1 Rice, *Oryza sativa*, is a crop plant that has adapted to grow in flooded fields.

Fig. 1.1 outlines the effects on rice plants of growing in flooded fields.

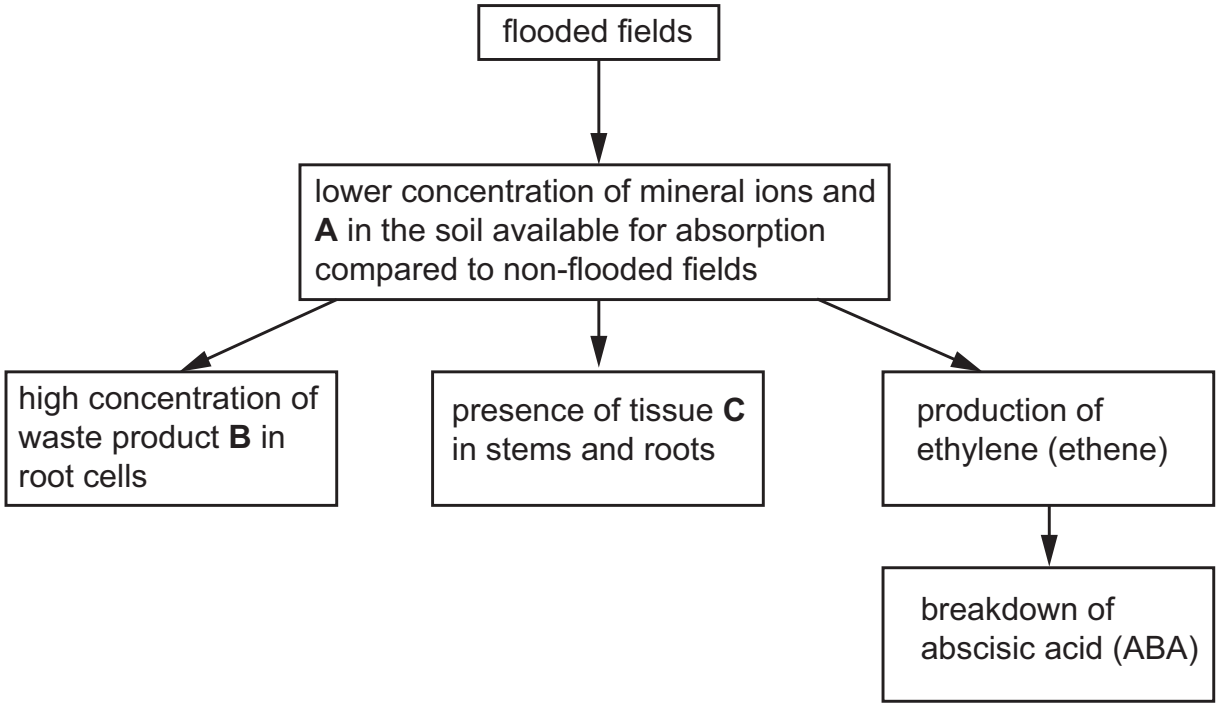

Fig. 1.1

(a) With reference to Fig. 1.1, name:

substance **A** .....

substance **B** .....

tissue **C** .....

[3]

(b) Describe how root cells respond to a high concentration of substance **B**.

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..... [1]

(c) Gibberellin is involved in the growth of stems in rice plants.

Fig. 1.2 shows the effect of gibberellin concentration on the length of stems in rice plants.

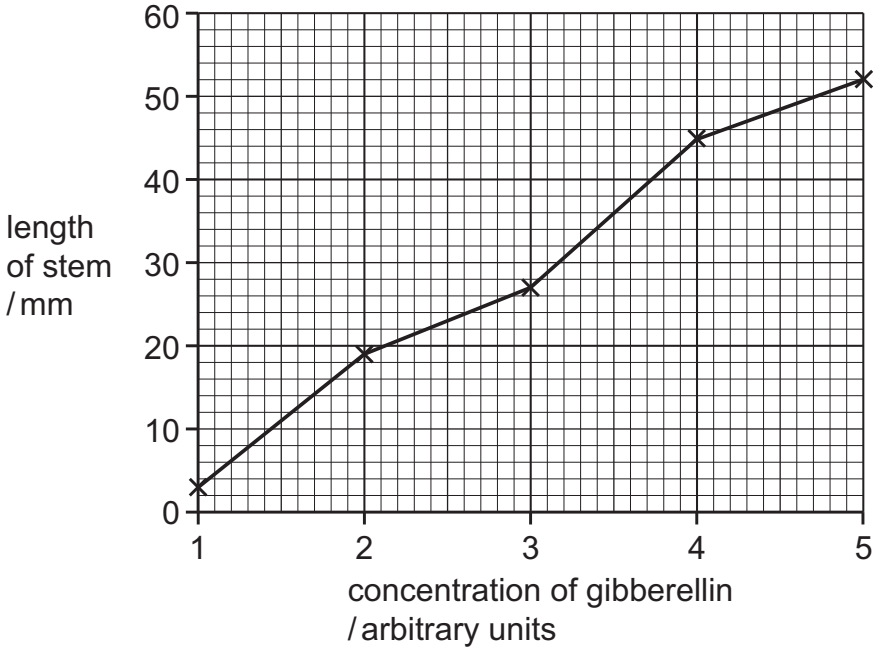

Fig. 1.2

(i) Describe the relationship shown in Fig. 1.2.

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..... [2]

(ii) ABA in rice plant cells inhibits the action of gibberellin.

With reference to Fig. 1.1 and Fig. 1.2, explain the importance of ethylene production for the growth of rice plants in flooded fields.

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..... [3]

[Total: 9]

9 **(a)** In aerobic conditions, pyruvate that has formed during glycolysis enters the mitochondrion and takes part in the link reaction.

Name the **two** coenzymes involved in the link reaction.

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[2]

(b) Enzymes play an important role in the functioning of the Krebs cycle.

The enzymes in the Krebs cycle can be affected by the presence of hydrogen peroxide. Hydrogen peroxide is a product of some of the reactions that occur within the mitochondrion.

An investigation was carried out to measure the effect of two different concentrations of hydrogen peroxide on an enzyme of the Krebs cycle. The activity of the enzyme was measured over 10 minutes when exposed to the two different concentrations of hydrogen peroxide.

The results are shown in Fig. 9.1.

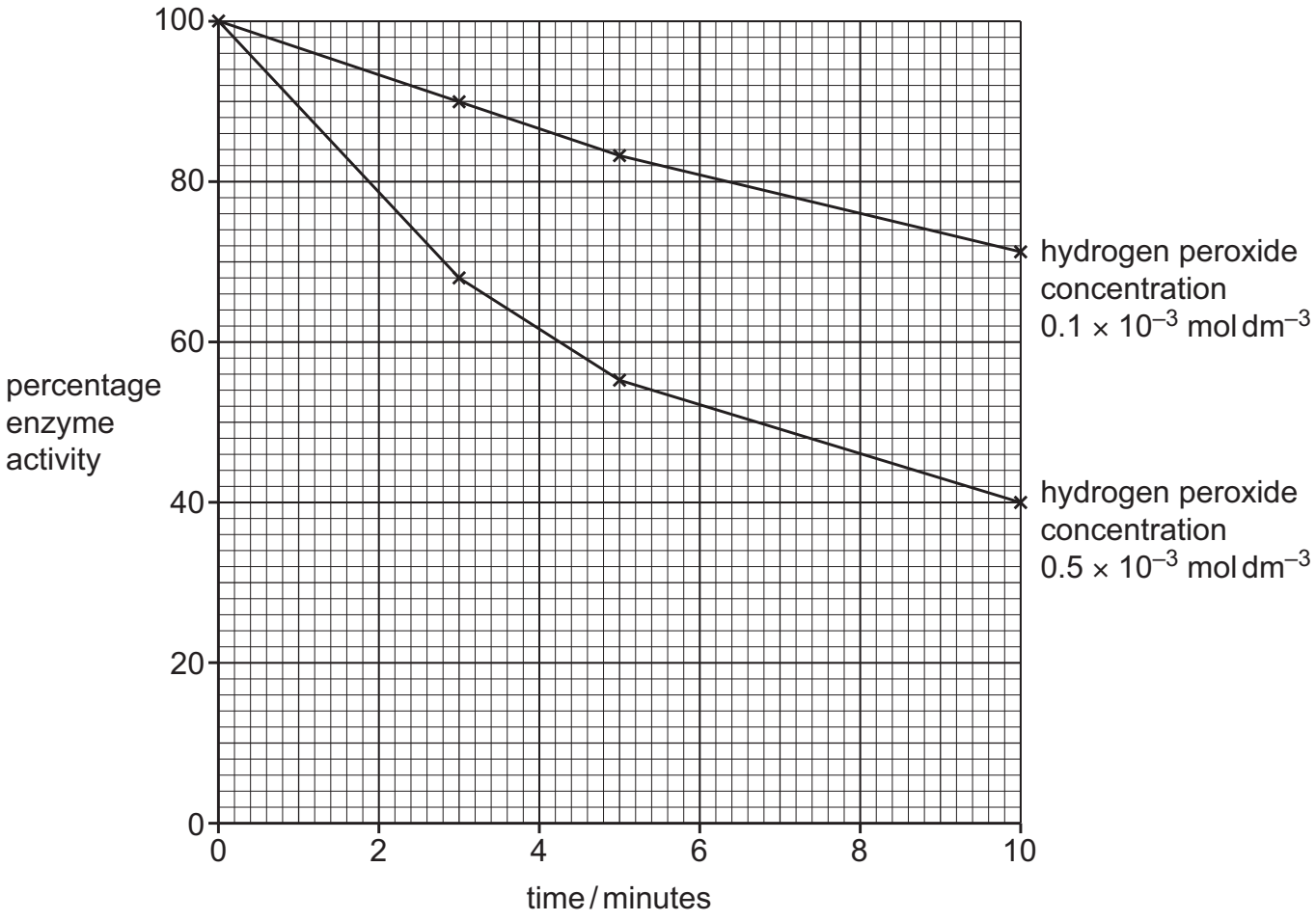

Fig. 9.1

Describe the effect shown in Fig. 9.1 of hydrogen peroxide concentration on the activity of the Krebs cycle enzyme.

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..... [3]

(c) Reduced NAD and reduced FAD are produced during the Krebs cycle. They carry hydrogen to the inner mitochondrial membrane where oxidative phosphorylation occurs.

The first two steps in oxidative phosphorylation are:

1. Hydrogen atoms split into protons and electrons.
2. Electrons move along the electron transport chain, releasing energy.

Outline the steps that occur to complete oxidative phosphorylation.

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..... [4]

(d) Fig. 9.2 shows the oxygen consumption of a person who is carrying out a fast-running exercise.

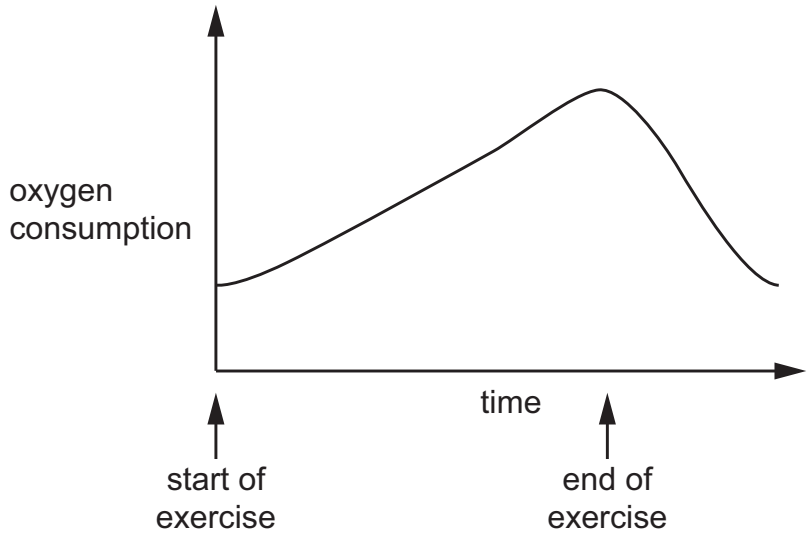

Fig. 9.2

Suggest why the oxygen consumption takes time to return to normal after exercise.

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..... [3]

[Total: 12]

1 Organisms need a source of energy for many cellular processes. Respiration involves the release of energy from energy-rich molecules for the synthesis of ATP molecules. ATP is described as the energy currency of cells.

(a) Name **two** energy-rich molecules that enter the respiration pathway to synthesise ATP.

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..... [2]

(b) Fig. 1.1 shows a molecule of ATP.

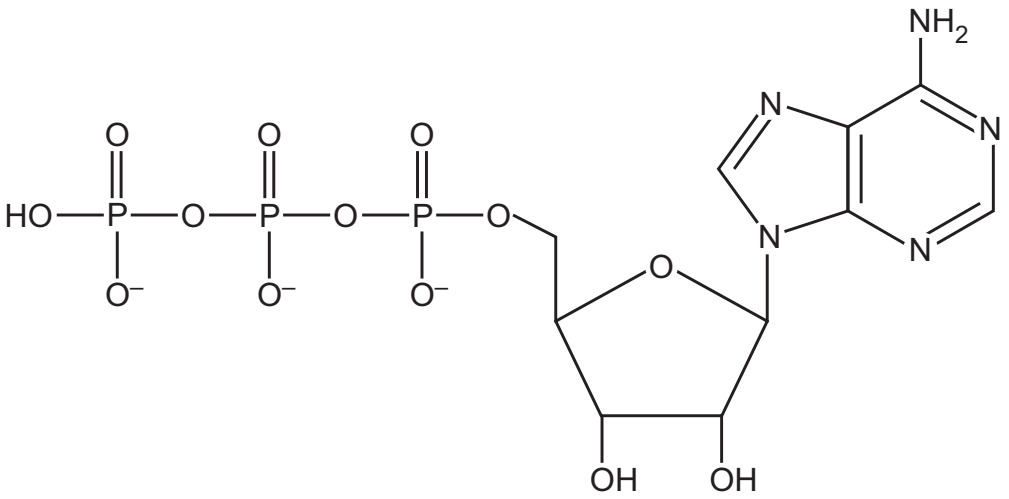

Fig. 1.1

Explain the features of ATP that make it suitable to be the universal energy currency of cells.

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..... [4]

(c) Identify the type of phosphorylation reaction to synthesise ATP that occurs during glycolysis and the Krebs cycle.

..... [1]

(d) **(i)** Pyruvate moves into the matrix of the mitochondrion only when a particular inorganic molecule is present.

Name the inorganic molecule that must be present in the cell for pyruvate to enter the matrix of the mitochondrion.

..... [1]

(ii) Explain how the presence of the inorganic molecule named in **(d)(i)** affects the ATP yield from respiration.

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..... [3]

[Total: 11]

2 A respirometer can be used to investigate how temperature affects the rate of respiration of woodlice.

Woodlice are small invertebrate animals. Fig. 2.1 shows a single woodlouse.

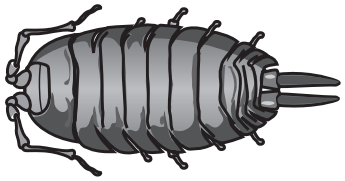

Fig. 2.1

Fig. 2.2 shows a simple respirometer.

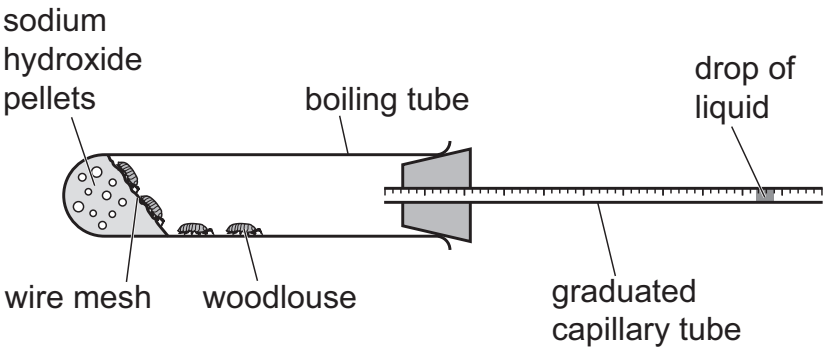

Fig. 2.2

(a) Explain how the experimental set-up in Fig. 2.2 allows the rate of respiration of woodlice to be determined.

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..... [4]

(b) A student determined the rate of respiration of woodlice at a temperature of 5 °C and at a temperature of 20 °C.

Predict **and** explain how the rate of respiration of woodlice differs at 5 °C compared to 20 °C.

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..... [1]

[Total: 5]