



Resources available from

**kickstart
tutors**

Student number

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Name _____

Date _____

Attempt/Time taken _____

GCSE BIOLOGY

Topic Paper: 4.1 Photosynthesis
Part 1

Time allowed: 45 minutes

Materials

For this paper you must have:

- the Periodic Table/Data Sheet, provided as an insert (enclosed)
- a ruler with millimetre measurements
- a calculator, which you are expected to use where appropriate.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- All working must be shown.
- Do all rough work in this book. Cross through any work you do not want to be marked.

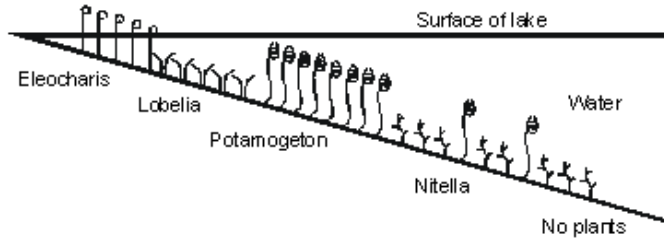
Information

- The Periodic Table/Data Sheet is provided as in insert.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions you need to make sure that your answer:
 - is clear, logical, sensibly structured
 - fully meets the requirements of the question
 - shows that each separate point or step supports the overall answer.



39 Marks

Q1. This is a diagram of a belt transect showing the major types of plants growing on the bottom of a lake.



(a) Suggest, and explain, **two** reasons why a much smaller population of *Nitella* plants is found amongst the *Potamogeton* plants than further down in the lake.

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- 2.
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(4)

(b) Describe how you would use the belt transect technique to measure the abundance and distribution of plants which live on the bottom of a shallow lake.

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(3)

(Total 7 marks)



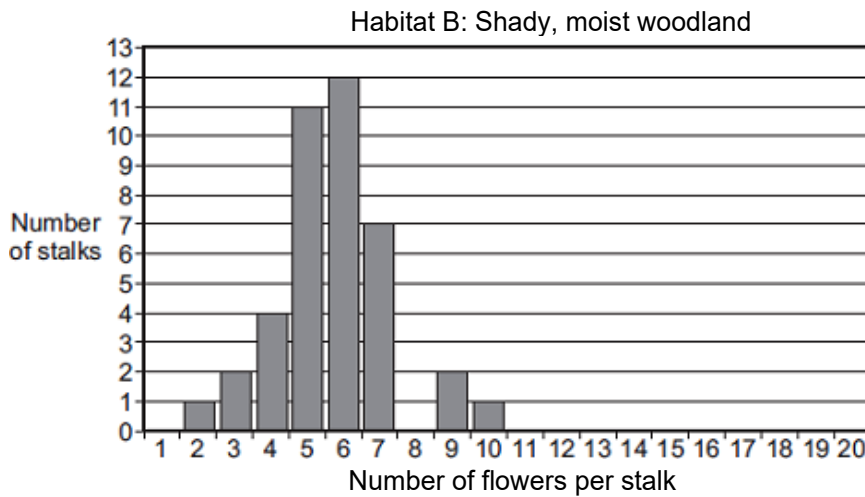
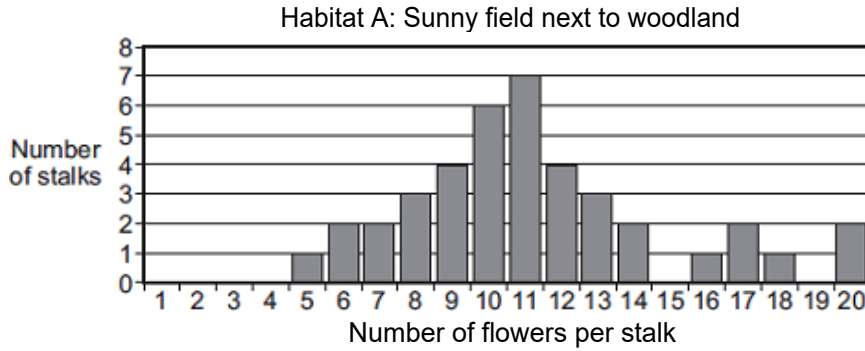
Q2. Some students studied bluebell plants growing in two different habitats.

Habitat **A** was a sunny field next to woodland.

Habitat **B** was a shady, moist woodland.

A bluebell plant can have several flowers on one flower stalk. The students counted the number of flowers on each of 40 bluebell flower stalks growing in each habitat.

The bar charts show the results.



- (a) The students wanted to collect valid data.
Describe how the students should have sampled the bluebell plants at each habitat to collect valid data.

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(2)



- (b) (i) The students used the bar charts to find the mode for the number of flowers per stalk in the two habitats.

The mode for the number of flowers per stalk in habitat **A** was 11.

What was the mode for the number of flowers per stalk in habitat **B**?

Mode =

(1)

- (ii) The students suggested the following hypothesis:

'The difference in the modes is due to the plants receiving different amounts of sunlight.'

Suggest why.

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(2)

- (iii) Suggest how the students could test their hypothesis for the two habitats.

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(2)

- (c) Suggest how receiving more sunlight could result in the plants producing more flowers per stalk.

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(2)

(Total 9 marks)



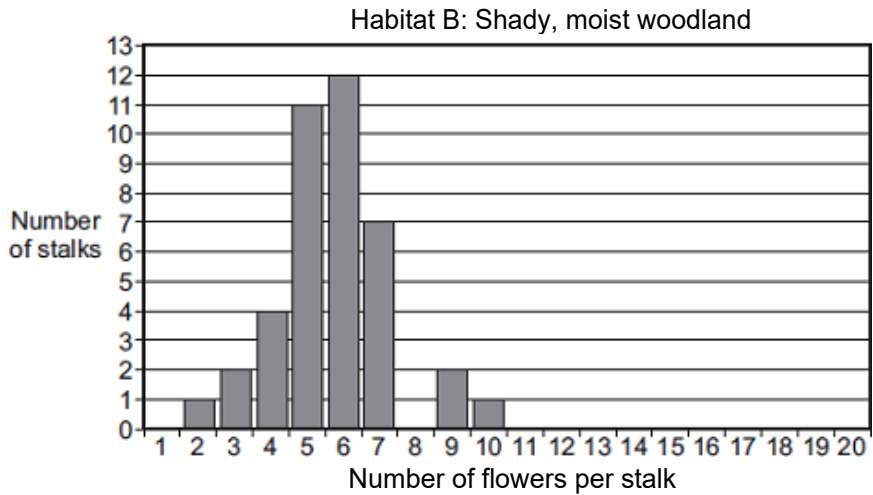
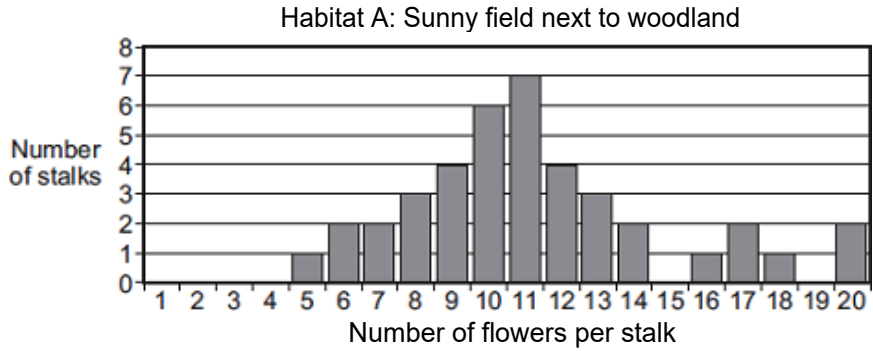
Q3. Some students studied bluebell plants growing in two different habitats.

Habitat **A** was a sunny field next to woodland.

Habitat **B** was a shady, moist woodland.

A bluebell plant can have several flowers on one flower stalk. The students counted the number of flowers on each of 40 bluebell flower stalks growing in each habitat.

The bar charts show the results.



(a) The students wanted to collect valid data.
Describe how the students should have sampled the bluebell plants at each habitat to collect valid data.

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(2)



- (b) (i) The students used the bar charts to find the mode for the number of flowers per stalk in the two habitats.

The mode for the number of flowers per stalk in habitat **A** was 11.

What was the mode for the number of flowers per stalk in habitat **B**?

Mode =

(1)

- (ii) The students suggested the following hypothesis:

'The difference in the modes is due to the plants receiving different amounts of sunlight.'

Suggest why.

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(2)

- (iii) Suggest how the students could test their hypothesis for the two habitats.

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(2)

- (c) Suggest how receiving more sunlight could result in the plants producing more flowers per stalk.

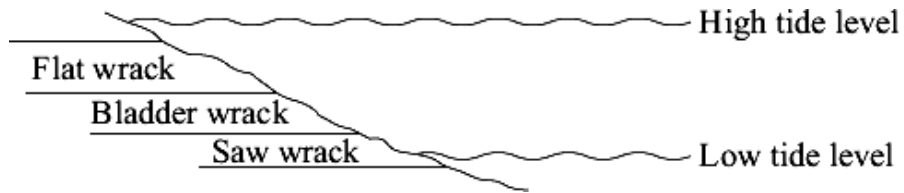
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(2)

(Total 9 marks)



Q4. The diagram shows where three seaweeds live on a seashore. As the tide moves in and out, these seaweeds are covered with seawater for different lengths of time.



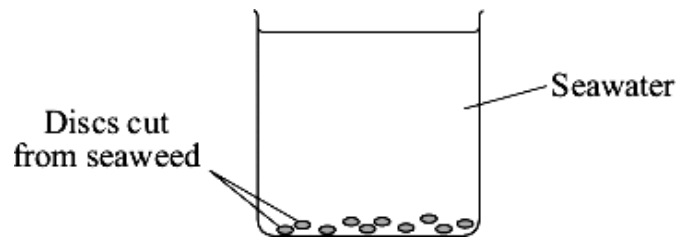
Some students investigated the rate of photosynthesis in these seaweeds.

They cut ten small discs from one seaweed.

They dropped the discs into seawater in a beaker.

They recorded the time taken for the fifth disc to float to the surface.

They repeated this experiment with the other two seaweeds.



(a) (i) Suggest why the discs floated to the surface.

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(1)

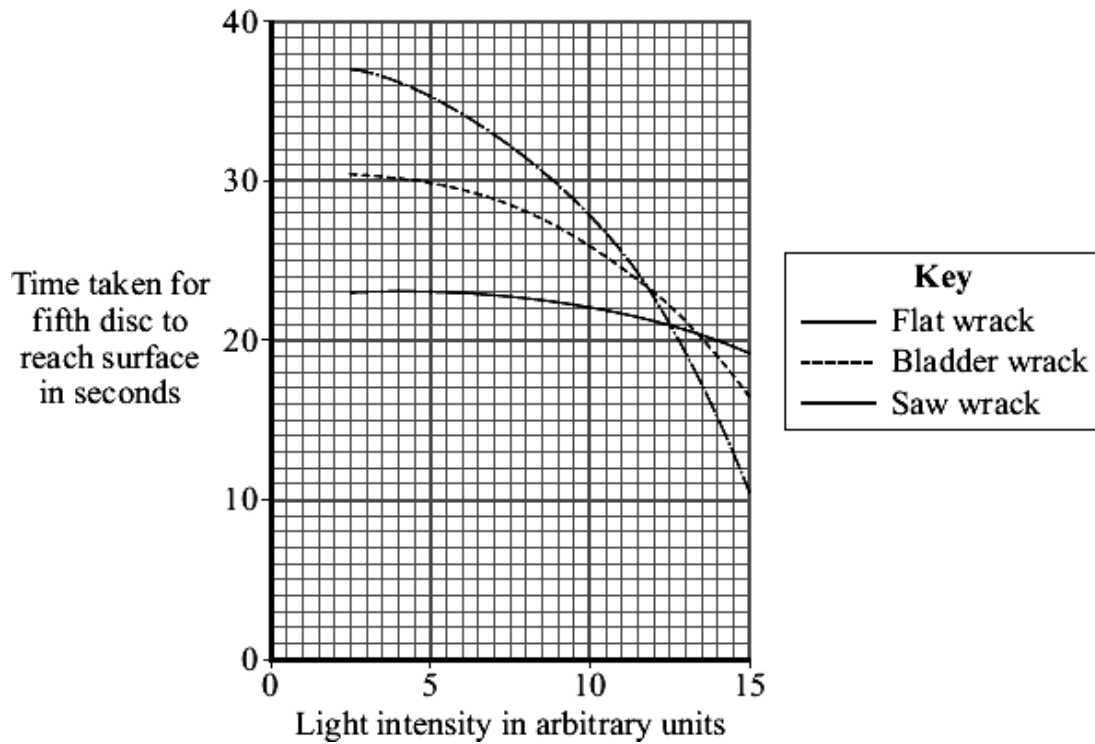
(ii) Suggest the advantage of recording the time taken for the fifth disc to reach the surface, rather than for the tenth disc.

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(1)



- (b) The students carried out their experiments at different light intensities. The graph shows the results they collected.



- (i) Compare the rate of photosynthesis for flat wrack with the rate for saw wrack at different light intensities.

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(2)

- (ii) Seawater absorbs light.

The growth rate of saw wrack is less than the growth rate of bladder wrack.

Suggest why.

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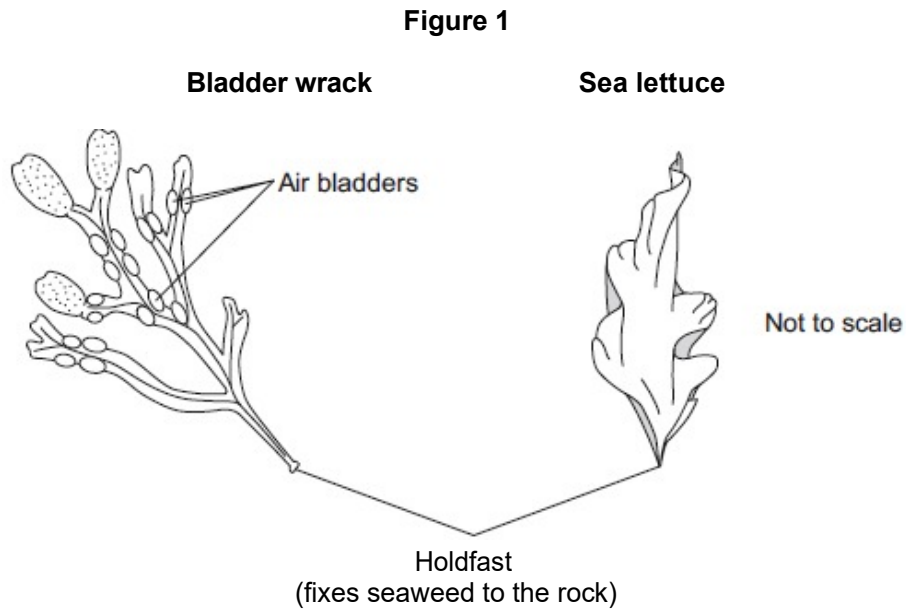
(2)
(Total 6 marks)

Q5. At the seashore, the tide comes in and goes out twice each day.

Some students investigated whether two different species of seaweed could live only at certain positions on a rocky shore.

Seaweeds are plant-like organisms that make their food by photosynthesis.

Figure 1 shows the two species of seaweed that the students investigated.

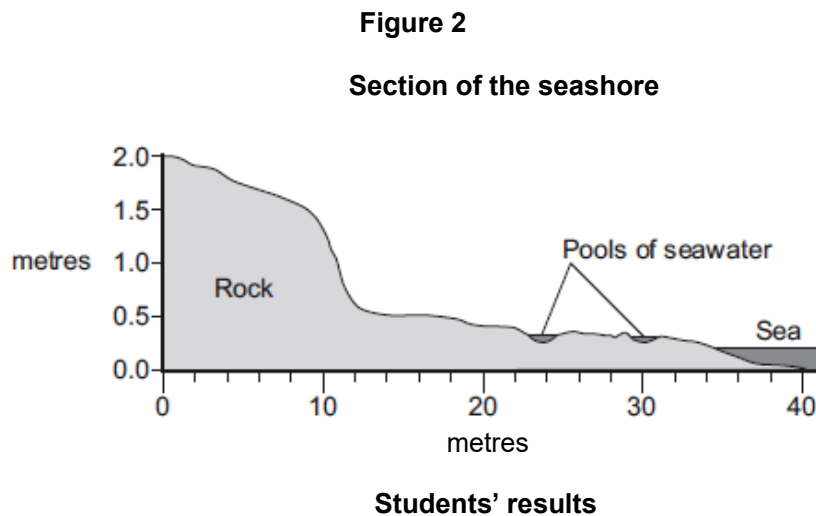


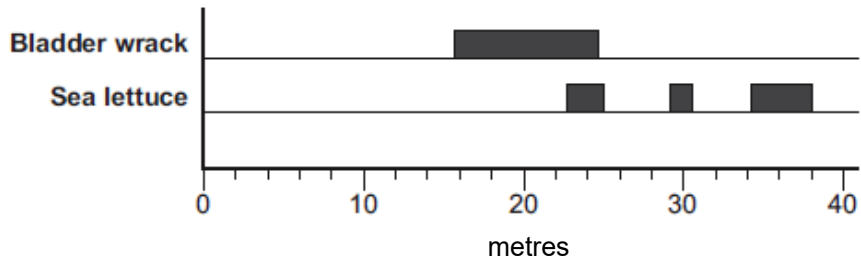
(a) The students:

- 1 placed a 50-metre tape measure on the rocks at right angles to the sea
- 2 placed a quadrat next to the tape measure
- 3 recorded whether each species was present or not.

The students repeated steps 2 and 3 every metre down the shore.

Figure 2 shows a section of the seashore and the students' results.





- (i) The students placed the quadrat at regular intervals along a transect line rather than placing the quadrat at random positions anywhere on the rocky shore.

Explain why.

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(2)

- (ii) How could the students have improved their investigation to ensure that they produced valid data?

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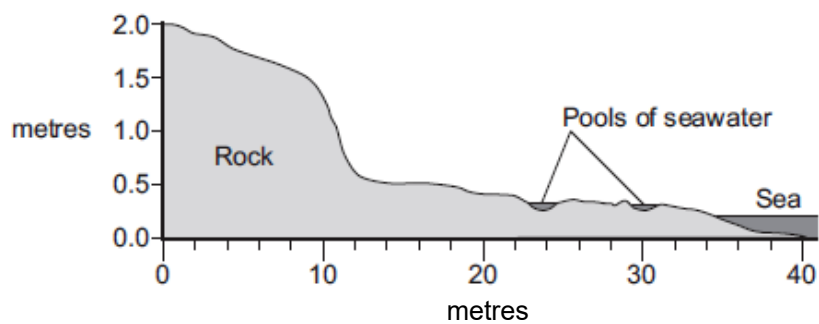
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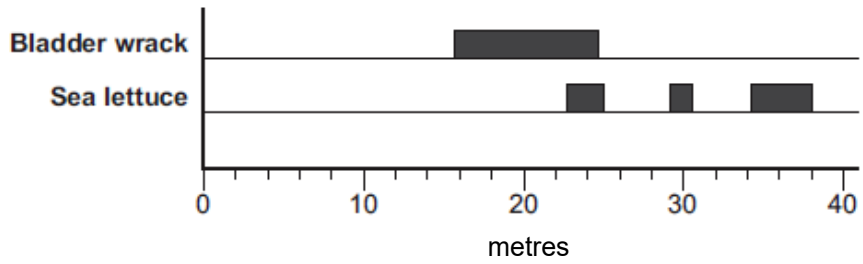
- (iii) **Figure 2** is repeated here to help you answer this question.

Figure 2

Section of the seashore



Students' results



The students concluded that bladder wrack is better adapted than sea lettuce to survive in dry conditions.

What is the evidence for this conclusion?

Use information from **Figure 2**.

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(2)

- (b) The bladder wrack has many air bladders.
The air bladders help the bladder wrack to float upwards when the sea covers it.

Suggest how this helps the bladder wrack to survive.

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(2)
(Total 8 marks)