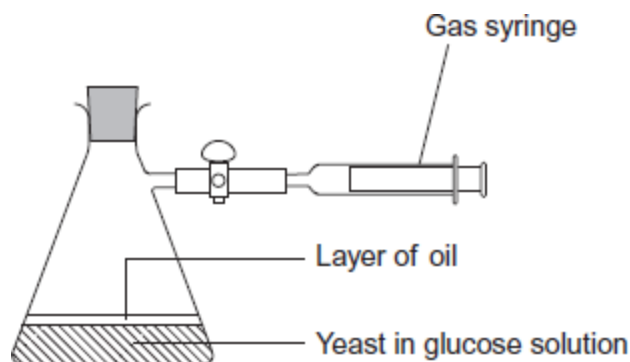


1.

A student investigated the rate of anaerobic respiration in yeast. She put 5 g of yeast into a glucose solution and placed this mixture in the apparatus shown in the figure below. She then recorded the total volume of gas collected every 10 minutes for 1 hour.



(a) Explain why a layer of oil is required in this investigation.

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(1)

(b) The student's results are shown in the following table.

| Time / minutes | Total volume of gas collected / cm <sup>3</sup> |
|----------------|---|
| 10             | 0.3   |
| 20             | 0.9   |
| 30             | 1.9   |
| 40             | 3.1   |
| 50             | 5.0   |
| 60             | 5.2   |

(i) Calculate the rate of gas production in cm<sup>3</sup> g<sup>-1</sup> min<sup>-1</sup> during the first 40 minutes of this investigation. Show your working.

Answer = \_\_\_\_\_ cm<sup>3</sup> g<sup>-1</sup> min<sup>-1</sup>

(2)

(ii) Suggest why the rate of gas production decreased between 50 and 60 minutes.

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(1)

(iii) Yeast can also respire aerobically. The student repeated the investigation with a fresh sample of yeast in glucose solution, but without the oil. All other conditions remained the same.

Explain what would happen to the volume of gas in the syringe if the yeast were only respiring aerobically.

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(2)

(c) Respiration produces more ATP per molecule of glucose in the presence of oxygen than it does when oxygen is absent. Explain why.

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(2)

(Total 8 marks)

2.

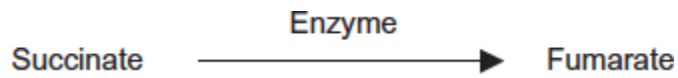
(a) The table contains statements about three stages of respiration.

Complete the table with a tick if the statement in the first column is true for each stage of respiration in an animal.

|                         | Glycolysis | Link reaction | Krebs cycle |
|-------------------------|------------|---------------|-------------|
| Occurs in mitochondria  |            |               |             |
| Carbon dioxide produced |            |               |             |
| NAD is reduced          |            |               |             |

(3)

(b) The following reaction occurs in the Krebs cycle.



A scientist investigated the effect of the enzyme inhibitor malonate on this reaction. The structure of malonate is very similar to the structure of succinate. The scientist added malonate and the respiratory substrate, pyruvate, to a suspension of isolated mitochondria. She also bubbled oxygen through the suspension.

(i) Explain why the scientist did not use glucose as the respiratory substrate for these isolated mitochondria.

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(2)

(ii) Explain how malonate inhibits the formation of fumarate from succinate.

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(2)

(iii) The scientist measured the uptake of oxygen by the mitochondria during the investigation. The uptake of oxygen decreased when malonate was added. Explain why.

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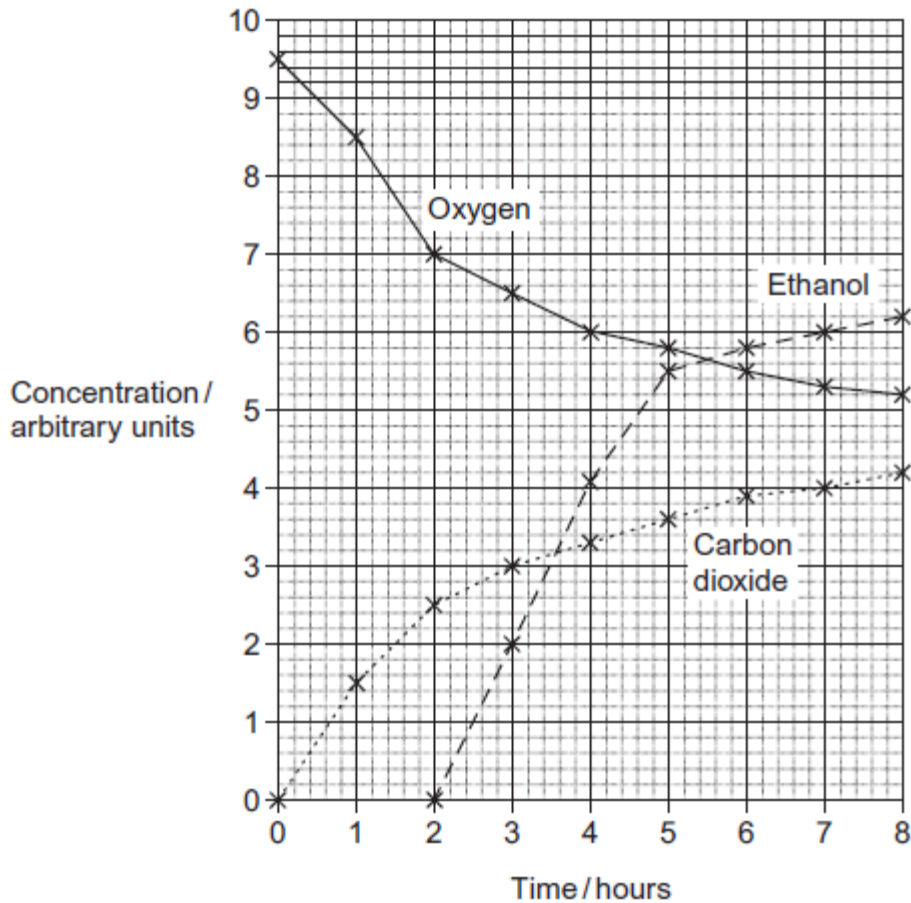
(2)

(Total 9 marks)

3.

A scientist investigated the use of a new source of carbohydrate in the production of ethanol for biofuel. He wanted to find the optimum time to leave a mixture of yeast and this carbohydrate to produce ethanol. The scientist set up an airtight container containing yeast and this carbohydrate. He then measured the oxygen, carbon dioxide and ethanol concentrations over 8 hours.

The results of his investigation are shown in the graph below.



- (a) The scientist used a container that was airtight.  
Give **two** explanations why the container had to be airtight.

1. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

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\_\_\_\_\_

\_\_\_\_\_

(4)

(b) Explain the relationship between the concentration of oxygen and the concentration of carbon dioxide between 0 and 3 hours.

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(2)

(c) The scientist concluded that yeast starts to respire anaerobically when the oxygen concentration falls below a certain concentration. What is the oxygen concentration when the yeast starts to respire anaerobically? Explain your answer.

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(2)

(d) (i) The scientist worked for a biofuel company. Give **two** suggestions for further work he should do to make sure that the results he presented to the company were reliable. Explain how each of your suggestions would make the results more reliable.

Suggestion \_\_\_\_\_

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Explanation \_\_\_\_\_

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Suggestion \_\_\_\_\_

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Explanation \_\_\_\_\_

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(4)

- (ii) The scientist recommended that when the ethanol is produced commercially as biofuel the reaction should be stopped at 6 hours. Use the graph to suggest why.

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**(2)**

- (iii) The scientist's work was funded by a biofuel company. Explain why the source of funding can cause problems with scientific work.

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**(2)**

**(Total 16 marks)**