Control and co-ordination in plants

Question Paper 1

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Control and co-ordination
Sub Topic	Control and co-ordination in plants
Booklet	Theory
Paper Type	Question Paper 1

Time Allowed : **71 minutes**

Score : **/ 59**

Percentage : **/100**

Grade Boundaries:

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

1 The Santa Cruz tarplant, *Holocarpha macradenia*, is a tall annual plant that grows only in the coastal grasslands in California. An annual plant is one that grows, flowers, produces seeds and dies in less than one year.

The tarplant used to be widely spread in California, but there are now only nine natural populations. It is listed as an endangered species.

(a) **(i)** Suggest **two** reasons why the tarplant has become endangered.

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(ii) State three reasons why it is important to conserve species.

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(b) Tarplant seeds can survive in the soil for several years. Dormant seeds can be encouraged to germinate by scraping the soil, which exposes them to light. This stimulates the production of gibberellin in these seeds, which brings about germination.

Explain how gibberellin brings about germination in seeds.

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(c) The long-term survival of tarplant seeds in the soil provides a store of seeds that can help to ensure the future survival of the tarplant.

Little is known about the survival of tarplant seeds in the soil, or what percentage of these seeds is able to germinate. Researchers therefore used computer models to predict how these factors could affect the likelihood that the tarplant might become extinct.

In their models they used:

- high or low survival values of tarplant seeds in the soil
- different germination percentages of tarplant seeds.

The predictions of the models are shown in Fig. 4.1.

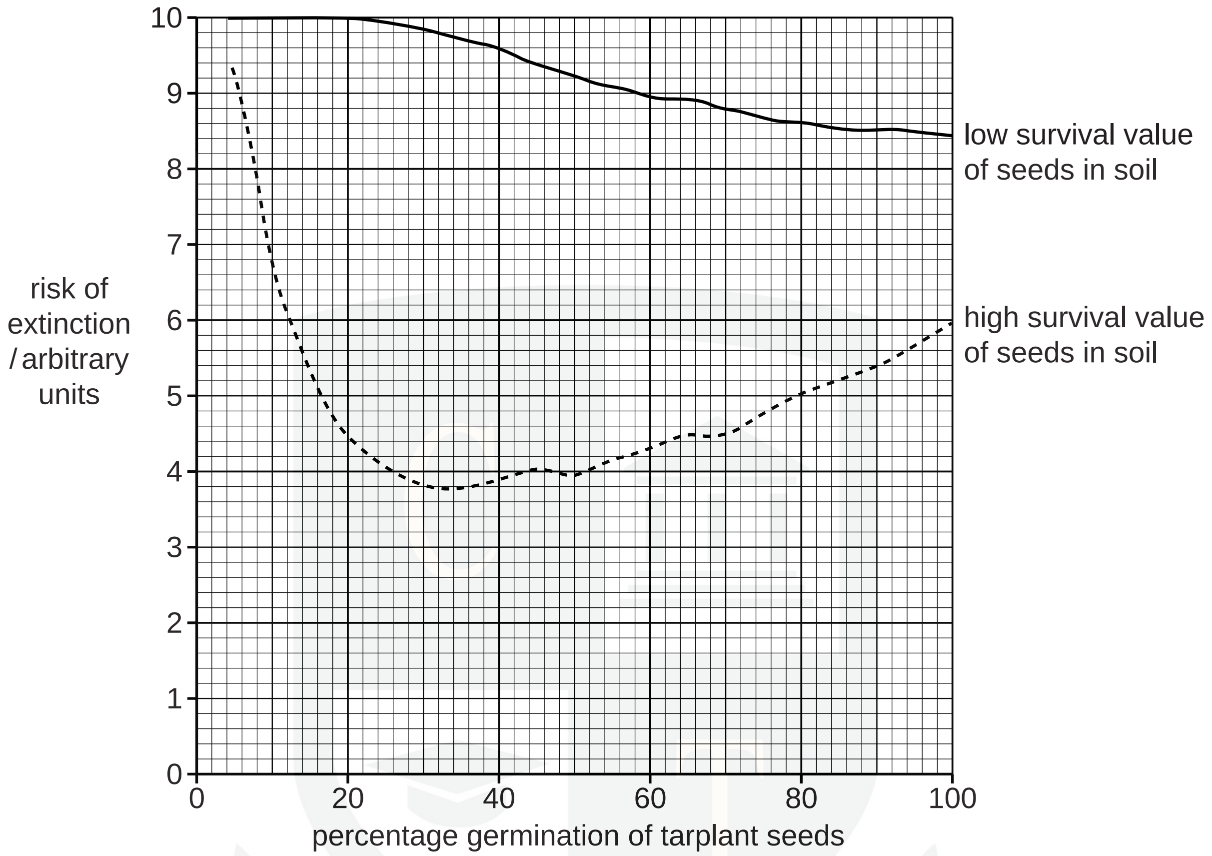

Fig. 4.1

(i) With reference to Fig. 4.1, describe the effect of each of the following on the risk of extinction of the tarplant:

high compared to low survival of the tarplant seeds

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different germination percentages of the tarplant seeds.

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(ii) With reference to Fig. 4.1, discuss whether scraping the soil should be recommended as part of the management strategy to attempt to conserve the tarplant.

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[Total: 15]

2 Rice, *Oryza sativa*, is a grass that is grown as a cereal crop in many parts of the world. In most rice-growing regimes, the rice fields are flooded with water while the rice is actively growing. Fig. 5.1 shows cultivation of rice.

Fig. 5.1

(a) **(i)** Describe **one** structural feature of the tissues in the submerged stems and leaves of rice that is an adaptation for growth in water.

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(ii) Explain the importance of the adaptation you have described in **(i)**.

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(b) An investigation was carried out into the effect of flooding on the growth of the submerged stems of rice plants.

Young rice plants were grown in a container in which the level of water was increased in 10 cm steps, over a period of seven days. The mean length of the submerged internodes (lengths of stem between two leaves) and the concentration of ethene in the rice stems was measured each day. As a control, rice plants were grown in identical conditions but the water level was kept constant throughout the seven days. The results are shown in Fig. 5.2.

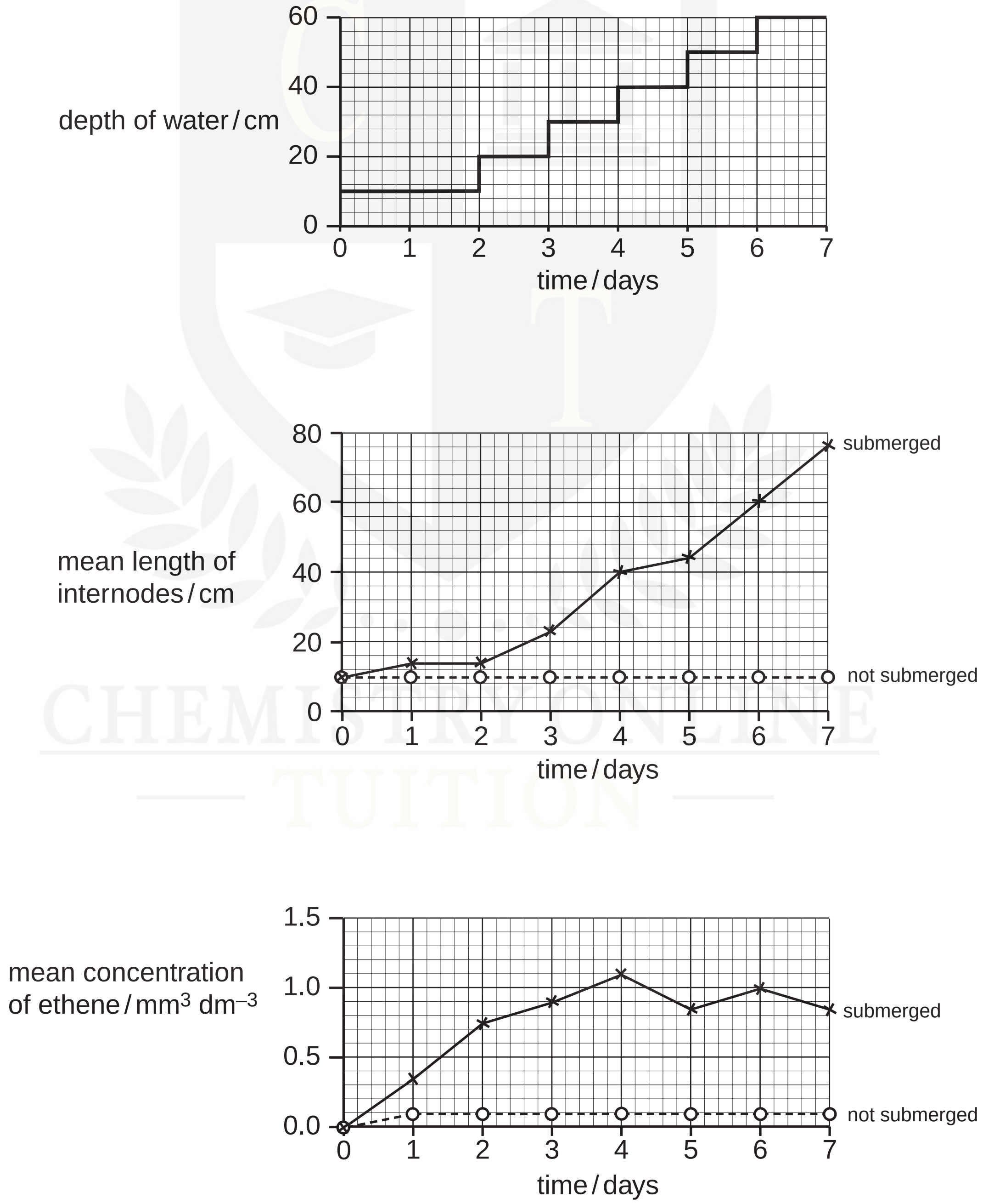

Fig. 5.2

(i) With reference to Fig. 5.2, describe the effect of increasing water level on the length of the submerged internodes.

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(ii) Suggest advantages to the rice plants of the effect that you have described in **(i)**.

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(iii) With reference to Fig. 5.2, describe the effect of increasing water level on the concentration of ethene in the rice stems.

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(c) Application of gibberellin can also affect the growth of rice plants. In a further investigation, various concentrations of gibberellin were applied to submerged rice stems. The stems were placed, for three days in closed containers, in which the air supply either contained pure air or contained ethene. Ethene is a gas that is secreted by plant tissues and acts as a plant growth regulator.

The results are shown in Fig. 5.3.

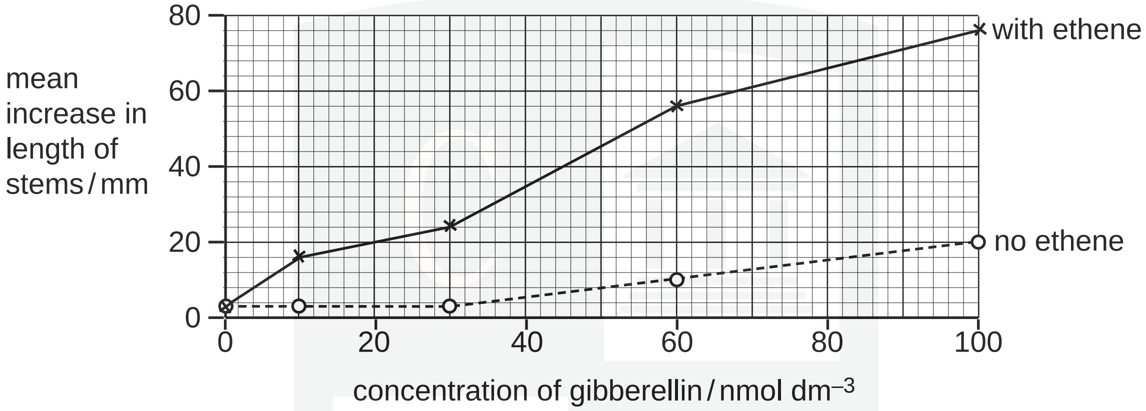

Fig. 5.3

(i) State the meaning of the term *plant growth regulator*.

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(ii) Using your knowledge of the effects of gibberellin, and the results shown in Fig. 5.2, suggest an explanation for the results shown in Fig. 5.3.

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[Total: 14]

3 **(a)** Describe why variation is important in natural selection. [6]

(b) Explain the role of isolating mechanisms in the evolution of new species. [9]

[Total: 15]

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4 **(a)** Explain the significance of cereal crops in the human diet. [8]

(b) Describe and explain how gibberellins are involved in the germination of wheat or barley seeds. [7]

[Total: 15]

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