

CANDIDATE
NAME

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CENTRE
NUMBER

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CANDIDATE
NUMBER

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Secondary 6

14/08/2024

BIOLOGY

August 2024

9700 Paper 4

1 hr

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

Total marks for this question is 40 marks.

Answer **all** questions.

For Teacher's Use Only	
Question No	Marks
1.	
2.	
3.	
4.	
5.	
Total	

Invigilator's Name: _____

Invigilator's Signature: _____

1.

(a) ATP is needed for many metabolic processes in living organisms.

(i) Describe the properties of ATP that make it suitable for its role as the universal energy currency.

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..... [4]

(ii) Suggest why ATP is needed for protein synthesis.

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..... [2]

(b) Fig. 1.1 is a diagram of a mitochondrion.

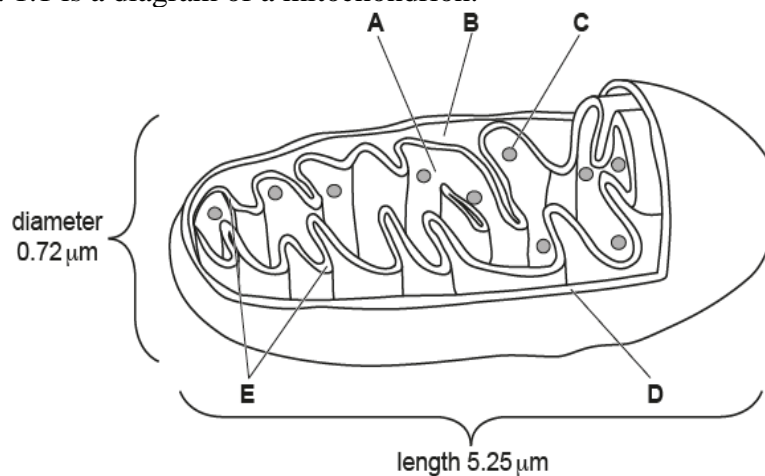


Fig. 1.1



- (i) Complete table 1.1 using letters A to E from fig 6.1.

Table 1.1

statement	letter
the site of the Krebs Cycle
a phospholipid bilayer impermeable to H ⁺ ions
the site of translation

[2]

- (iii) Assume that the mitochondrion in fig. 1.1 is a cylinder.

Calculate the surface area of this mitochondrion.

Use the formula: Surface area of cylinder = $2\pi r^2 + 2\pi rh$

Show your working.

surface area = μm^2 [2]

[Total: 10]

2.

- (a) During a sporting event, an athlete carries out respiration in aerobic conditions.

- (i) Complete Table 2.1 to state the precise locations within a muscle cell of glycolysis, the link reaction, the Krebs cycle and oxidative phosphorylation.

Table 2.1

process	precise location
glycolysis	
link reaction	
Krebs cycle	
oxidative phosphorylation	

[2]



- (ii) In a muscle cell, molecules of glucose are phosphorylated at the start of glycolysis.

Suggest why the phosphorylated glucose molecules cannot diffuse out of the cell.

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..... [2]

- (b) Sometimes an athlete will need to carry out respiration in anaerobic conditions to produce ATP.

Explain why the respiration of glucose in anaerobic conditions produces less ATP than in aerobic conditions.

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..... [5]

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- (c) For a short time after exercise, a person continues to breathe more heavily than at rest to take in more oxygen than normal.

Explain the use of this **extra** oxygen.

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[Total: 12]

3.

- (a) Photosynthesis is a complex process involving a light dependent stage and a light independent stage.

- (i) Name the products of the light dependent stage that are needed in the light independent stage.

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..... [2]

- (ii) Describe the role of chlorophyll b in photosynthesis.

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..... [2]

A student carried out an experiment to investigate the effect of light intensity and light wavelength on the rate of photosynthesis.

- An aquatic plant, *Elodea canadensis*, was put into a beaker containing sodium hydrogencarbonate solution as a source of carbon dioxide.
- To minimise changes in temperature, an LED lamp was used as a source of light.
- The lamp was switched on and the number of bubbles released by the aquatic plant in 1 minute was counted.
- The lamp was placed at seven different distances from the beaker to change light intensity.
- Five replicates were carried out at each lamp distance.
- All other variables were controlled.

- (b) The student calculated the light intensity for each distance (d) using $\frac{1}{d^2}$.

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Table 3.1 shows the calculated light intensities for each distance.

Table 3.1

distance between plant and lamp / m	light intensity / $\frac{1}{d^2}$
0.025	1600
0.050	400
0.100	
0.150	44
0.200	25
0.250	16
0.300	11

Complete Table 3.1 by calculating the light intensity for a distance 0.100 m. [1]

- (c) At each distance from the lamp, the experiment was repeated using a red filter in front of the lamp to give a different wavelength of light. The experiment was repeated using a blue filter and then using a green filter. Each filter transmitted the same light intensity.

The student calculated the mean rate of bubble production as a measure of the rate of photosynthesis.

Fig. 3.1 shows a graph of the results.

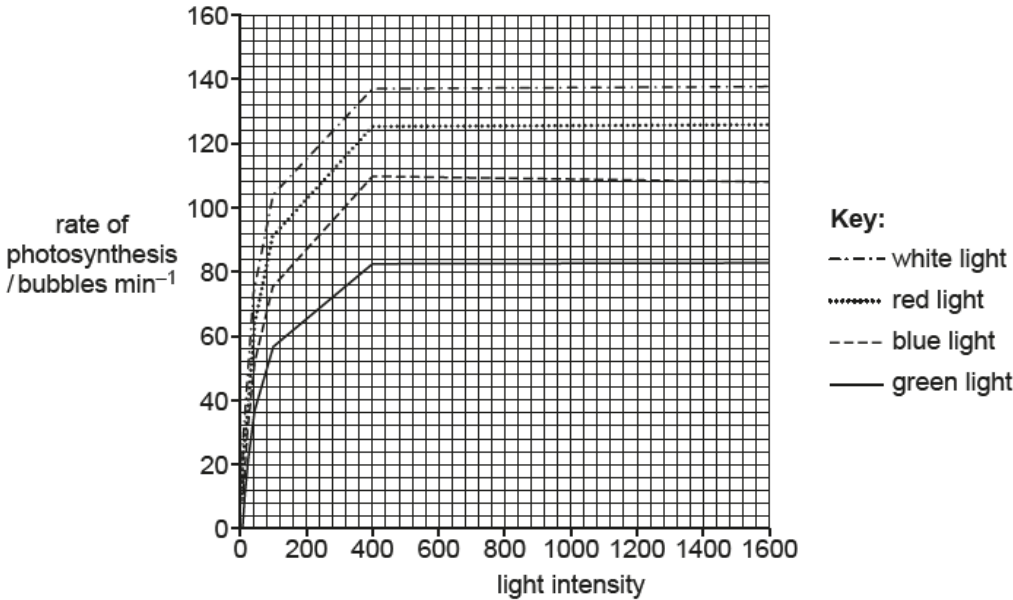


Fig. 3.1

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(i) With reference to fig. 3.1:

- state the range over which light intensity is the limiting factor
- explain why light intensity above this range is not limiting the rate of photosynthesis.

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(ii) At a light intensity of 1600, explain why different colour filters result in different rates of photosynthesis.

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..... [3]

[Total:11]

4.

(a) ATP and coenzyme A both play important roles in respiration.

Fig. 4.1 represents the molecular structure of the coenzyme A.

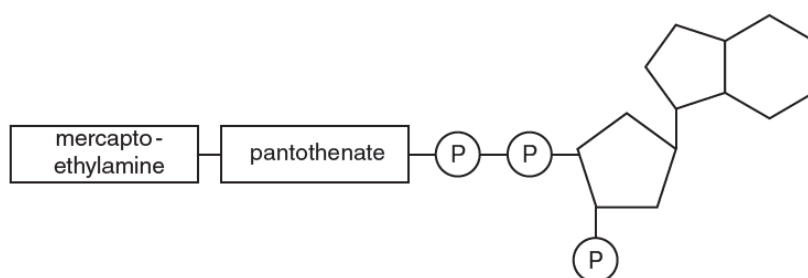


Fig. 4.1

