Helicate

HELICATE · AS AND A-LEVEL BIOLOGY · TOPIC BANK

3.1.7 Water

Topic question bank

Version 1 · 2 October 2026

Name

Date

QUESTIONS	TOTAL MARKS	TIME	YOUR SCORE
7	42	No time limit	/ 42

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Total		**42**

Instructions

- Answer the questions in the spaces provided. Show all your working.
- The marks for each question are shown in brackets. Use them to judge how much detail to give.
- Work through a subtopic at a time, then mark your answers with the matching mark scheme.

Original questions by Helicate for AQA AS and A-level Biology (7401/7402), specification section 3.1.7. Not affiliated with or endorsed by AQA.

Do not write outside the box

Water as a metabolite and a solvent 3.1.7

Dry barley grains contain a large amount of starch. When the grains are soaked in water, enzymes in the grains hydrolyse the starch to maltose, which is a reducing sugar.

A student soaked some dry barley grains in water. Every 12 hours, the student removed a sample of the grains and determined:

- the water content of the grains
- the reducing sugar content of the grains.

Table 1 shows the results.

Table 1

Time after soaking began / hours	Water content / % of fresh mass	Reducing sugar content / mg per g of dry mass
0	12	4
12	35	5
24	42	11
36	44	23
48	45	36
60	45	41

0 1 . 1 Which statement correctly describes the role of water when starch is hydrolysed to maltose?
Tick (✓) one box.

[1 mark]

A water molecule is released as each glycosidic bond forms. ☐

A water molecule is used as each glycosidic bond is broken. ☐

A water molecule is hydrolysed as each glycosidic bond is broken. ☐

A water molecule is used as each ester bond is broken. ☐

Question 1 continues on the next page

Do not write outside the box

0 1 . 2 Calculate the percentage increase in the reducing sugar content of the grains between 24 hours and 48 hours.

[2 marks]

Answer ..... **%**

0 1 . 3 The student gave the reducing sugar content per gram of **dry** mass rather than per gram of fresh mass.
Suggest why.

[1 mark]

0 1 . 4 Use your knowledge of the properties of water to suggest why the starch in **dry** barley grains is not hydrolysed.

[3 marks]

Question 1 continues on the next page

Do not write outside the box

0 1 . 5 The student concluded that the uptake of water by the grains caused the increase in their reducing sugar content.
Evaluate this conclusion. Use data from Table 1 in your answer.

[3 marks]

10

Turn over for the next question

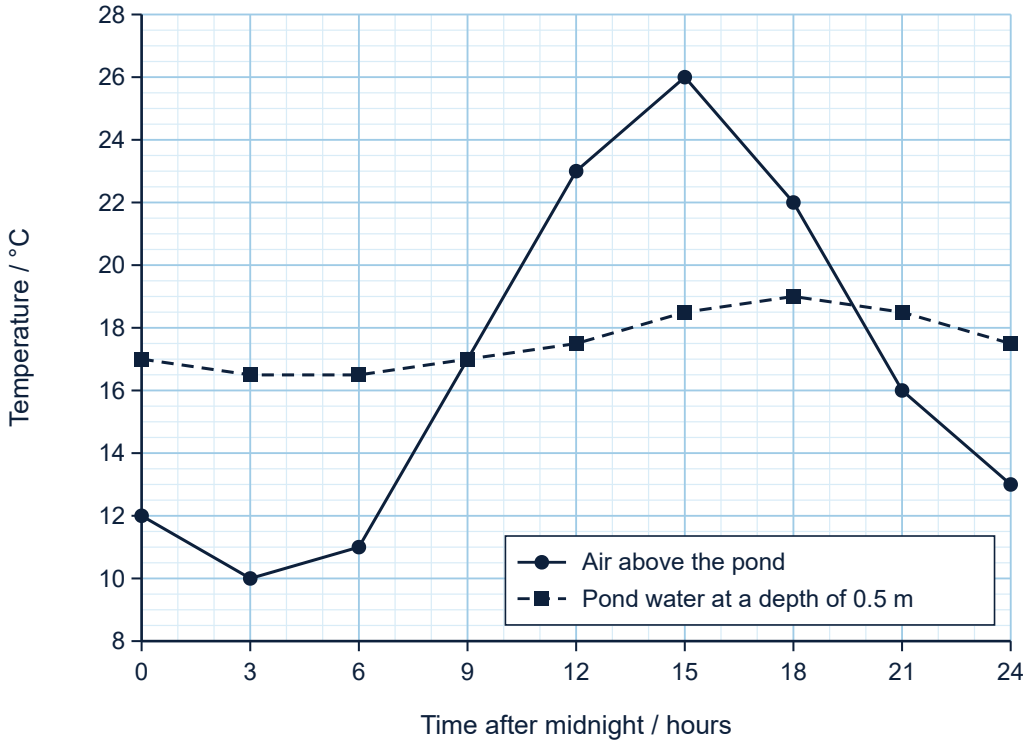
Do not write outside the box

Heat capacity and latent heat of vaporisation 3.1.7

An ecologist recorded the temperature of the air above a pond and the temperature of the pond water at a depth of 0.5 m. She took readings every 3 hours for 24 hours on a summer day.

Figure 1 shows her results.

Figure 1



0 2 . 1 Use Figure 1 to calculate how many times greater the range of air temperatures was than the range of pond water temperatures during the 24 hours.

[2 marks]

Answer .....

Question 2 continues on the next page

Do not write outside the box

0 2 . 2 Use your knowledge of the properties of water to explain the difference between the two curves in Figure 1.

[2 marks]

0 2 . 3 Most animals living in the pond cannot control their body temperature. Suggest **one** advantage to these animals of the pattern of pond water temperature shown in Figure 1.

[1 mark]

5

Turn over for the next question

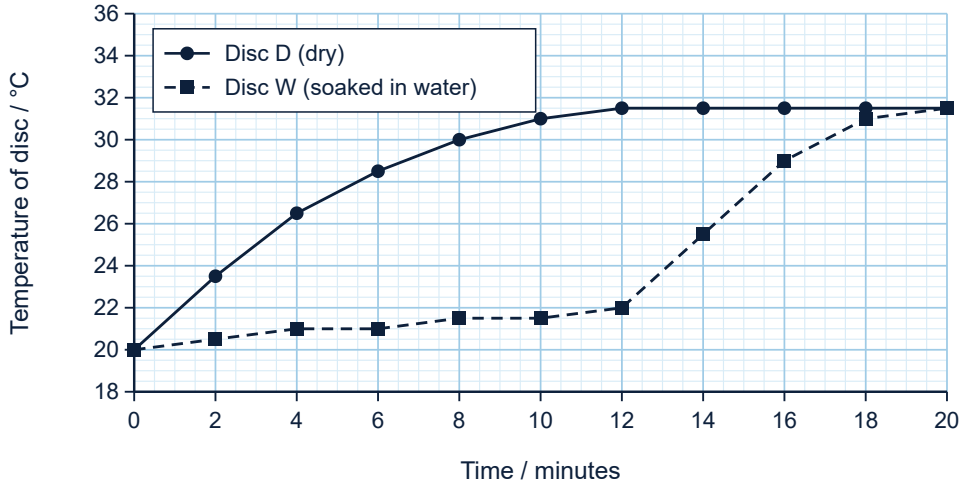
Do not write outside the box

A student used discs of filter paper as a model of leaves. The student:

- soaked disc **W** in water and left disc **D** dry
- attached a temperature probe to the lower surface of each disc
- placed both discs the same distance below a lit lamp
- recorded the temperature of each disc every 2 minutes for 20 minutes.

Figure 2 shows the results.

Figure 2



Question 3 continues on the next page

Do not write outside the box

0 3 . 1 Use your knowledge of the properties of water to explain the results shown in Figure 2.

[5 marks]

0 3 . 2 Suggest **one** way in which disc **W** is not a good model of a leaf on a living plant.

[1 mark]

6

Turn over for the next question

Do not write outside the box

A scientist investigated cooling by sweating. A cyclist exercised for 1 hour in hot, dry conditions and did not drink during this time. The scientist found that:

- the cyclist's body produced 2900 kJ of heat energy
- the cyclist's body mass decreased by 1.20 kg
- 80% of the sweat evaporated from the skin and the rest dripped off.

The scientist assumed that all of the decrease in body mass was due to the loss of sweat. The evaporation of 1 g of water from the skin absorbs 2.4 kJ of heat energy.

0 4 . 1 Calculate the percentage of the heat energy produced by the cyclist that was removed by the evaporation of sweat.

[2 marks]

Answer ..... **%**

0 4 . 2 Use the information about the cyclist to explain how the large latent heat of vaporisation of water is an advantage to humans.

[2 marks]

Question 4 continues on the next page

Do not write outside the box

0 4 . 3 Suggest **two** reasons why the mass of sweat that evaporated, used in your calculation in Question 04.1, may not be accurate.

[2 marks]

1 .....

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2 .....

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.....

6

Turn over for the next question

Do not write outside the box

Cohesion 3.1.7

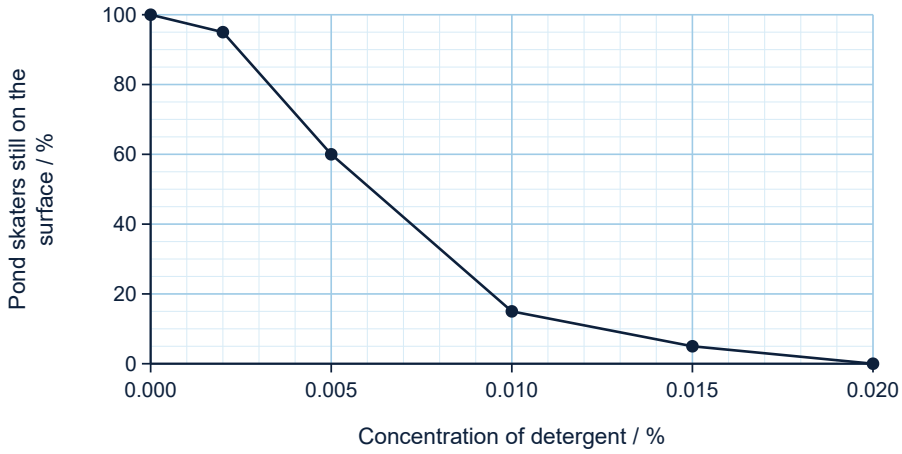
Pond skaters are small insects that stand on the surface of ponds. Detergents reduce the cohesion between water molecules at the surface of water.

A scientist investigated the effect of detergent on pond skaters. For each concentration of detergent, the scientist:

- placed 20 pond skaters of similar mass on the surface of pond water
- after 1 minute, counted the pond skaters still standing on the surface
- then immediately returned all the pond skaters to clean pond water.

Figure 3 shows the results.

Figure 3



0 5 . 1 Use your knowledge of cohesion to explain the results in Figure 3.

[4 marks]

Question 5 continues on the next page

Do not write outside the box

0 5 . 2 Explain why the scientist used pond skaters of similar mass.

[2 marks]

0 5 . 3 Waste water from homes can carry detergents into ponds.
Use Figure 3. Suggest how this could affect the population of pond skaters in a pond.

[1 mark]

7

0 6 . 1 Which property of water supports continuous columns of water in the xylem vessels of plants?
Tick (✓) one box.

[1 mark]

It has a relatively high heat capacity. ☐

It has a relatively large latent heat of vaporisation. ☐

It has strong cohesion between its molecules. ☐

It is an important solvent. ☐

Question 6 continues on the next page

Do not write outside the box

In very dry conditions, a bubble of air can form inside a xylem vessel. Once an air bubble fills the width of a xylem vessel, water stops moving up that vessel.

0 6 . 2 Suggest why.

[1 mark]

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.....

.....

2

Turn over for the next question

Water in living organisms 3.1.7

0 7 A large tree is growing in hot, sunny conditions.
Explain how the properties of water are important to the tree.

[6 marks]

6

END OF QUESTIONS

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