produce natural reproductive clones is common in plants but rare in animals.

Explain why plants are more able to form **natural** reproductive clones than animals.

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(iii) Polyploidy is the possession of more than two sets of chromosomes in the nucleus. Polyploidy is common in plants.

Suggest an explanation for the significance of polyploidy in forming new species of plant such as bread wheat, *Triticum aestivum*.

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- (b) A student setting up an experiment to investigate the effect of light on cress plant seedlings accidentally shone the bright light onto one side of the face of another student. He noticed that the student immediately responded by raising her hand to shield her eye from the light.

The response of the cress seedlings to light shining from one direction was slower, but after 24 hours the cress seedlings had grown towards the light.

Describe the mechanisms that produced the responses to light in the cress seedlings **and** in the human.

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[7]

[Total: 13]



7 An investigation was carried out into the effects of two plant growth substances, gibberellins and auxins, on apical dominance. The terminal (apical) buds of a number of pea plants were removed and discarded. The tops of each of the remaining shoots were given one of the following treatments:

- coated with a paste containing gibberellin
- coated with a paste containing auxin (IAA)
- coated with a paste without any plant growth substance

In addition, a control group of plants did not have their terminal buds removed and were not coated with paste.

The growth of the side shoots was measured at regular time intervals and a mean value calculated. The results are shown in Fig. 7.1.

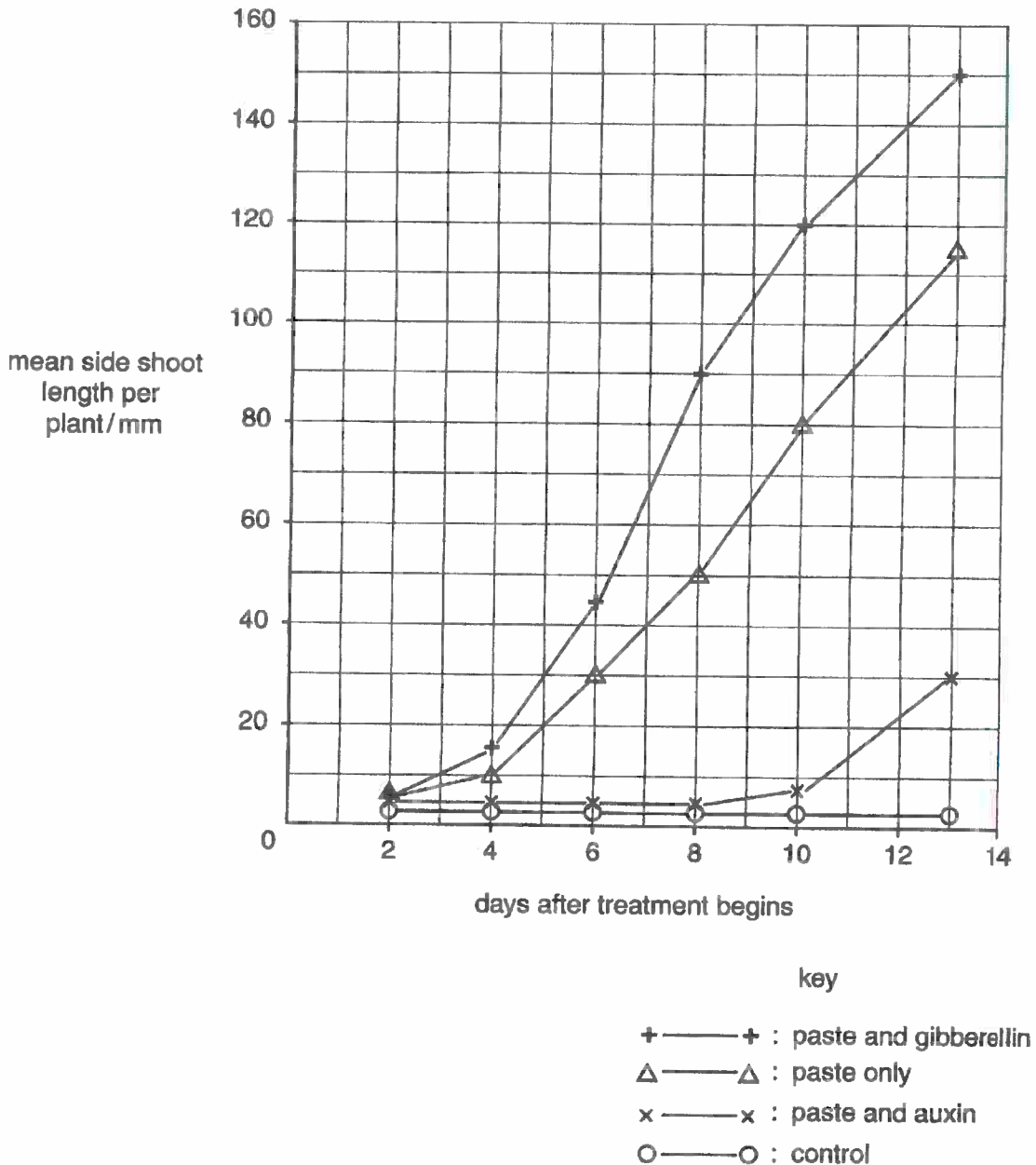


Fig. 7.1



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(a) Explain why the side shoots grow when the terminal buds are removed.

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(b) Side shoots show greater growth when paste containing gibberellin is applied than when paste without any plant growth substance is applied.

Calculate the percentage increase in growth due to gibberellin in 8 day old seedlings compared with seedlings with paste only. Show your working.

answer% [2]

(c) Using data from Fig. 7.1, describe and explain the effect of auxin (IAA) on the growth of side shoots.

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[Total: 8]

END OF QUESTION PAPER