

# Oxidative Phosphorylation

## Question Paper

Level	A Level
Subject	Biology
Exam Board	Edexcel
Topic	Energy of Biological Processes
Sub Topic	Oxidative Phosphorylation
Booklet	Question Paper

Time Allowed: 51 minutes

Score: /42

Percentage: /100

Grade Boundaries:

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

An investigation was carried out to study the respiration rate of carrots.

All other variables were kept constant.

The results are shown in the table below.

Stage of the investigation	Percentage of each gas in the bag (%)	
	Oxygen	Carbon dioxide
Start	21.0	0.04
End	5.3	8.14

- (2)

- (3)

This image shows a full page of white paper with horizontal dashed lines, typical of primary school writing paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

(4)

[illegible]

- (c) The investigation was repeated at storage temperatures of 5 °C and 10 °C.

The table below shows the change in percentage of carbon dioxide in the bag at the end of the investigation compared with the start of the investigation for all three storage temperatures.

Storage temperature / °C	Change in percentage of carbon dioxide (%)
1	+ 8.
5	+ 14.
10	+ 16.

Explain the effect of temperature on the change in the percentage of carbon dioxide in the bag.

(3)

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- (d) Suggest why the carrot tissue could survive when no oxygen was left in the bag.

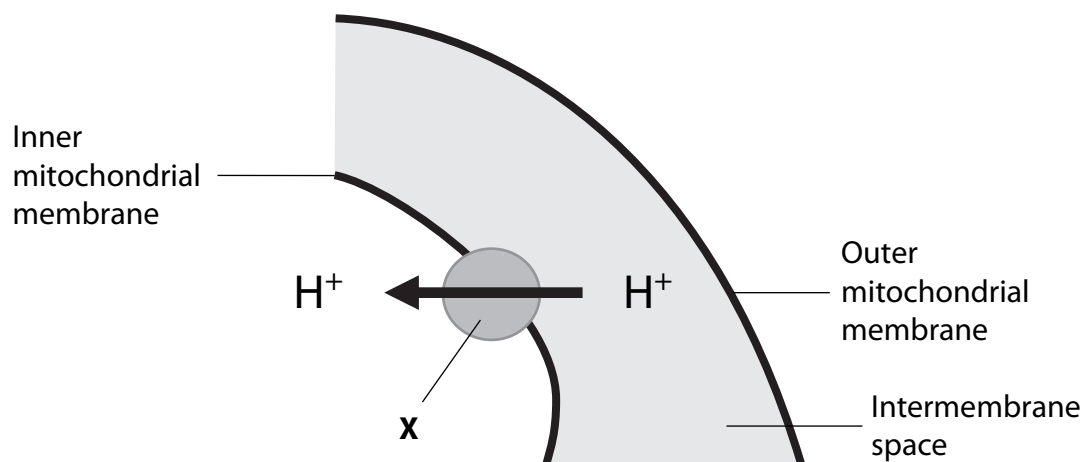
(1)

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(Total for Question 1 = 13 marks)

2 The diagram below shows part of the process of chemiosmosis in a mitochondrion.



(a) Name the enzyme labelled **X** involved in chemiosmosis.

(1)

(b) Explain how a high concentration of hydrogen ions ( $H^+$ ) is maintained in the intermembrane space.

(3)

(c) Describe the role of the hydrogen ion concentration gradient in making available an accessible supply of energy for biological processes.

(2)

(Total for Question 2 = 6 marks)

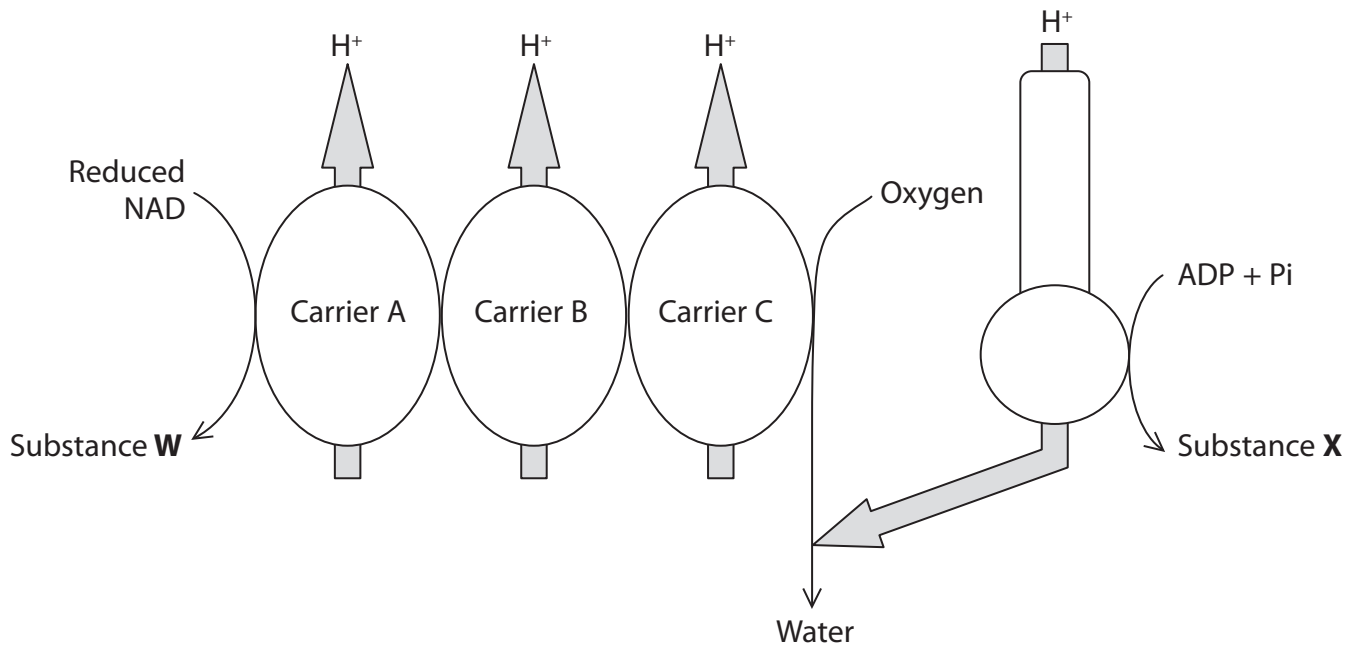
(a) The diagram below shows a metabolic process consisting of three steps.

Substance P →<sup>1</sup> Substance Q →<sup>2</sup> Substance R →<sup>3</sup> Substance S

(4)

[illegible]

(b) The diagram below shows the electron transport chain, which is part of aerobic respiration.



(i) Using the information in the diagram, name substance **W** and explain how it is formed.

(3)

[illegible]

(ii) Name substance **X**.

Explain the link between the formation of substance **X** and the  $\text{H}^+$  shown on the diagram.

(3)

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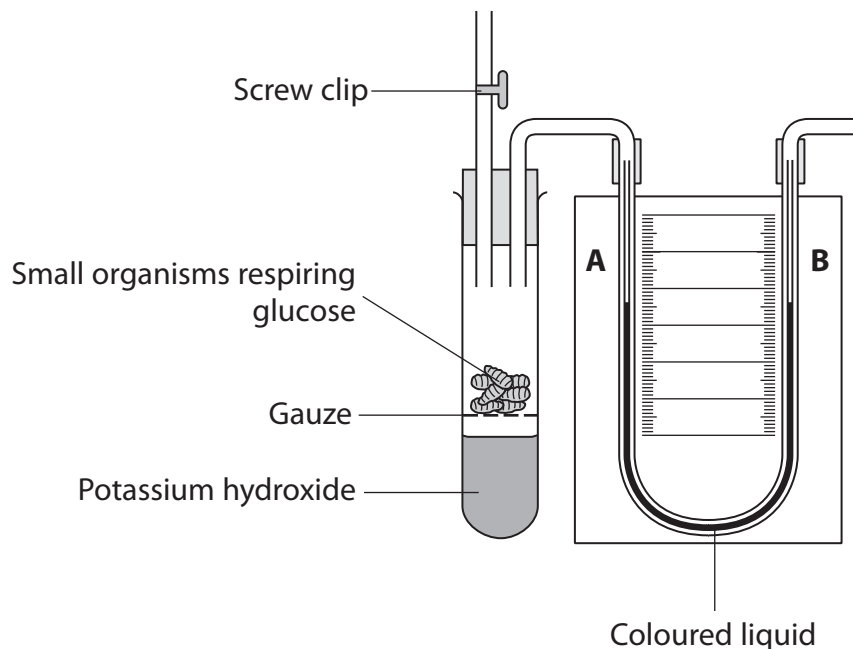
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- (c) The diagram below shows a respirometer used to measure the rate of aerobic respiration in small organisms.



Potassium hydroxide absorbs carbon dioxide.

The table below describes three different situations.

Place a cross in the box ☒ that correctly shows the movement of the coloured liquid in the U-shaped tube for each situation.

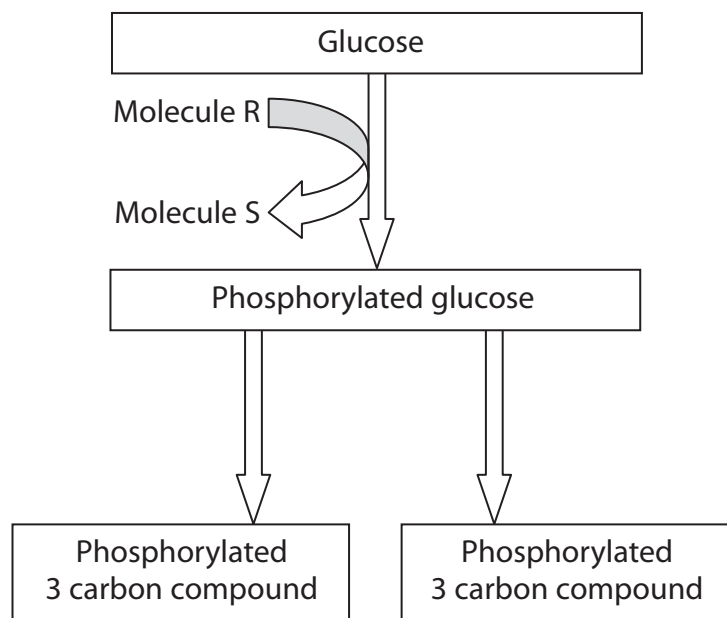
(3)

Situation	Movement of coloured liquid		
	towards A	towards B	does not move
Screw clip is open	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Screw clip is closed	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Potassium hydroxide is replaced with water and screw clip is closed	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

(Total for Question 3 = 13 marks)

- 4** Respiration is a vital process in living organisms.  
All organisms carry out glycolysis. The Krebs cycle also occurs in some organisms.

(a) The diagram below shows some of the stages in glycolysis, using the hexose sugar glucose.



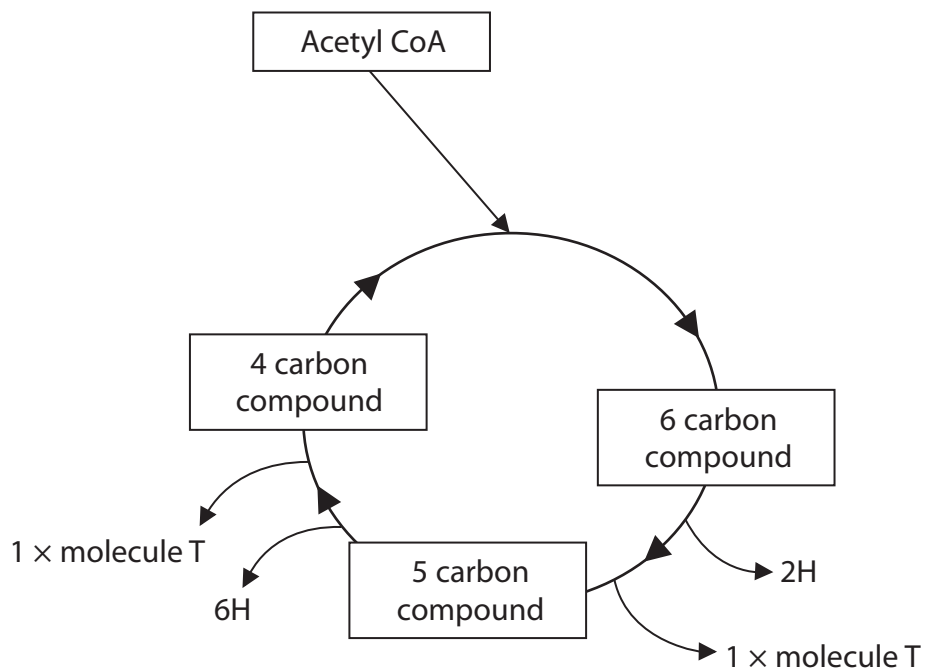
Name the molecules R and S shown in the diagram.

(2)

Molecule R .....

Molecule S .....

(b) The diagram below shows some of the stages in the Krebs cycle.



(i) Name molecule T and use the information in the Krebs cycle diagram to give a reason for your answer.

(2)

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- (ii) Using information in the diagram, suggest what would happen in the Krebs cycle if acetyl CoA became unavailable.

(3)

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- (c) The hydrogen (H) from the Krebs cycle enters the electron transport chain and oxidative phosphorylation occurs.

Explain what is meant by the term **oxidative phosphorylation**.

(3)

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(Total for Question 4 = 10 marks)