OCR GCSE 21ST CENTURY BIOLOGY B · J257

BIOLOGY



EXAM QUESTION PACK

B3.1 WHAT HAPPENS DURING PHOTOSYNTHESIS? (HIGHER)

SCORE	PERCENTAGE
/73	%

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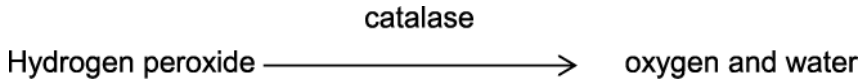
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1(a). A group of students carry out an enzyme investigation. The equation below shows the reaction.



Name the substrate and the enzyme in the reaction above.

Substrate_____

Enzyme_____

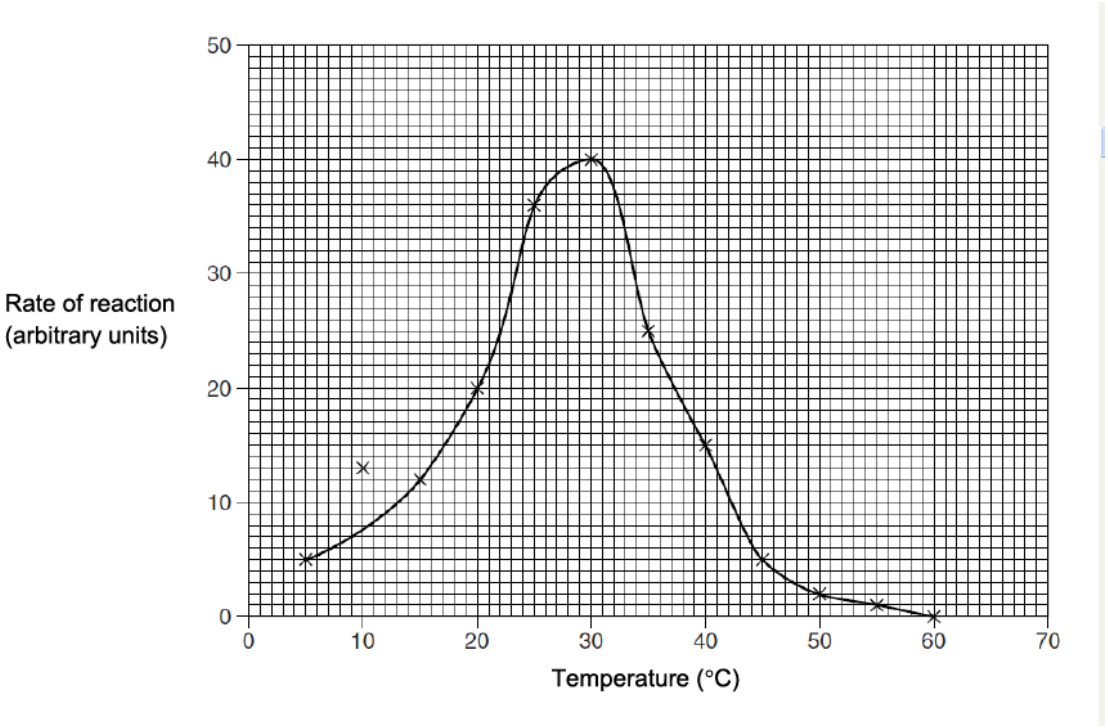
[1]

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(b). * The students investigated the effect of temperature on the rate of the enzyme controlled reaction.

Their results are shown in the graph below.



Use the graph above to describe and explain the effect of temperature on an enzyme such as this.

[6]

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2. All cells respire.

(i) Name **two** parts of animal cells that are involved in the process of respiration. Describe the function of each part.

Part 1 _____

Function _____

Part 2 _____

Function _____

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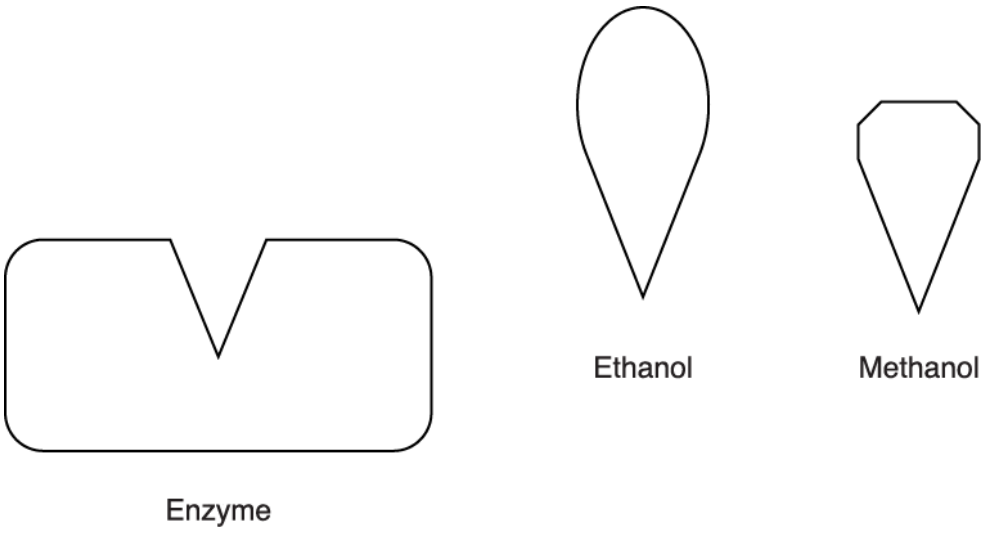
[4]

(ii) Methanol is a type of alcohol.

In the body, methanol is broken down by an enzyme.

The products of this process are poisonous.

Ethanol is a different type of alcohol. It can be used to treat methanol poisoning.



The diagrams show the shapes of the molecules of enzyme, ethanol and methanol.

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Use your knowledge of enzymes to explain why ethanol is used to treat methanol poisoning.

[3]

(iii) During beer and wine making, yeast cells respire anaerobically to produce ethanol.
Write down one other useful application of anaerobic respiration in microorganisms.

[1]

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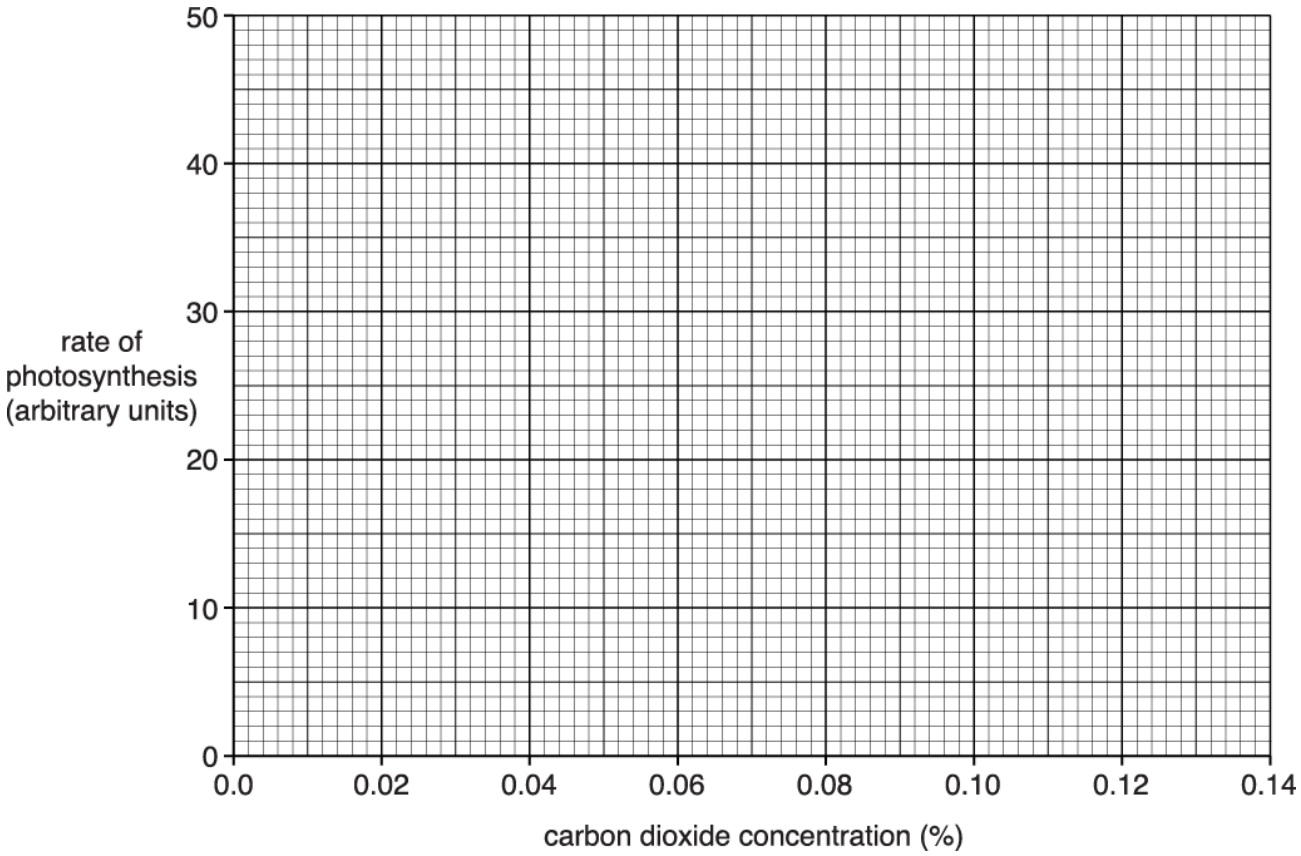
3(a). 0Paresh does an experiment to investigate the effect of carbon dioxide on the rate of photosynthesis.

His results are shown below

Carbon dioxide concentration in the air (%)	Rate of photosynthesis (arbitrary units)
0.00	0
0.02	20
0.04	28
0.06	35
0.08	40
0.10	
0.12	43
0.14	43

(i) Plot the data on the grid below.

[2]



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(ii) Use the points to draw an appropriate line of best fit.

[1]

(iii) The table does not show the rate of photosynthesis when the concentration of carbon dioxide was 0.10%.

Use the graph to find the rate of photosynthesis when the carbon dioxide concentration was 0.10%.

rate of photosynthesis _____ [1]

(iv) What conclusions can be made about the effect of carbon dioxide concentration on the rate of photosynthesis?

---

[2]

(v) Paresh measures the rate of photosynthesis at 0.13%.

The rate of photosynthesis was 22 (arbitrary units).

He decides **not** to include this in the data set.

Suggest why.

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[2]

(b). Complete the **balanced symbol equation** for photosynthesis.

$$6CO_2 + \text{.....} \longrightarrow \text{.....} + 6O_2$$

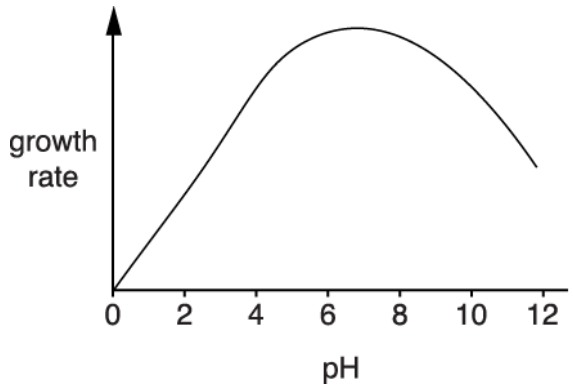
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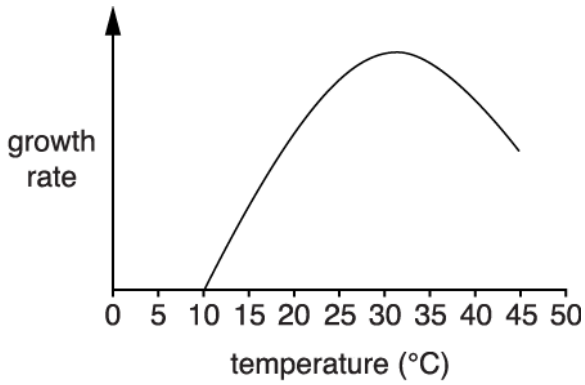
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(c). Paresh is a keen gardener. He wants to improve the growth rate of his tomatoes.

To do this he needs to provide the optimum conditions for growth.

Paresh read the information below in a gardening magazine. It shows the effects of pH and temperature on the growth rate of tomatoes.





Describe what conditions he should provide to grow his tomatoes. Use the information above and your biological knowledge in your answer.

The quality of written communication will be assessed in your answer.

[6]

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4(a). Coral reefs are found in tropical seas.

They are made by living organisms called reef-building corals.

Reef-building corals have a symbiotic relationship with microscopic algae. Algae are single-celled plants.

In a symbiotic relationship both organisms **benefit** from each other.

Algae can photosynthesise.

During photosynthesis, the algae make glucose.

(i) Algae can convert glucose into other substances.

Name **two** of these substances.

1

2

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[2]

(ii) Some of the glucose is passed from the algae to the coral.

Suggest what the algae gain in return.

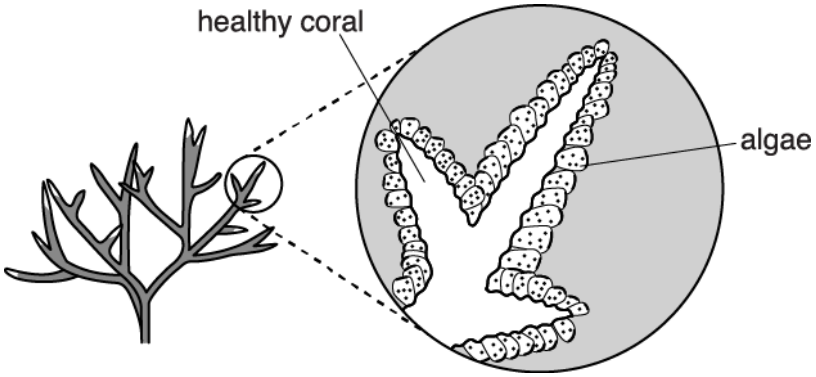
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[2]

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(b). Scientists have found that some algae in coral are dying.

This is thought to be caused by increases or decreases in sea temperature.



Photosynthesis is controlled by enzymes.

Explain how changes in sea temperature can result in the algae dying.

The quality of written communication will be assessed in your answer.

[6]

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(c). Some scientists think that temperature changes are killing the algae.

Other scientists think that increased UV light could be the cause.

How would scientists show whether UV light or temperature change is the cause of the algae dying in their natural habitat?

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[3]

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5. Embryonic stem cells can develop into any other type of tissue.

Some genes need to be switched on and some need to be switched off to make a specialised cell.

Some of these statements describe genes that would need to be switched on to produce a **cell where photosynthesis takes place**.

Put ticks (?) in the boxes next to the correct statements.

Genes to control temperature. ☐

Genes to make chlorophyll. ☐

Genes to make a neurotransmitter. ☐

Genes to make a cell membrane. ☐

Genes to make carbon dioxide. ☐

Genes to control diffusion. ☐

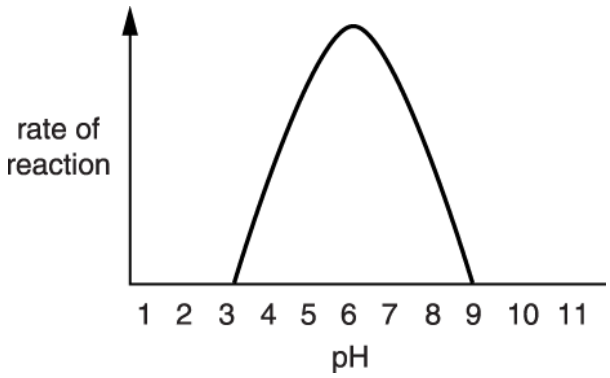
Genes to make enzymes. ☐

[3]

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6. The graph shows how pH affects the rate of reaction of an enzyme.



Use your knowledge of enzymes and how they work, to describe and explain the shape of the graph.

The quality of written communication will be assessed in your answer.

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[6]

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7(a). The processes of photosynthesis and respiration are made up of a series of reactions.

Each reaction needs a specific enzyme.

This means that each enzyme only works for one reaction.

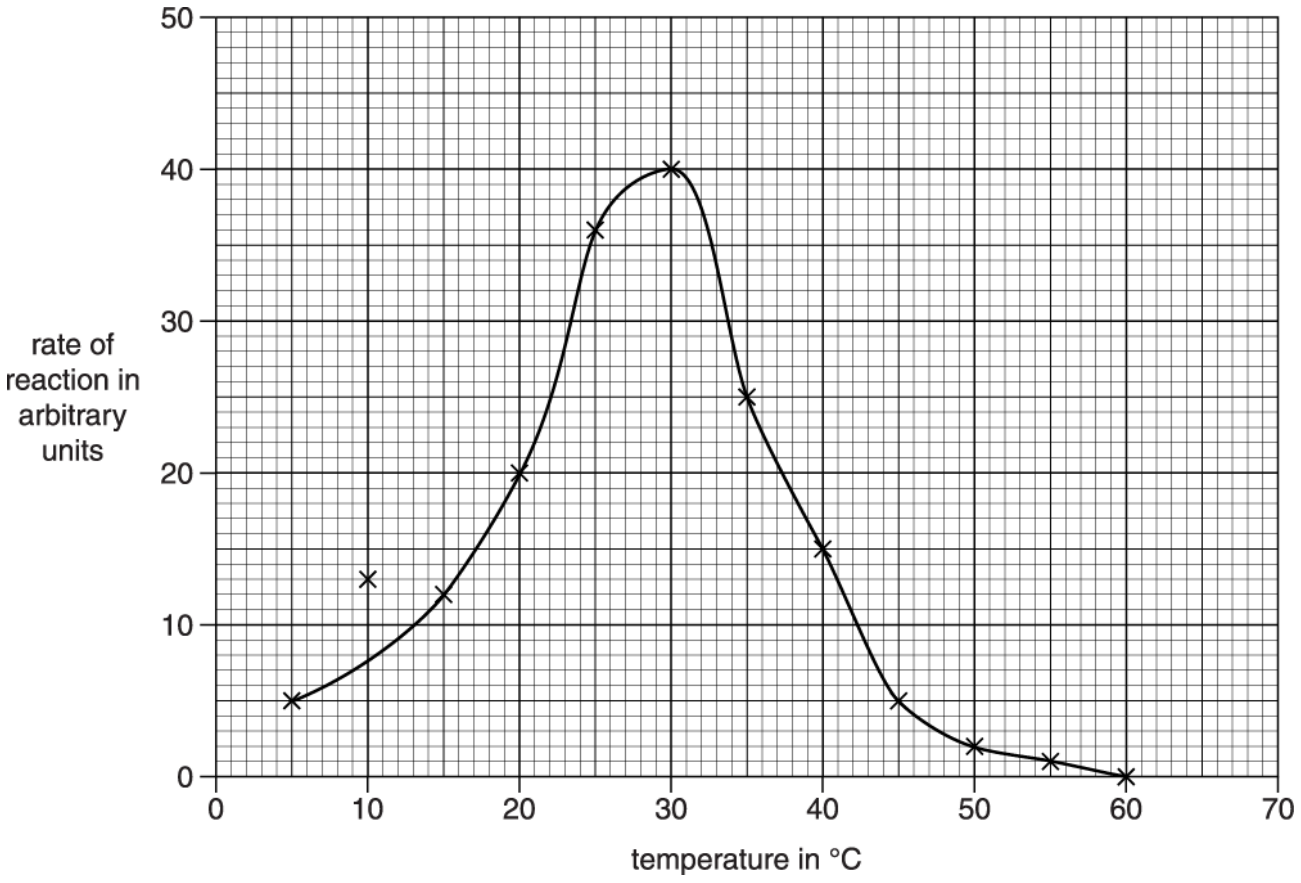
Explain why.

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[2]

(b). A group of students carry out an investigation using enzymes.

They record the rate of an enzyme reaction across a range of temperatures.



(i) There is a correlation between temperature and the rate of reaction between 15 °C and 25 °C.

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Describe the correlation.

---

[1]

(ii) State **two** ways in which the students can increase their confidence in their results.

---

[2]

(iii) The reaction rate changes between 30 °C and 70 °C.

Complete the sentences to show what is happening between these temperatures.

The collision rate between the molecules and enzymes is _____ .

Higher temperatures change the shape of the _____ of the enzyme.

This change in shape is _____ .

The enzyme becomes _____ .

[2]

(iv) What is the name of the **model** used to describe how enzymes work?

_____ model **[1]**

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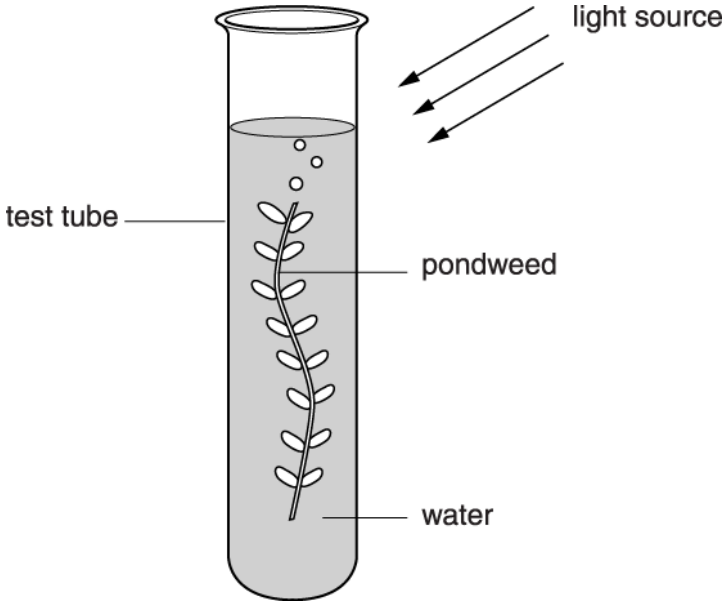
8(a). Photosynthesis takes place in plants.

Write down the **balanced symbol** equation for photosynthesis.

..... + ... ⟶ ..... + ...

[2]

(b). Jason is studying the rate of photosynthesis for pondweed under **low** and **high** light intensities.



- Jason cuts 20 pieces of pondweed and puts each piece in a separate test tube in water.
- He puts 10 test tubes under **low** light intensity and 10 under **high** light intensity.
- He records the number of oxygen bubbles produced by each of the pieces of pondweed during a 1 minute period.
- Jason records the data in **Table 1**.

Table 1

Light intensity	Number of bubbles produced per minute										Mean
low	8	7	5	9	6	10	7	8	6	6	7.2
high	10	11	9	13	15	8	11	10	9	12	10.8

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(i) Another student repeats the experiment using five species of pondweed, **A, B, C, D** and **E**.

The mean number of bubbles produced per minute for each species of pondweed is shown in **Table 2**.

Table 2

Light intensity	Mean number of bubbles produced per minute				
	Pondweed species				
	A	B	C	D	E
low	7	5	7	6	8
high	15	10	11	17	13

Use the results in **Table 1** and **Table 2** to identify which species, **A, B, C, D** or **E**, was the one also used by Jason.

species used by Jason = _____ **[1]**

(ii) How confident can you be about your conclusion?

Explain why.

---**[2]**

(iii) Jason's experiment can be improved by repeating it and using more species of pondweed.

Suggest **two** further improvements for Jason's experiment.

---**[1]**

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9.

(i) Plants require water for photosynthesis.

Write down the name of the process which moves water into plant roots.

---

[1]

(ii) The rate of photosynthesis may be limited by **two** of the following factors.

Put a tick (✓) in the boxes next to the **two** correct answers.

carbon dioxide concentration ☐

glucose concentration ☐

nitrate concentration ☐

oxygen concentration ☐

Temperature ☐

[2]

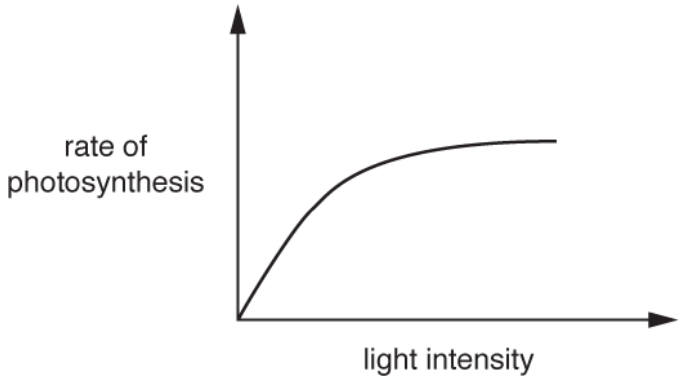
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(iii) Light intensity also limits the rate of photosynthesis.

The graph shows how light intensity affects the rate of photosynthesis.

Draw an X on the graph where light intensity is **not** a limiting factor.



[1]

10. The Galapagos Islands are a group of 13 islands found in the Pacific Ocean.

Algae live in the marine environment around the Galapagos Islands.

Photosynthesis takes place in the cells of algae.

(i) In which cell structure does photosynthesis take place?

---

[1]

(ii) Many factors can limit the rate of photosynthesis.

Which factor will **not** limit the rate of photosynthesis in the algae?

Put a (ring) around the correct answer.

carbon dioxide concentration **light intensity** **temperature** **water availability**

[1]

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END OF QUESTION PAPER

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