

**GCSE**

**BIOLOGY**

Biology Test 5: Ecology (Higher)

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Total number of marks: 33



0 1 This question is about the decay of milk.

0 1 . 1 Name **two** types of microorganism that cause decay.

[2 marks]

- 1 fungi
- 2 bacteria

0 1 . 2 Cows' milk is pH 6.6.

As milk decays, lipids in the milk are broken down.

One of the products of the breakdown of lipids causes the pH of milk to decrease.

Name the product that causes the pH to decrease.

[1 mark]

fatty acids

A student investigated the effect of temperature on the time taken for different types of milk to decay.

This is the method used.

1. Put cows' milk in six test tubes.
2. Keep each test tube at a different temperature.
3. Measure the pH of the milk in each tube every day for 12 days.
4. Record the number of days taken to reach pH 5.
5. Repeat steps 1 to 4 with goats' milk and with almond milk.

0 1 . 3 Give **one** way the pH can be measured.

[1 mark]

pH probe

0 1 . 4 Give **two** control variables the student should have used in this investigation.

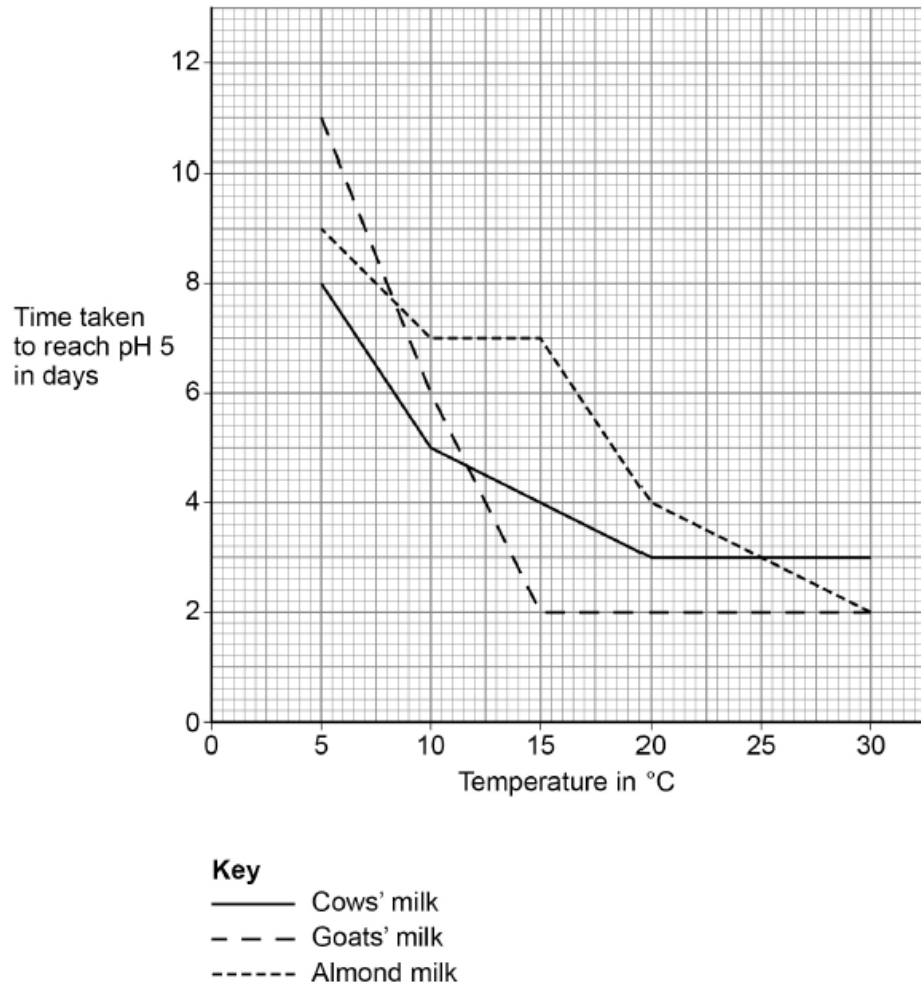
[2 marks]

- 1 volume of milk in each test tube
- 2 measure the pH at the same time each day

The student improved the investigation to produce valid results.

Figure 1 shows the results.

Figure 1



0 1 . 5 Which type of milk stays fresh the longest at 10 °C?

[1 mark]

almond milk

0 1 . 6 Describe the effect of temperature on the time taken for goats' milk to reach pH 5.

Use data from Figure 1 in your answer.

[2 marks]

As temperature increases from 5 °C to 15 °C, the time taken for goats' milk to reach pH 5 decreases from pH 11 to pH 2 (by 9 units). After 15 °C the rate of decay remains constant so the pH stays the same.

- 0 1 . 7 The time taken for cows' milk to reach pH 5 at 10 °C is less than the time taken for cows' milk to reach pH 5 at 5 °C.

Suggest **one** reason why.

[1 mark]

The higher temperature means there's a faster rate of enzymatic reactions taking place, so the milk is broken down faster.

- 0 1 . 8 Suggest **two** reasons why the different types of milk took different lengths of time to reach pH 5.

[2 marks]

- 1 cow's and goats' milk contains lactose whereas almond milk doesn't
  - 2 the initial pH of each type of milk is different
-

0 1 . 9 The student said:

'The temperature milk is stored at affects how likely the milk is to cause food poisoning.'

How can the investigation be developed to find out if the student is correct?

[1 mark]

Tick (✓) **one** box.

Determine the types of bacteria present in the milk

Record the pH every 12 hours

Use more than three different types of milk

0 7

The limpet is a snail-like animal that lives attached to a rock on the seashore.

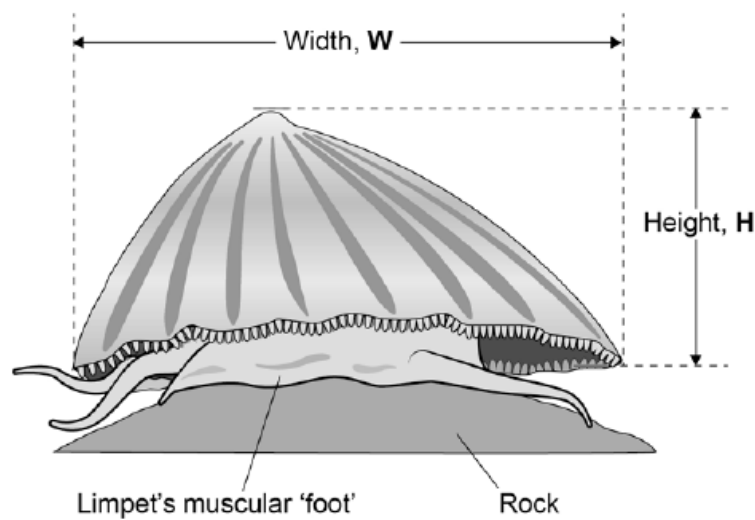
Some students investigated variation in the size of limpets living on two seashores:

- one shore was in a sheltered bay
- the other shore was exposed to the full force of the sea.

The students measured the heights (**H**) and widths (**W**) of 60 limpets on each shore.

**Figure 7** shows a limpet and the measurements made by the students.

**Figure 7**



0 7 . 1

On each shore, the students measured a large number of limpets at random locations.

Explain why the students did this.

[2 marks]

Large number of limpets to reduce the effect of any anomalies and make the experiment more valid

Random locations to avoid bias and obtain a representative sample

The students calculated  $\frac{H}{W}$  for each limpet.

**Table 3** shows the students' results.

**Table 3**

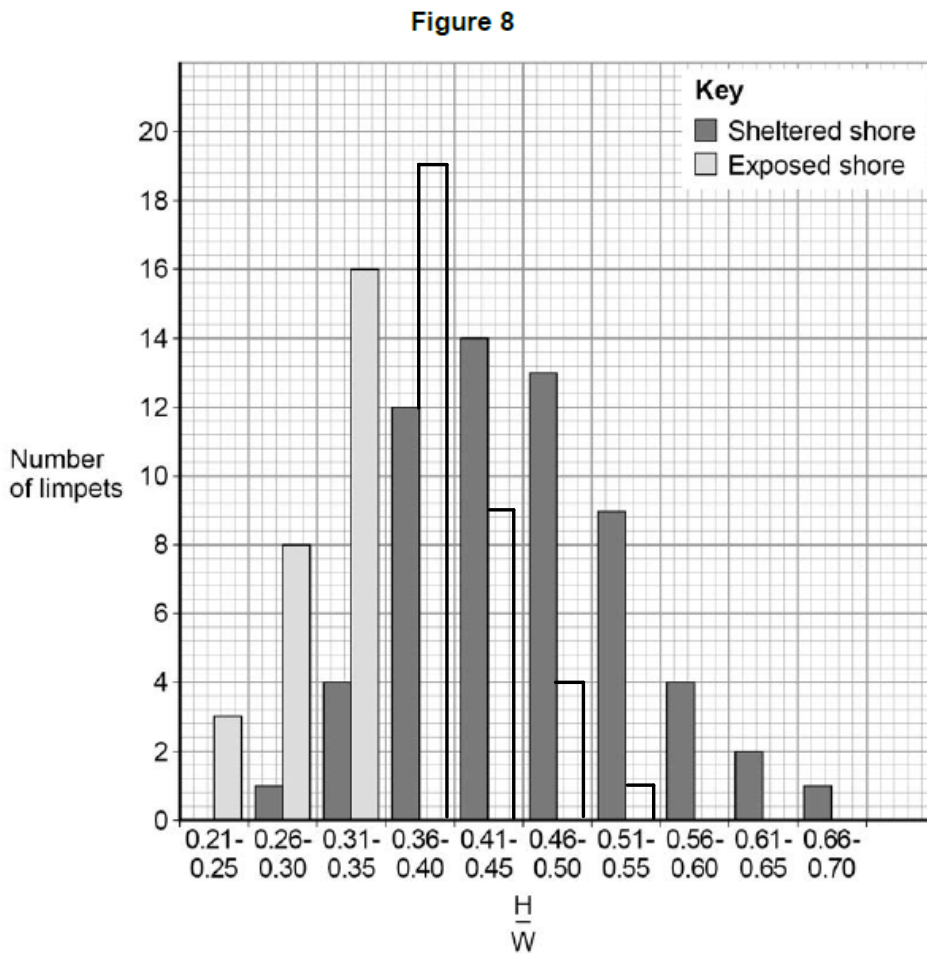
$\frac{H}{W}$	Sheltered shore		Exposed shore	
	Score	Number	Score	Number
0.21 – 0.25				3
0.26 – 0.30		1		8
0.31 – 0.35		4		16
0.36 – 0.40		12		19
0.41 – 0.45		14		9
0.46 – 0.50		13		4
0.51 – 0.55		9		1
0.56 – 0.60		4		
0.61 – 0.65		2		
0.66 – 0.70		1		

07.2 Complete **Table 3**.

[1 mark]



Figure 8 shows some of the results.



0 7 . 3 Complete Figure 8.

[1 mark]

0 7 . 4 Compare the patterns in the results for the exposed shore and the sheltered shore.

Use information from Figure 8.

[3 marks]

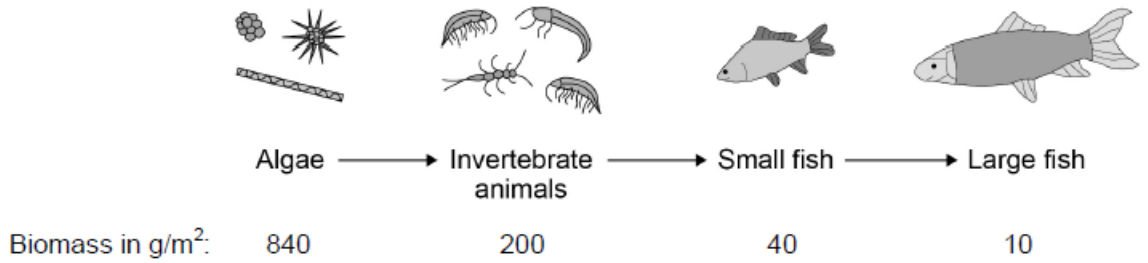
The greatest number of limpets for the sheltered shore was at 0.41 – 0.45 whereas for the exposed shore the greatest number was at 0.36 – 0.40, suggesting that the limpets are larger on the sheltered shore. The sheltered shore has a higher mode and wider range than the exposed shore. There is a lot of overlap between the two shores.

0 7

Figure 8 shows:

- a food chain for organisms in a river
- the biomass of the organisms at each trophic level.

Figure 8



0 7 . 1

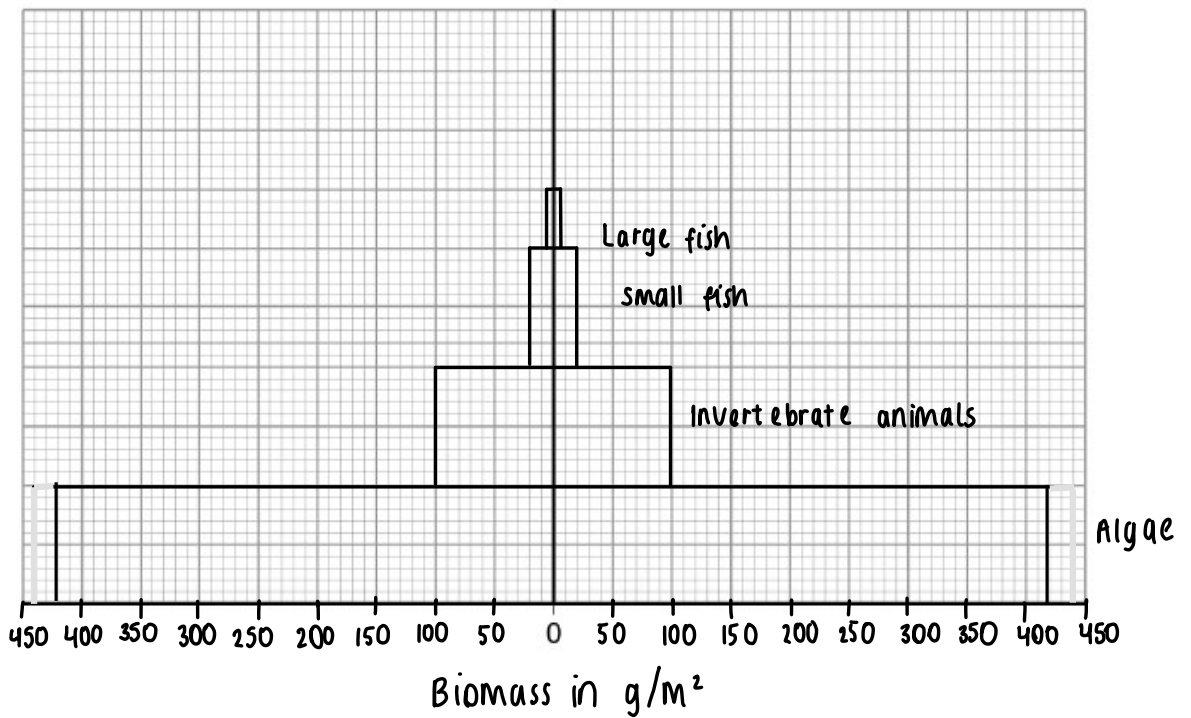
Draw a pyramid of biomass for the food chain in Figure 8 on Figure 9.

You should:

- use a suitable scale
- label the x-axis
- label each trophic level.

[4 marks]

Figure 9



07.2 Calculate the percentage of the biomass lost between the algae and the large fish.

Give your answer to 2 significant figures.

[3 marks]

$$\left( \frac{840 - 10}{840} \right) \times 100 = 98.809\ldots$$

Percentage loss = 99%

07.3 Give **one** way that biomass is lost between trophic levels.

[1 mark]

excretion

07.4 A large amount of untreated sewage entered the river. Many fish died.

Untreated sewage contains organic matter and bacteria.

Explain why many fish died.

[5 marks]

The bacteria decomposed the organic matter to produce small molecules such as nitrates and carbon. Decomposition means the bacteria carried out aerobic respiration to produce carbon dioxide, which entered the water and reached very high levels which is toxic to fish. The bacteria used up the oxygen in the water so there was not enough left for the fish, so they were not able to respire and produce energy, so they died.