Respiration

Question Paper 1

Level	A Level
Subject	Biology
Exam Board	OCR
Module	Communication, homeostasis and energy
Topic	Respiration
Booklet	Question Paper 1

Time allowed: **53 minutes**

Score: **/39**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E
>69%	56%	50%	42%	34%	26%

Citrate synthase catalyses the conversion of oxaloacetate into citric acid in the Krebs cycle. It exhibits product inhibition.

Which of the following is the correct description of citrate synthase?

	Type of respiration involved in	Location of enzyme	Inhibitor
A	anaerobic	cytoplasm	citric acid
B	aerobic	mitochondria	citric acid
C	aerobic	mitochondria	oxaloacetate
D	anaerobic	cytoplasm	oxaloacetate

[Total: 1]

ATP can be produced in various ways. Each stage of respiration contributes to the production of ATP.

(a) Describe the production of ATP by **substrate-level phosphorylation** in different stages of respiration with reference to the number of ATP molecules produced.

[4]

(b) Glucose and other carbohydrates are present in respiring cells. The concentrations of carbohydrate molecules vary between tissues.

A student conducted tests on three tissues, **A**, **B** and **C**. Table 2 shows the results of these tests.

Tissue	Colour after Benedict's test	Colour after treatment with HCl and Benedict's test	Colour after iodine test
A	red	red	yellow
B	yellow	red	black
C	orange	orange	black

Table 2

Two of the tissues were known to be phloem tissue and liver tissue.

Use the evidence in Table 2 to identify which tissue, **A**, **B** or **C**, is phloem and which tissue is liver. Explain your answer.

[3]

Tissue ..... must be phloem because .....

Tissue ..... must be liver because .....

(c) Cells can use fatty acids instead of carbohydrates as respiratory substrates. A process called beta oxidation is used to break down fatty acids to acetyl CoA for use in respiration.

Fig. 2 shows a simplified example of beta oxidation.

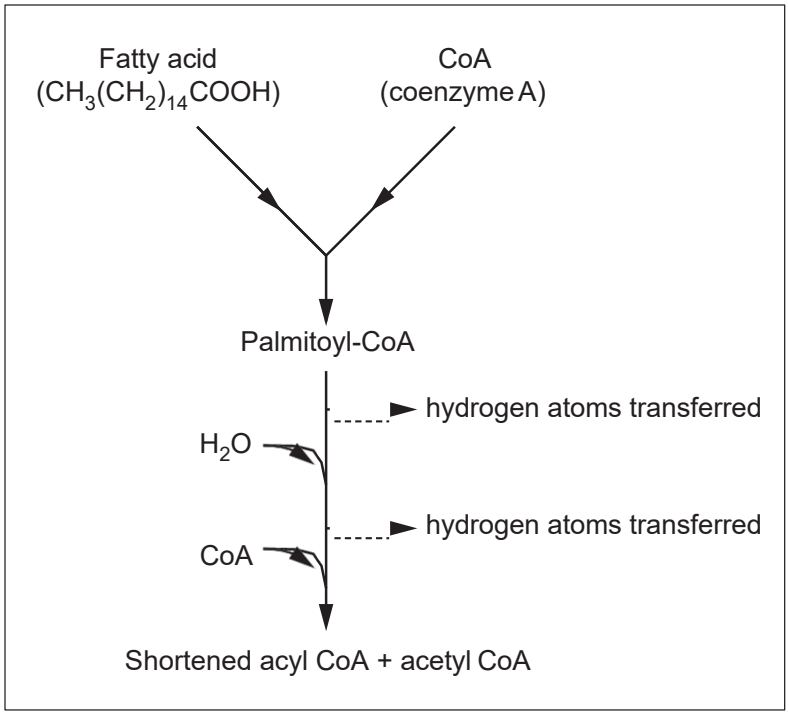

Fig. 2

(i) Using the information in Fig. 2, calculate the percentage of carbon atoms in the fatty acid that are able to enter the Krebs cycle.

[1]

(ii) The percentage of carbon atoms that a reaction makes available for use in the Krebs cycle can be described as the efficiency of the reaction.

Calculate the efficiency of the **link reaction**. Using your answer to part **(i)**, state whether the link reaction is **more**, **less** or **equally** efficient when compared to the reactions described in Fig. 2.

Show your working. **[1]**

(iii) Fig. 2 shows the role of coenzyme A in beta oxidation.

Suggest a role for coenzymes **other than coenzyme A** in beta oxidation. **[1]**

[Total: 10]

A group of students set up a simple respirometer, as shown in **Fig. 1.1**, and used it to determine the rate of respiration in germinating mung beans.

- They placed a small muslin bag of soda lime into the syringe and then added five germinating mung beans, which were held in place with the syringe plunger.
- The students measured the movement of the red fluid in the capillary tube.
- After each set of readings the plunger was reset to return the fluid to its original position.

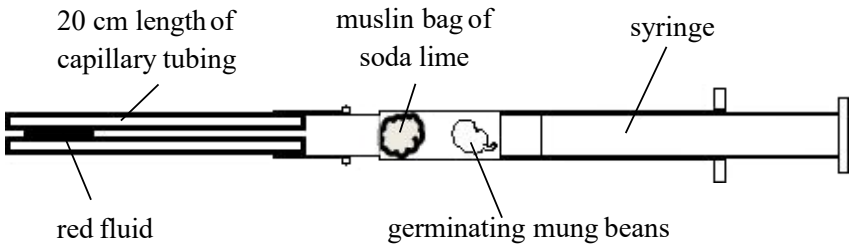

Fig. 1.1

The results are shown in **Table 1.1**.

Time (s)	Distance moved by the red fluid in capillary tube (mm)		
	1	2	3
0	0.0	0.0	0.0
30	11.5	12.0	12.5
60	22.5	21.5	17.5
90	31.0	32.0	32.5
120	41.5	42.0	42.5
150	53.0	54.0	53.5
180	63.0	63.0	64.0
210	72.5	71.0	71.5
240	78.5	79.5	79.0
270	87.5	88.5	87.0

Table 1.1

(a) Give **one** limitation of using this method to investigate respiration rate. **[1]**

(b) Read the procedure carefully. Identify **one** variable that had not been controlled in this experiment **and** suggest an improvement to control that variable. **[2]**

Variable

Improvement

(c) Describe how you would add the red fluid to the capillary tube at the start of the experiment. **[1]**

(d) The data shows an anomalous result at 60 seconds.

Explain why the result is considered to be anomalous **and** describe one correct way of dealing with this type of result.

[2]

(e) Using the data the student obtained, calculate the mean rate of respiration for germinating mung beans between 90 and 150 seconds. **[1]**

(f) What additional information would be needed to calculate:

(i) the volume of oxygen taken up by the seeds. **[1]**

(ii) the oxygen uptake for this batch of seeds to be comparable with data from another type of bean. **[1]**

(g)* The group of students wanted to find out if the rate of respiration of a small invertebrate animal was comparable to that of the mung beans.

Adapt the procedure used to investigate the respiration rate of a small invertebrate, such as a woodlouse or caterpillar, with that of mung beans.

Comment on the results you might expect from this experiment and the conclusions you might draw.

[6]

[Total: 15]

(a) ATP is described as the 'universal energy currency'.

Describe how the structure of ATP is similar to **and** differs from the structure of a DNA nucleotide.

In your answer, you should use appropriate technical terms, spelled correctly. **[5]**

(b) ATP is produced in cells by the process of respiration. Some of the reactions involved in the process of respiration are outlined in Fig. 3.1.

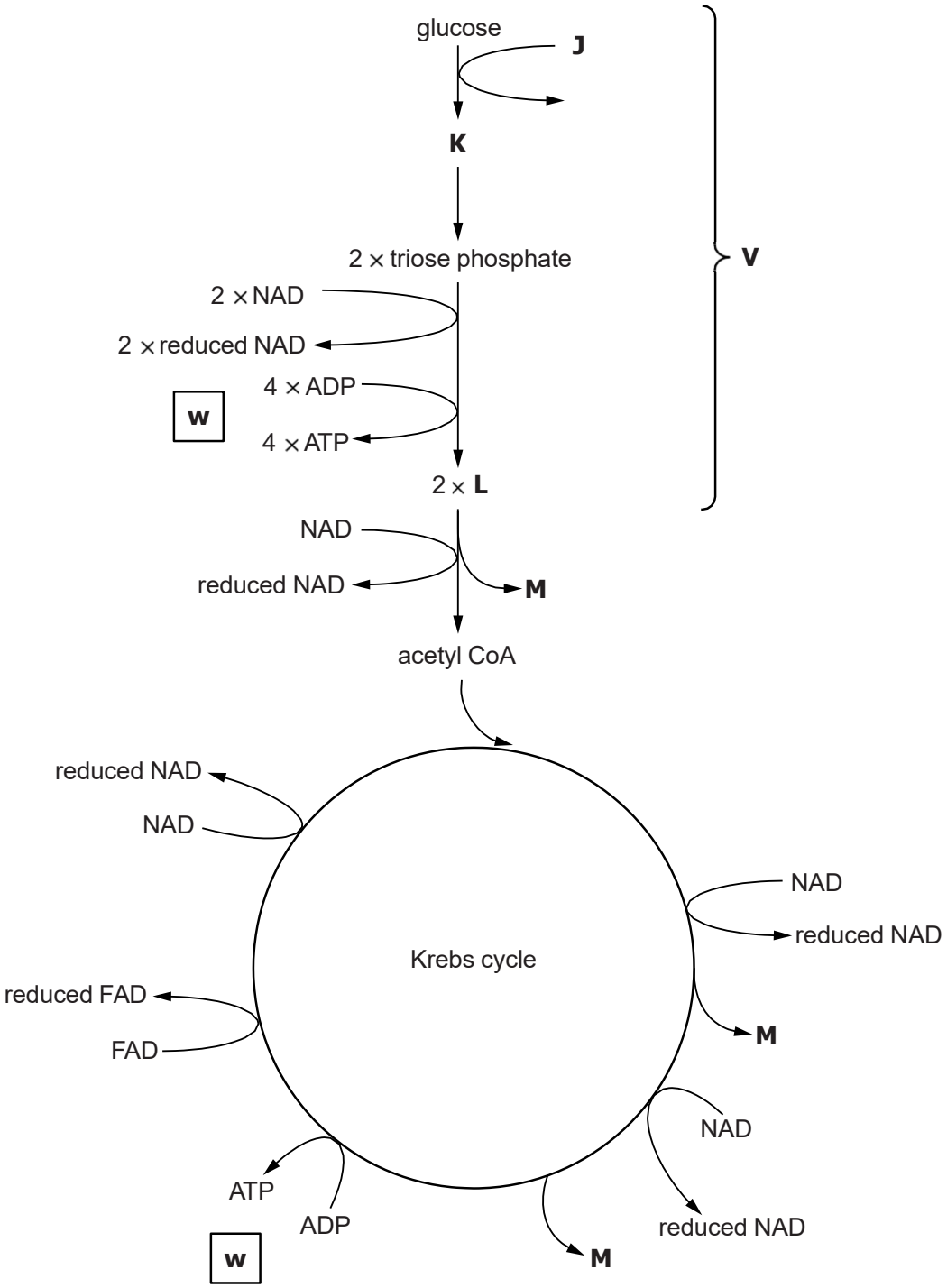

Fig. 3.1

(i) Compound **J** is required for the reaction pathway to start.

Identify compound **J**. **[1]**

(ii) Identify compounds **K** to **M**. **[3]**

(iii) Name the pathway labelled **V**. **[1]**

(iv) ATP is produced in two different ways during respiration.

- Some ATP is produced at the points labelled **W** on Fig. 3.1.
- ATP is also produced using reduced NAD and reduced FAD on the inner mitochondrial membrane.

Outline the differences in the two ways by which ATP is produced in respiration. **[3]**

[Total : 13]