Respiration

Question Paper 4

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Energy and respiration
Sub Topic	Respiration
Booklet	Theory
Paper Type	Question Paper 4

Time Allowed : **66 minutes**

Score : **/ 55**

Percentage : **/100**

Grade Boundaries:

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

1 Fig. 7.1 is an outline diagram of the Krebs cycle. A two carbon acetyl group enters the cycle by combining with a molecule of oxaloacetate. A molecule of citrate is formed which is decarboxylated and dehydrogenated to regenerate the oxaloacetate.
The letters **P** to **V** are steps in the cycle.

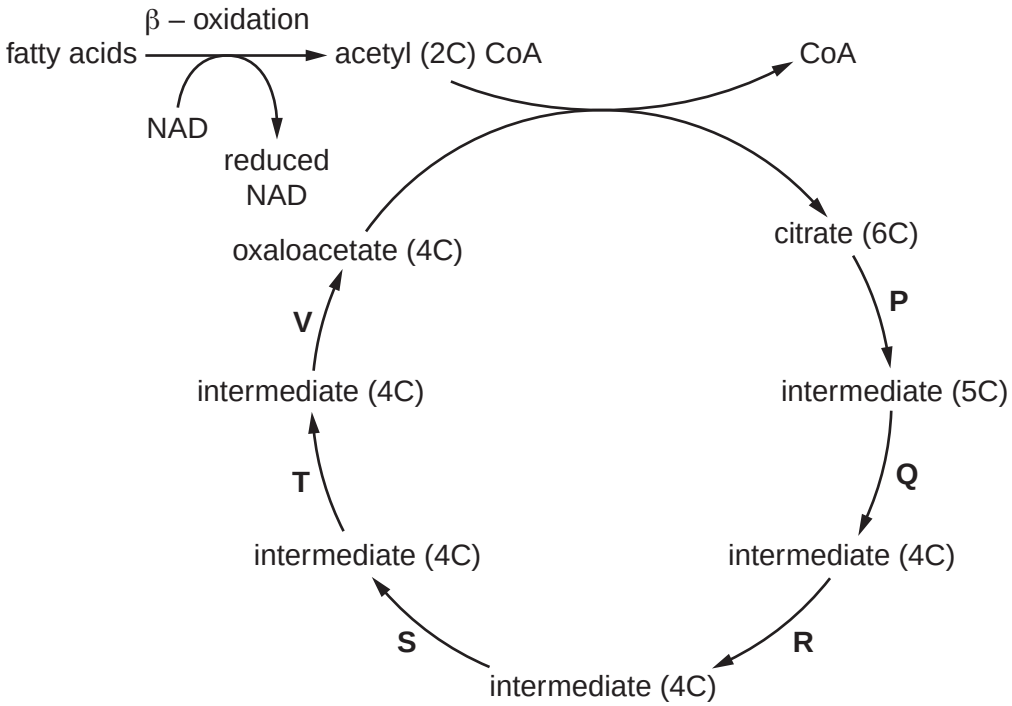

Fig. 7.1

(a) **(i)** Explain what is meant by the following terms:

decarboxylation .....

dehydrogenation ..... [2]

(ii) Using the letters in the cycle, state where decarboxylation is taking place.

..... [1]

(b) Fig. 7.1 shows that fatty acids can be converted into acetyl coenzyme A (acetyl CoA) by a process known as oxidation. Both this process and the Krebs cycle require NAD. The hydrogen atoms released reduce the NAD molecules.

(i) State the number of reduced NAD molecules that are formed in the Krebs cycle from one acetyl group that enters the cycle from acetyl CoA.

..... [1]

(ii) State where the reduced NAD molecules are re-oxidised **and** describe what happens to the hydrogen atoms.

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..... [5]

(c) Describe the role of reduced NAD in respiring yeast cells in the absence of oxygen.

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..... [4]

(d) Describe how the production of lactate in muscle tissue **differs** from anaerobic respiration in yeast.

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..... [3]

[Total: 16]

2 **(a)** The respiratory quotient (RQ) is used to show what substrates are being metabolised in respiration.

The RQ of a substrate may be calculated using the formula below:

$$RQ = \frac{\text{molecules of } CO_2 \text{ given out}}{\text{molecules of } O_2 \text{ taken in}}$$

When the unsaturated fatty acid linoleic acid is respired aerobically the equation is:

$$C_{18}H_{32}O_2 + 25O_2 \rightarrow \ldots\ldots\ldots CO_2 + 16H_2O + \text{energy}$$

(i) Calculate how many molecules of carbon dioxide are produced when one molecule of linoleic acid is respired aerobically.

answer ..... [1]

(ii) Calculate the RQ for linoleic acid.

answer ..... [1]

(b) Hummingbirds feed on nectar from flowers only during daylight hours. Nectar is rich in sugars.

Fig. 1.1 shows a hummingbird.

Fig. 1.1

A study of aerobic respiration in captive hummingbirds was carried out. The hummingbirds were allowed to feed freely and then made to fast for four hours in constant conditions. During this time their RQ values were calculated every 40 minutes.

Fig. 1.2 shows the results from this study.

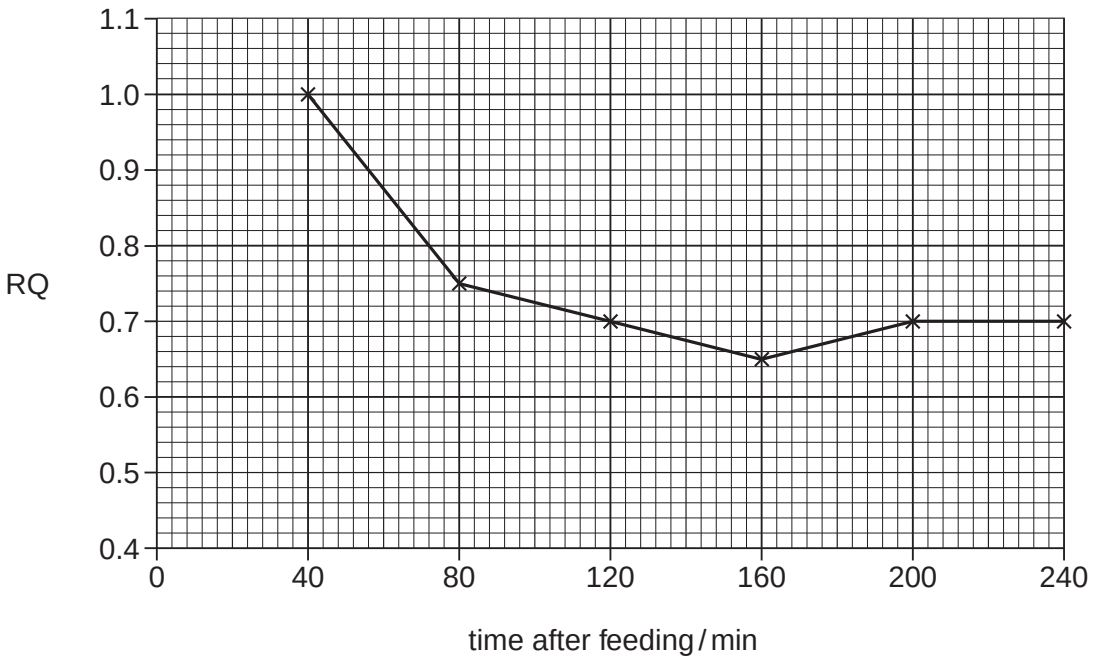

Fig. 1.2

Describe **and** explain the results shown in Fig. 1.2.

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..... [4]

(c) Hummingbirds regulate their body temperature whereas butterflies do not regulate their body temperature.

Explain briefly the effect of an increase in temperature on the rate of respiration of a butterfly.

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..... [2]

[Total: 8]

3 **(a)** Describe the process of oxidative phosphorylation in the mitochondrion. [9]

(b) Explain the roles of NAD in anaerobic respiration in **both** plants and animals. [6]

[Total: 15]

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4 Aerobic respiration consists of three main processes.

Fill in the table to show the major products of each process.

process	major products
glycolysis	....
Krebs cycle	....
oxidative phosphorylation	....

[8]

[Total: 8]

5 The metabolic pathway in which a hexose sugar, such as glucose, is broken down in respiration by cells starts with glycolysis. Fig. 1.1 outlines the key stages of glycolysis.

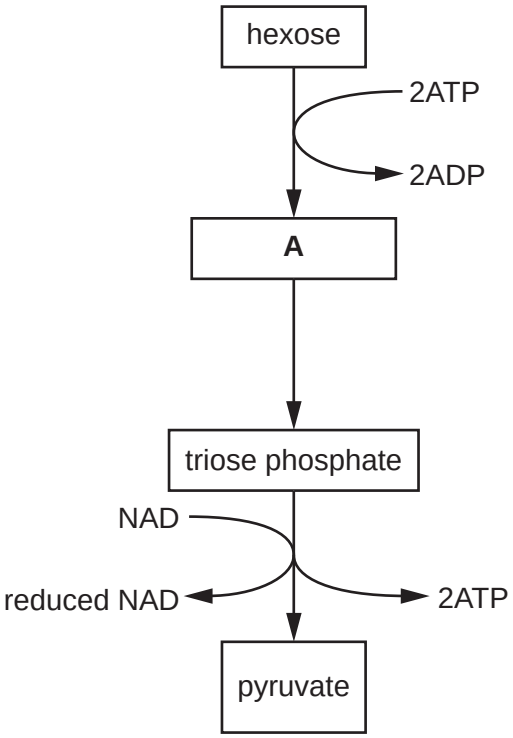

Fig. 1.1

(a) State where in the cell glycolysis takes place.

.....[1]

(b) Name substance **A**.

.....[1]

(c) Explain why the hexose is converted to substance **A**.

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.....[2]

(d) Briefly describe what happens to pyruvate if **yeast** is deprived of oxygen.

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.....[4]

[Total: 8]