



Rewarding Learning

General Certificate of Secondary Education
2021–2022

Centre Number

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Candidate Number

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Double Award Science: Biology

Unit B1

Higher Tier



[GDW12]

GDW12

WEDNESDAY 23 FEBRUARY 2022, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

Answer **all ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question **2(a)**.



- 1 Scientists have been monitoring a population of killer whales in the Pacific Ocean. This population of killer whales feeds mainly on Chinook salmon.

The photographs below show one of these killer whales and some Chinook salmon.



killer whale



Chinook salmon

The statements below give information about the food web that includes these killer whales and Chinook salmon.

Seaweed and plankton carry out photosynthesis.
Insects feed on seaweed.
Crustaceans feed on plankton.
Salmon feed on insects and crustaceans.
Seals feed on salmon and crustaceans.
Killer whales feed on salmon.



(a) Use the statements opposite to complete the food web below.

seaweed

[4]



Chinook salmon are born in a river and then swim to the Pacific Ocean.
These salmon return to this river to reproduce.
The salmon need cold river water to survive and reproduce.
Due to climate change, the water in this river has become warmer.

- (b) Suggest what effect warmer river water could have on the **killer whale** population.
Explain your answer.

[3]

- (c) In 2016, scientists monitoring this killer whale population found 78 individuals.
This was 80% of the population of these whales recorded in 1990.

- (i) Calculate the size of the population of these killer whales in 1990.
Give your answer to the **nearest whole number**.

Show your working.

_____ [3]

- (ii) Suggest **one** measure that scientists could take to increase the population size of these killer whales.

[1]





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[Turn over



28GDW1205

- (b) Name the other type of communication system in the body and state **one** way it differs from the nervous system.

_____ system.

Difference _____

_____ [2]



- 3 (a) When leaves fall to the ground, in autumn, they are broken down by decomposers.
Decomposers produce enzymes to break down the different substances in the leaves.

(i) Name **two** types of decomposer.

1. _____

2. _____

[2]

Table 1 below gives information about three different decomposers **A**, **B** and **C**, and the enzymes they produce.

Table 1

Decomposer	Enzyme produced	Substance in leaves broken down by enzyme
A	lignase	lignin, a woody substance in cell walls
B	amylase	substance X
C	cellulase	substance Y

Substance **X** is broken down by the enzyme amylase.

(ii) Name substance **X**.

[1]

Substance **Y** is found in **cell walls**.

(iii) Name substance **Y**.

[1]



- (b) The percentage (%) of substances in the leaves **broken down** by decomposers in autumn over 15 weeks was recorded.

Table 2 below shows the results.

Table 2

Time/weeks	Percentage (%) of substance broken down		
	Lignin	Substance X	Substance Y
0	0	0	0
5	0	30	0
10	0	60	20
15	10	90	30

- (i) Use the information in **Table 2** above to name the substance that takes the **longest** time to break down.

[1]

- (ii) Use the information in **Table 1** opposite **and Table 2** above to calculate the **rate** of breakdown caused by decomposer **C** over 15 weeks.

Show your working.

_____ % per week [2]

[Turn over]



- (c) Suggest how the rate of breakdown by decomposers in winter would compare to the rate of breakdown by decomposers in autumn.

Explain your answer.

Rate of breakdown in winter _____

Explanation _____

_____ [2]



4 Complete the sentences below about the kidneys by writing in the blank spaces.

- (a) The kidneys have a role in filtering the _____
and controlling the reabsorption of water.

The kidneys carry out homeostasis to balance water and salts in the body.

This process is called _____. [2]

- (b) When the kidneys reabsorb **less water** than normal, what will happen to the:

- volume of urine produced by the body?
- concentration of urine produced by the body?

Draw a circle around each correct answer in the table below.

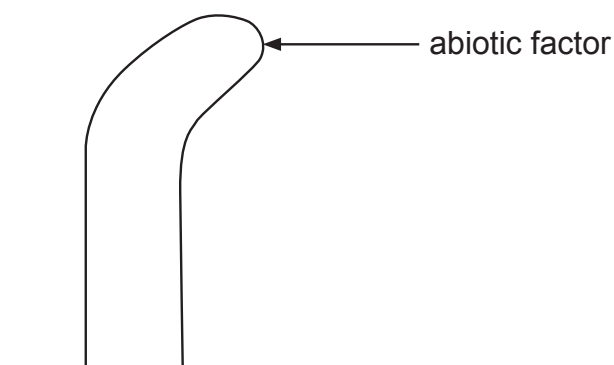
Volume of urine	increases	stays the same	decreases
Concentration of urine	increases	stays the same	decreases

[2]

[Turn over



- 5 The diagram below shows a growth response (phototropism) of a plant shoot.



- (a) Name the abiotic factor in the diagram.

[1]

- (b) The diagram shows the plant shoot bends towards the abiotic factor. Explain how this growth response occurs.

[3]





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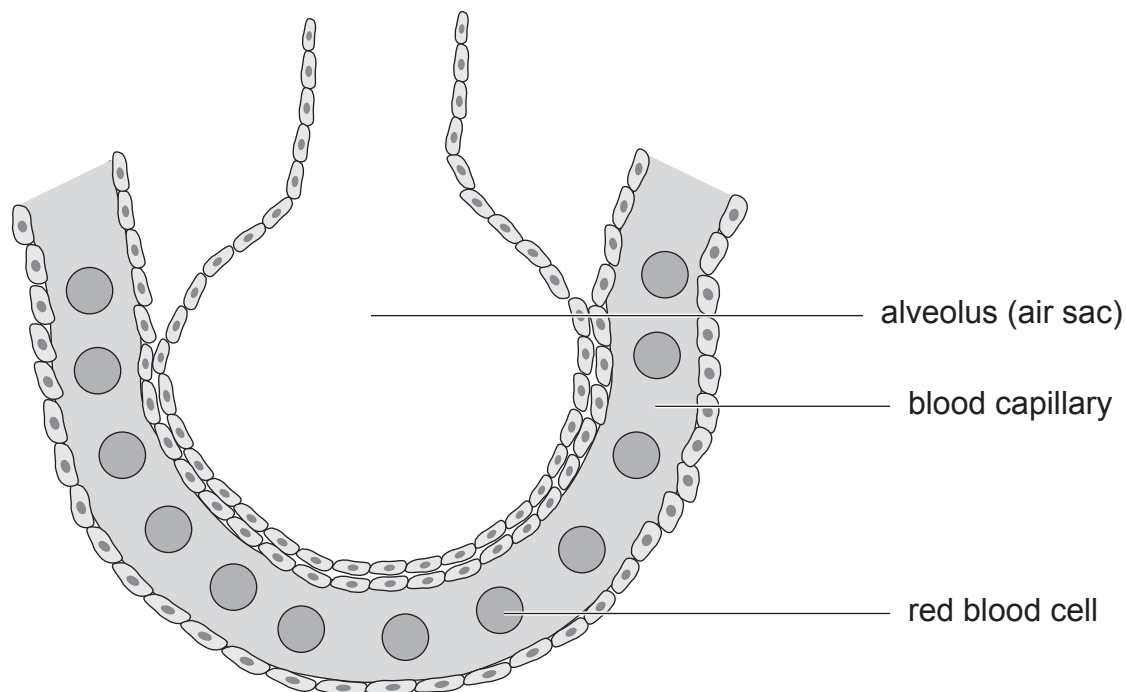
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- 6 Gas exchange occurs across the respiratory surface (alveoli and blood capillaries) in the lungs.

The diagram below shows one alveolus and a blood capillary.



- (a) The wall of the alveolus is thin. This helps gas exchange.
Give **three other** features of the alveolus that help gas exchange.

1. _____

2. _____

3. _____

[3]



A diffusion gradient exists across the respiratory surface.
Oxygen diffuses from the alveolus into the blood capillary.

- (b) Which statement **A**, **B** or **C**, in the table correctly compares the oxygen concentrations in the alveolus and blood capillary?

Write the letter of the correct statement on the line below the table.

A	There is a low oxygen concentration in the alveolus and a high concentration in the blood capillary.
B	There is the same oxygen concentration in the alveolus and in the blood capillary.
C	There is a high oxygen concentration in the alveolus and a low oxygen concentration in the blood capillary.

Statement _____

[1]

[Turn over



(c) Exercise causes changes in breathing.

(i) What happens to the breathing **rate** of a person during exercise?

_____ [1]

(ii) Give **one other** change that happens to breathing during exercise.

_____ [1]

(iii) Complete the sentence below by drawing a circle around the correct answer.

The time taken for breathing rate to return to normal in a fit person

compared to an unfit person is

longer
shorter
the same

[1]





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7 (a) Eutrophication in a river can be caused by fertiliser run-off.

- (i) Name the substance in fertiliser run-off that causes increased growth of aquatic plants and algae.

[1]

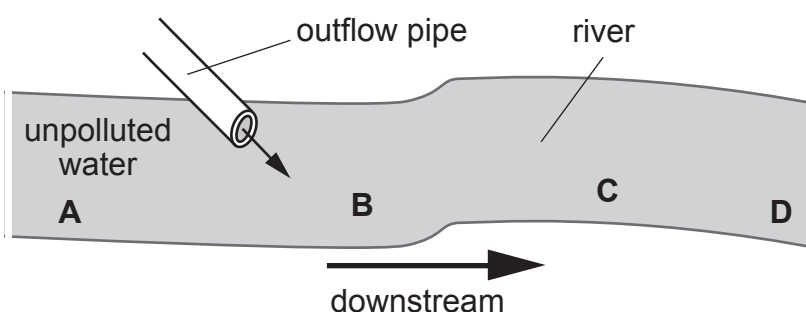
- (ii) Give **one** reason why aquatic plants and algae die after this increased growth.

_____ [1]

- (iii) What is the role of microorganisms when the aquatic plants and algae die?

_____ [1]

Eutrophication in a river can also be caused by pollution from an outflow pipe. In an investigation, pupils collected water samples at four points, **A**, **B**, **C** and **D** along a river as shown in the diagram.



- (b) The pupils carried out a pollution test on each of the four water samples.

The pollution test gave values for the amount of oxygen **used** by aerobic microorganisms in the water samples from the river.

Some of the pupils' results are shown in the table below.

Water sample	Amount of oxygen used by microorganisms/ mg/l
A	8
B	400
C	200
D	

At point **D** on the river the pupils found the river water was unpolluted.

- (i) Use the diagram opposite and the data in the table above to give the value for the amount of oxygen **used** by the microorganisms at **D**.

_____ mg/l [1]

- (ii) Suggest the relationship between the number of microorganisms present and the amount of oxygen used.

_____ [1]

[Turn over



8 Scientists carried out an investigation into **anaerobic** respiration.

They mixed bananas, yeast and water in a flask.

They measured the sugar concentration and the alcohol concentration every 10 hours for 60 hours.

The table below shows their results.

Time/hours	Sugar concentration/ arbitrary units	Alcohol concentration/ arbitrary units
0	19	0
10	16	3
20	12	6
30	11	9
40	10	12
50	9	15
60	7	17



Five statements about this investigation are given in the table below.

(a) Write a tick (✓) in the box which best describes each statement.

Statement	True	False	Cannot tell
There is no alcohol present at the start of the investigation.			
As sugar concentration decreases, alcohol concentration decreases.			
No more alcohol is produced after 60 hours.			
Carbon dioxide is produced during the investigation.			
If the same mass of a different fruit was used, it would give identical results for the alcohol concentration.			

[5]

(b) The temperature inside the flask increased during this investigation.

(i) Give the term that describes the type of reaction where temperature increases.

[1]

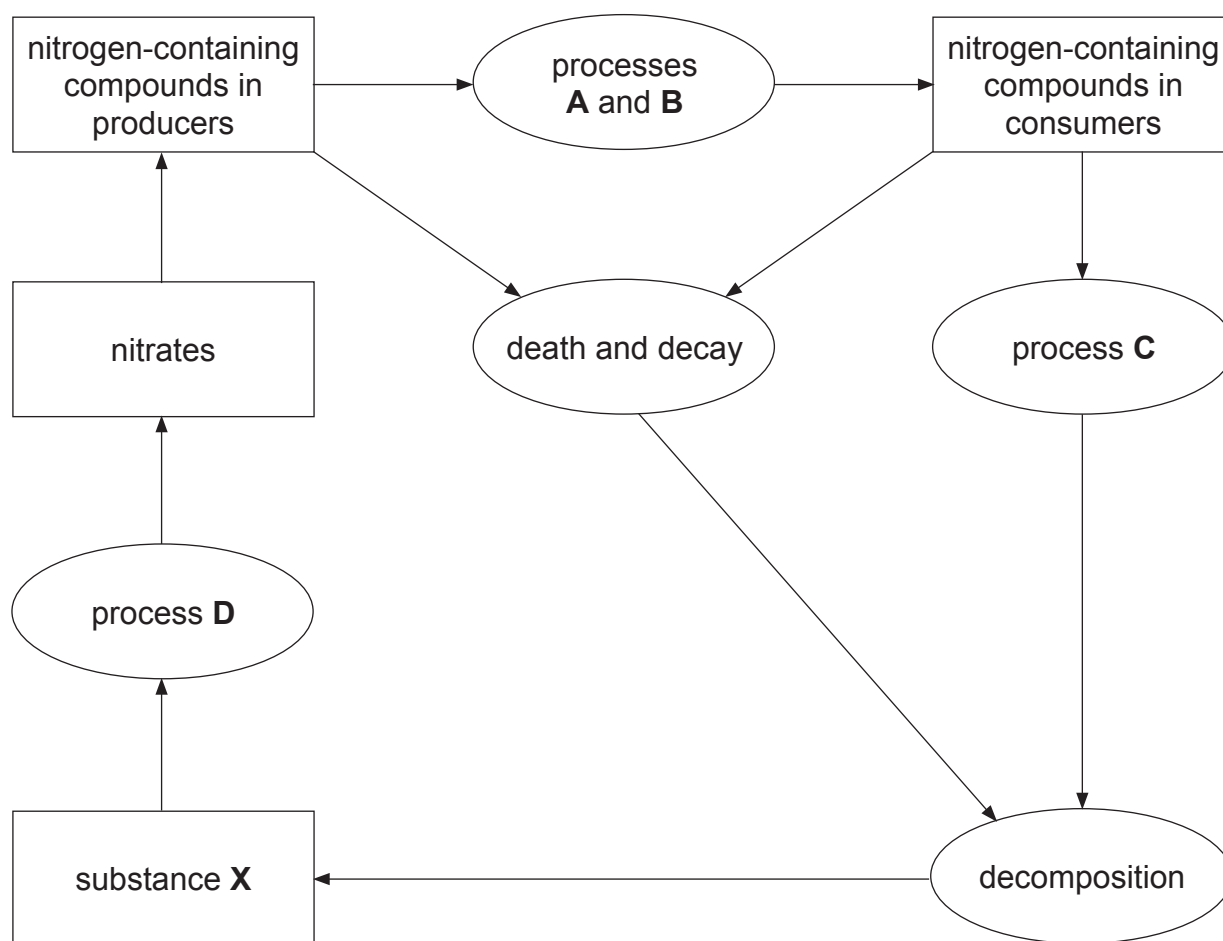
(ii) Explain the reason for this temperature change.

[1]

[Turn over



9 The diagram shows part of the nitrogen cycle.



(a) Name **one** biological molecule made by producers which contains nitrogen.

[1]

(b) (i) Name processes **A** and **B** that consumers must carry out before they can use the nitrogen-containing compounds from the producers.

A _____

B _____

[2]



- (ii) Process **C** is carried out by consumers when they are alive.
The nitrogen-containing compounds produced are then available to decomposers.

Name process **C**.

[1]

- (c) (i) Name substance **X** shown on the diagram.

[1]

One type of nitrogen bacteria carries out process **D**.

- (ii) Name process **D**.

[1]

[Turn over

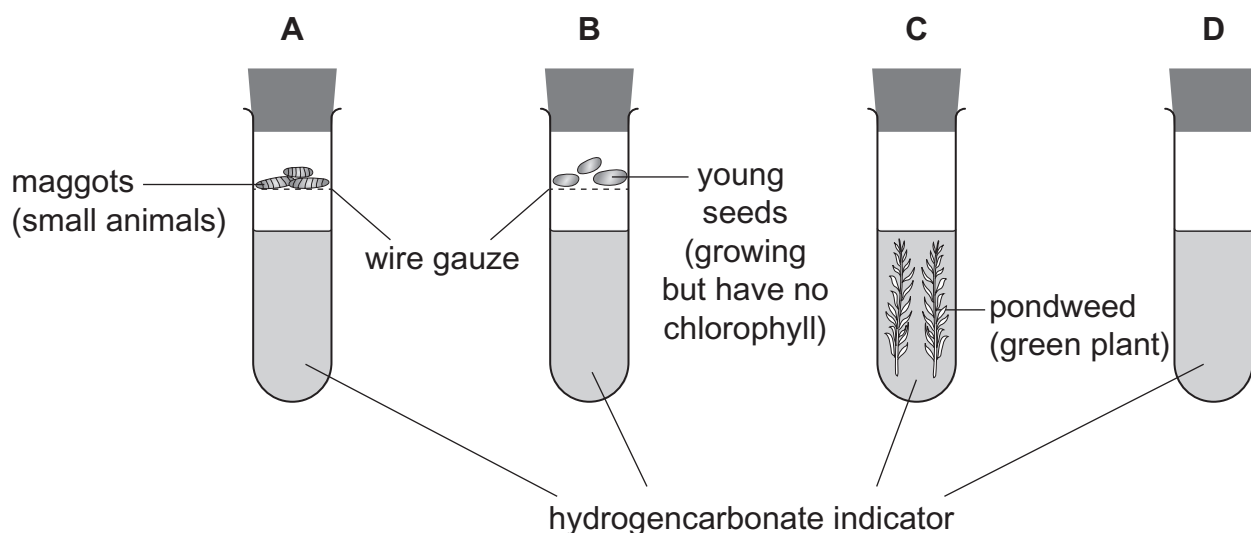


- 10 A student carried out an investigation into photosynthesis and respiration. He investigated how carbon dioxide levels changed in four boiling tubes, **A**, **B**, **C** and **D**.

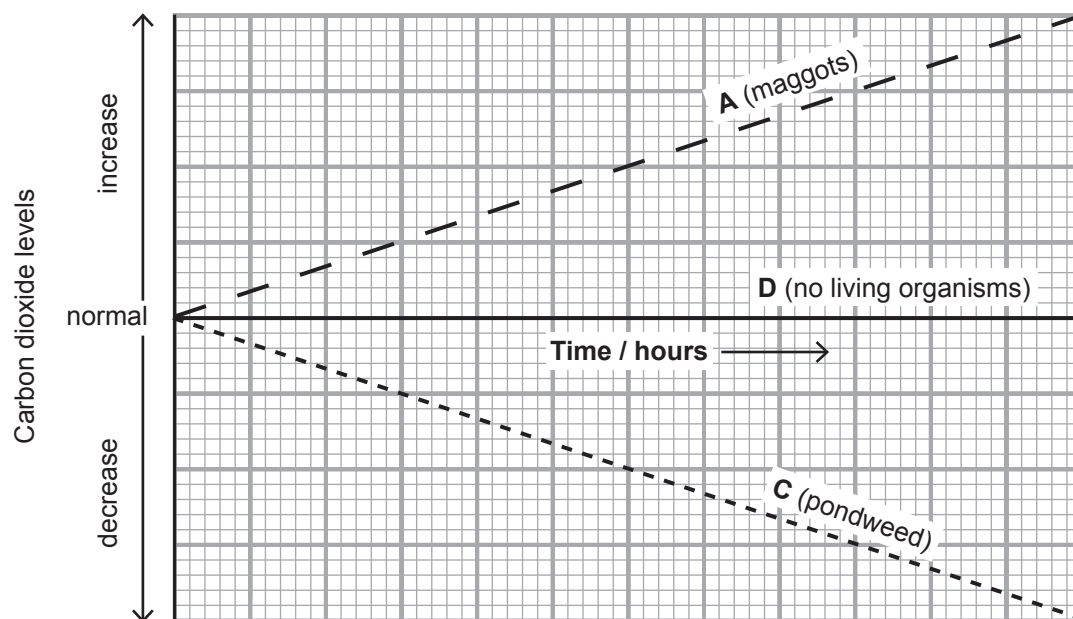
Boiling tubes **A**, **B** and **C** contained living organisms.

The four boiling tubes were left in **bright light** for 12 hours.

The diagram below shows the investigation.



The graph below shows how the carbon dioxide levels changed in boiling tubes **A**, **C**, and **D** over 12 hours.



- (a) Give the colour of the hydrogencarbonate indicator in boiling tubes **A** and **D** at the end of the investigation.

A _____

D _____

[2]

The line showing the results for boiling tube **B** is missing from the graph.

- (b) Would you expect the line for the results for boiling tube **B** to be most similar to the line for boiling tube A, C, or D?

[1]

[Turn over



Statements about the investigation are given in the three lists below.

List 1

Statements about photosynthesis and respiration	
1	Photosynthesis only occurred.
2	Respiration only occurred.
3	The rate of photosynthesis was greater than the rate of respiration.
4	The rate of respiration was greater than the rate of photosynthesis.

List 2

Statements about carbon dioxide in the boiling tube	
5	Carbon dioxide level decreased.
6	Carbon dioxide level stayed the same.
7	Carbon dioxide level increased.

List 3

Statements about carbon dioxide in the organism	
8	More carbon dioxide was taken in than given out.
9	Carbon dioxide was given out but not taken in.
10	The same amount of carbon dioxide was given out as taken in.



(c) Complete the table below.

- Give the number of one statement from **List 1**, the number of one statement from **List 2** and the number of one statement from **List 3** that apply to boiling tube **A**.
- Give the number of one statement from **List 1**, the number of one statement from **List 2** and the number of one statement from **List 3** that apply to boiling tube **C**.

Write your answers in the empty boxes.

Boiling tube	Number of statement from:		
	List 1	List 2	List 3
A			
C			

[3]

[3]

THIS IS THE END OF THE QUESTION PAPER



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Question 7: Source: Chief Examiner

Question 8: Source: Principal Examiner

Question 10: Source: Principal Examiner

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Question Number	Marks
1	
2	
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10	

Total Marks	
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Examiner Number

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