

INTERNATIONAL GCSE COMBINED SCIENCE DOUBLE AWARD

9204/BE

BIOLOGY – PAPER 1 – EXTENSION TIER

Specimen material

1 hour 45 minutes

Materials

For this paper you must have:

- a ruler with millimetre measurements
- a calculator.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the bottom of this page.
- Answer **all** questions.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 100.

Please write clearly, in block capitals, to allow character computer recognition.

Centre number

Candidate number

Surname

Forename(s)

Candidate signature _____

Answer **all** questions in the spaces provided.

1 This question is about decay and the carbon cycle.

0 1 . **1** Decay happens faster in aerobic conditions.

Identify **two** other conditions which leads to faster decay of living things after they die.

[2 marks]

Condition 1 _____

Condition 2 _____

0 1 . **2** Why does decay happens faster in aerobic conditions?

[1 mark]

2

The map shows Christmas Island.

Christmas Island is in the Indian Ocean, 400 km from any other land.



Many years ago, Christmas Island rats lived on the island.

The island was the only place in the world where this rat species lived.

0 2 . 1

Suggest **one** reason why this species of rat was able to evolve on Christmas Island. **[1 mark]**

0 2 . 2

The Christmas Island rats became extinct a number of years after a ship had visited the island.

Some Black rats of a different species had jumped off the ship onto the island.

The Black rats started to breed very quickly.

Suggest **two** reasons why the introduction of Black rats resulted in the extinction of Christmas Island rats.

[2 marks]

3

This question is about plants.

03 . 1

Plant roots are adapted for absorbing water from the soil.

Explain how plant roots are adapted for absorbing water.

[4 marks]

0 3 . 2

The surface of plant leaves are covered by epidermal tissue.

What is a tissue?

[1 mark]

0 3 . 3

The epidermal tissues on the lower surface of a leaf has pores called stomata.

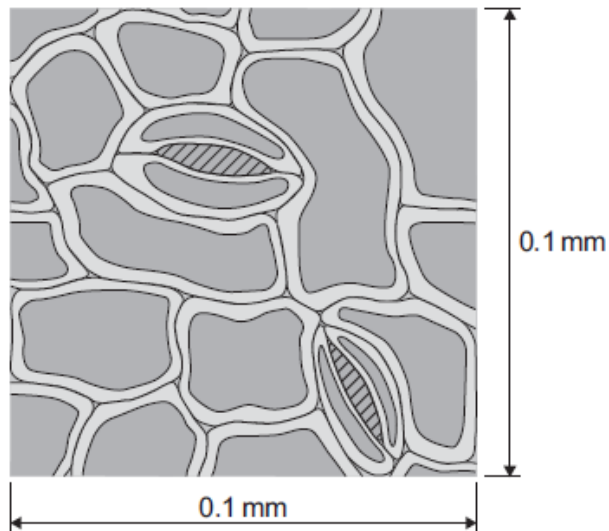
Suggest why the rate of photosynthesis increases when these pores are open.

[1 mark]

0 3 . 4

Figure 3 shows part of the surface of a leaf.

Figure 3



The length and width of this piece of leaf surface are both 0.1 mm.

Calculate the number of stomata per mm^2 of this leaf surface.

[2 marks]

_____ per mm^2

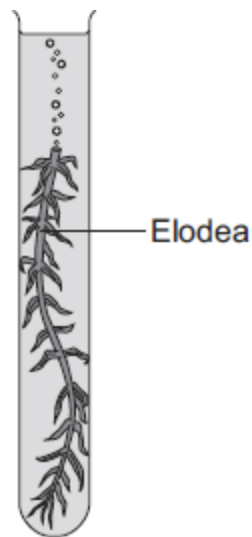
0 4 . 1 Write a balanced symbol equation for photosynthesis.

[3 marks]

0 4 . 2 Elodea is an aquatic plant.

When Elodea is in the light, bubbles of gas are given off from the stem as shown in **Figure 4**.

Figure 4



Describe how you would use Elodea to investigate the effect of light intensity on the rate of photosynthesis.

You should include how you would make the investigation a fair test.

[6 marks]

0 4 . 3 Predict the results of your investigation.

[2 marks]

Question 4 continues on the next page

In a similar investigation a student investigated the effect of temperature on the rate of photosynthesis.

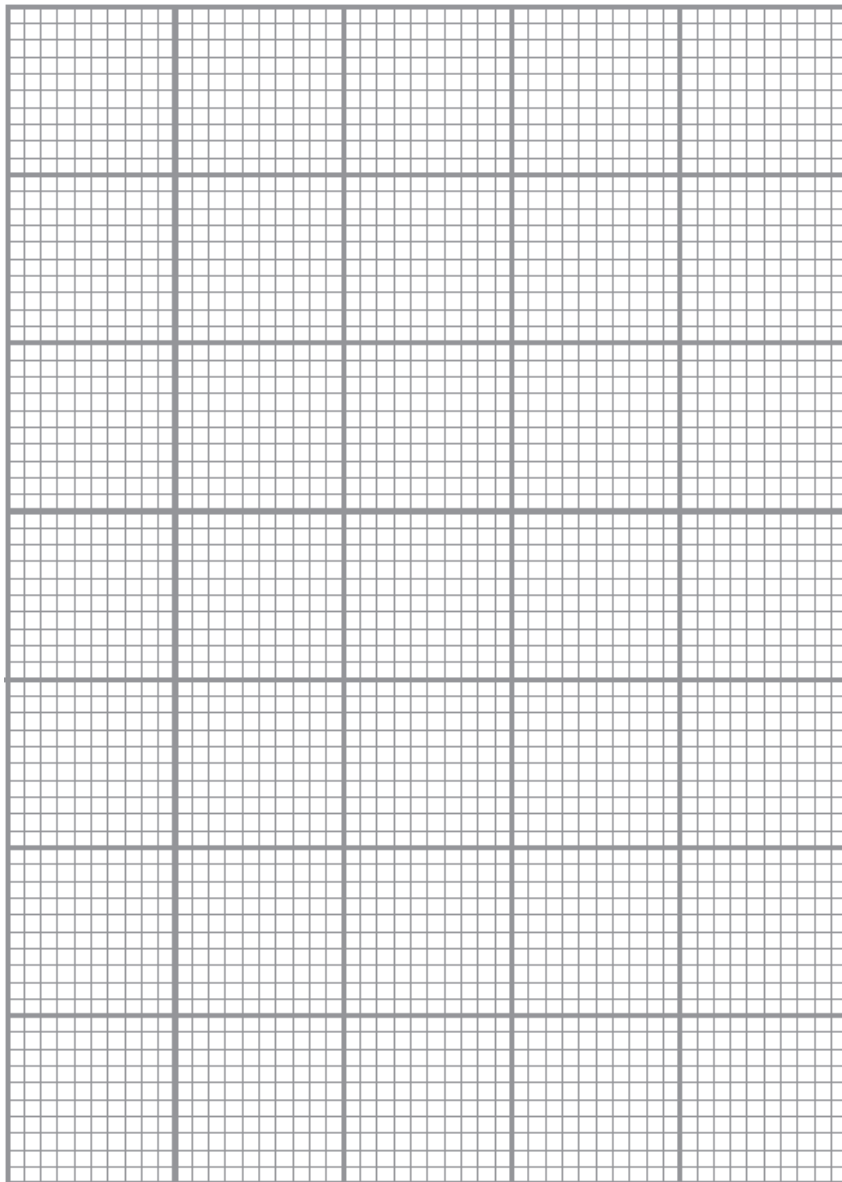
Table 1 shows the student's results.

Table 1

Temperature in °C	0	10	20	30	40	5
Volume of oxygen given off in 1 hour in cm³	0	0.6	1.5	2.3	2.3	1.9

0 4 . 4 On the graph paper below draw a graph to show the student's results.

[4 marks]



0 4 . **5** Suggest an explanation for the results between 0 °C and 20 °C.

[2 marks]

0 4 . **6** Suggest an explanation for the results between 30 °C and 40 °C.

[2 marks]

Turn over for the next question

0	5	.	4
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Explain why, in cold water, a tall, thin swimmer is more likely to become too cold than a short, overweight swimmer of the same body mass.

[1 mark]

Turn over for the next question

6

This question is about reproduction.

The photographs show the flowers of two closely-related species of plant.

Species A



Species B



The drawings show chromosomes from one cell in the root of each plant during cell division.

Species A



Species B



The drawings show that each chromosome has two strands of genetic material.

0 6 . 1

What type of molecule are chromosomes made of?

[1 mark]

0 6 . 2

Explain why each chromosome must become two strands before the cell divides.

[2 marks]

For sexual reproduction, the plants produce gametes.

0 6 . 3

Name the type of cell division that produces gametes

[1 mark]

0 6 . 4

How many chromosomes would there be in a gamete from each of these two plant species?

[1 mark]**Species A** _____**Species B** _____**0 6 . 5**It is possible for gametes from **Species A** to combine with gametes from **Species B** to produce healthy offspring plants.

How many chromosomes would there be in each cell of one of the offspring plants?

[1 mark]

Question 6 continues on the next page

06 . 6

Look back at the information at the start of the question and the information from parts 06.3 to 06.5.

What evidence supports the belief that **Species A** and **Species B** evolved from a common ancestor?

[2 marks]

06 . 7

For successful gamete production to take place, chromosomes that contain the same genes must pair up.

The drawings showing the chromosomes of **Species A** and of **Species B** are repeated below.



The offspring plants cannot reproduce sexually.

Suggest an explanation for this.

[2 marks]

0 6 . 8

Some mammals are infected by animals called flukes. Adult flukes produce eggs and sperm inside the mammal.

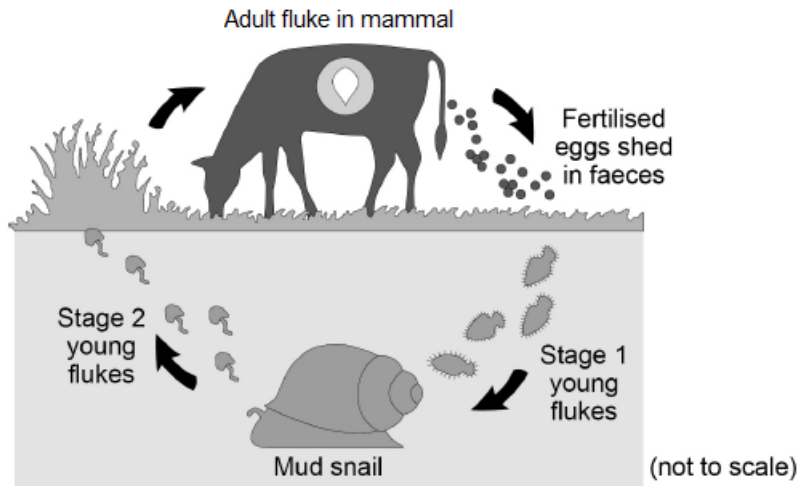
Fertilised fluke eggs leave in the faeces of the mammal. The fertilised eggs hatch and develop into young flukes.

A young fluke will burrow into a mud snail in the water. The young fluke reproduces asexually inside the snail.

Many young flukes leave the snail and attach themselves to grass. They are eaten by mammals.

Figure 5 shows the life cycle of a fluke.

Figure 5



Describe the role of mitosis and meiosis in the life cycle of the fluke.

In order to gain full marks you should link both mitosis and meiosis to stages in the life cycle.

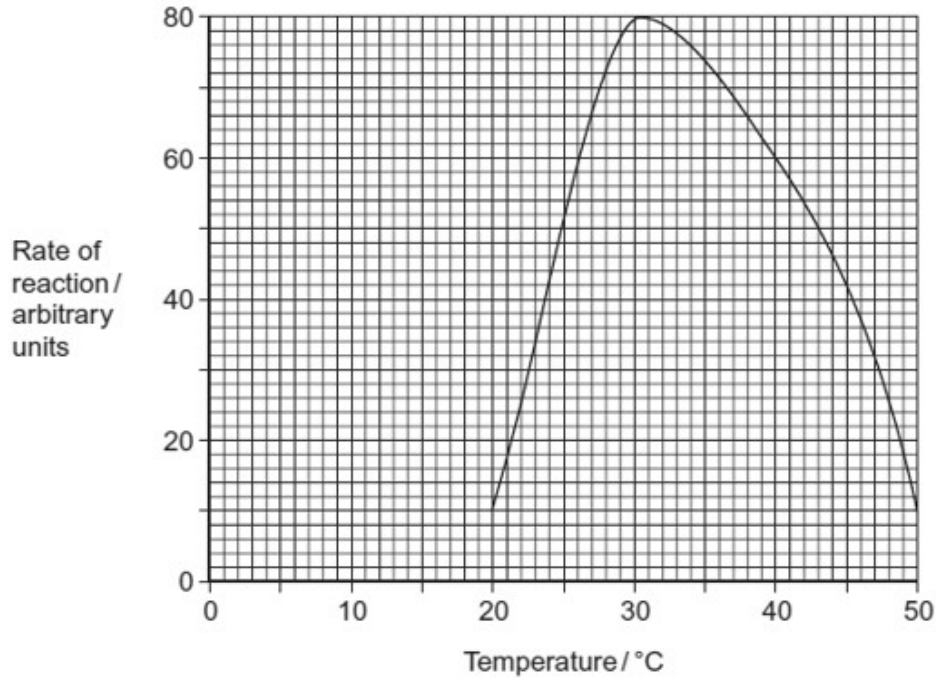
[5 marks]

7

A protease is an enzyme that digests protein.

Figure 6 shows how the activity of a protease varies with temperature.

Figure 6



0 7 . 1 What is the product of the digestion of protein?

Tick **one** box.

[1 mark]

- Amino acids
- Fatty acids
- Glucose
- Glycerol

0 7 . 2 Describe what **Figure 6** shows about the effect of temperature on the rate of reaction. Use data to support your answer.

[2 marks]

The student did the experiment at 20, 30, 40 and 50 °C.

0 7

. 3

Describe how the experiment could be improved to find a more precise value for the optimum temperature.

[2 marks]

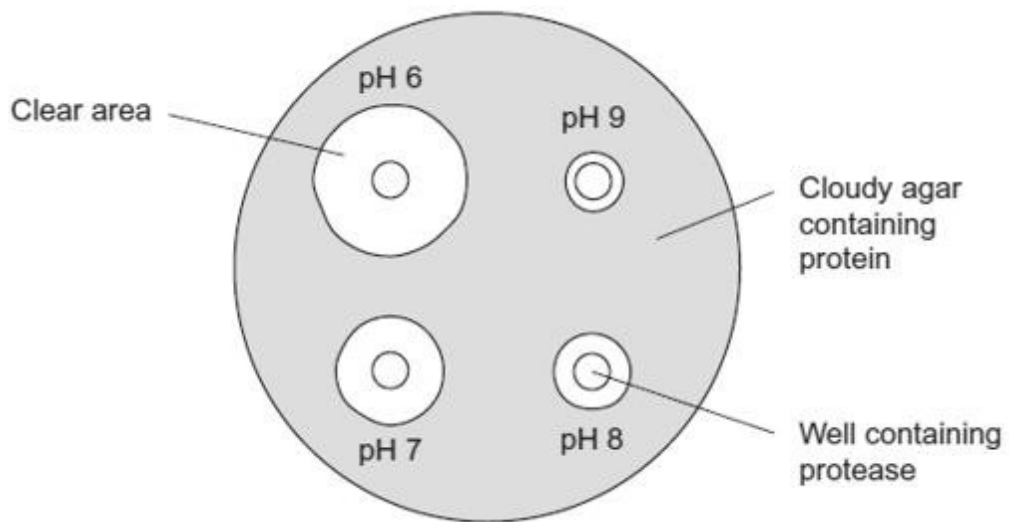
Question 7 continues on the next page

Students investigated the effect of pH on the activity of the protease.

- The students used agar plates containing protein. The protein made the agar cloudy.
- They made four holes of equal size in the agar of each plate.
- They added a drop of protease solution to each of the holes. The protease solution in each well was at a different pH.

Figure 7 shows the agar plates after they were incubated.

Figure 7



07 . **4** Give the optimum pH for the protease enzyme from **Figure 7**.

[1 mark]

0 7 . **5** Describe how the student could have used these results to compare the activity of the enzyme at different pH values.

[1 mark]

0 7 . **6** Describe why the student repeated the experiment using boiled protease.

[2 marks]

0 7 . **7** Explain why the agar plates were not incubated above 50 °C.

[1 mark]

Turn over for the next question

0 8 . **1** Describe, using a suitable example, what is meant by 'active transport'.

[4 marks]

In animals, anaerobic respiration is used to supply energy to cells when there is not enough oxygen.

0 8 . **2** Write down the word equation for anaerobic respiration in muscle cells.

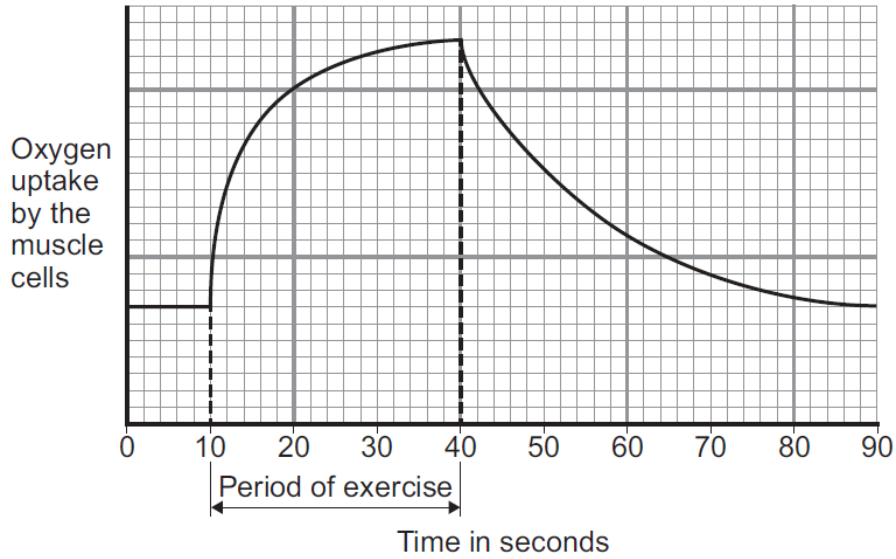
[2 marks]

_____ → _____ (+energy)

0 8 . 3

Figure 8 shows how the uptake of oxygen by the muscle cells may change during and immediately after a period of vigorous exercise, such as sprinting

Figure 8



Describe how the oxygen uptake by the muscle cells changed between 40 and 70 seconds.

Explain why.

[5 marks]

0 8 . 4

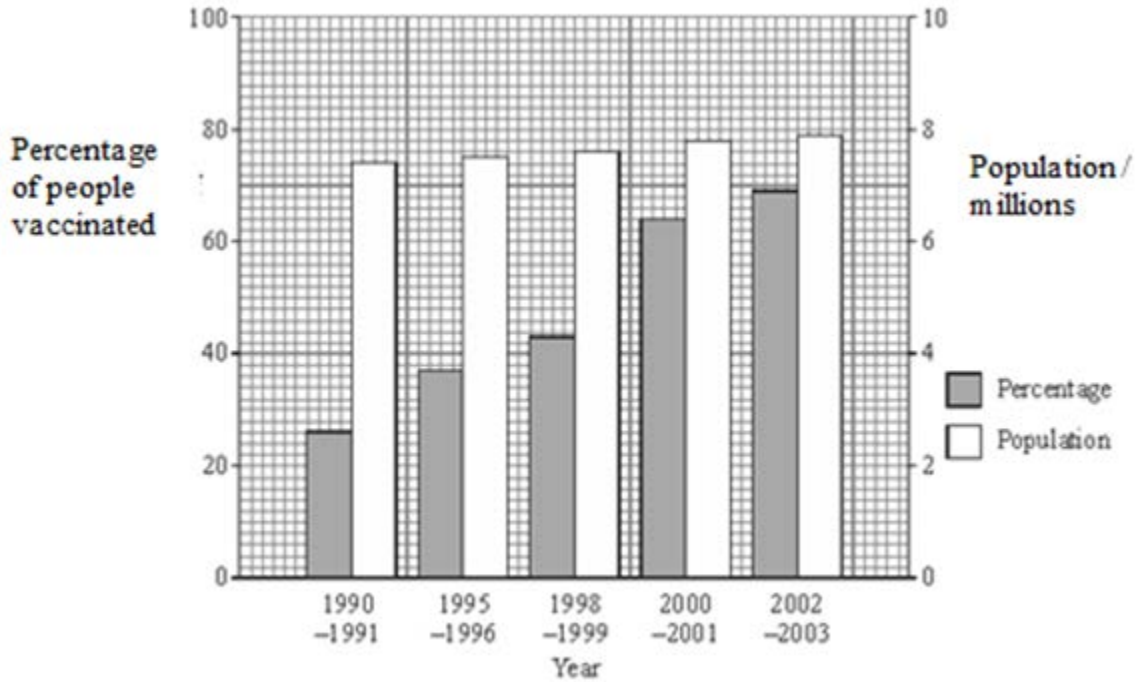
Why does anaerobic respiration release much less energy, per glucose molecule, than aerobic respiration?

[1 mark]

9 Influenza (flu) is an infectious disease caused by a virus. People who are considered 'at risk' are offered a vaccination against flu each year.

The bar chart in **Figure 9** shows the number of people in a population and the percentage of those who were vaccinated against flu.

Figure 9



0 9 . **1** Describe the change in the percentage of people vaccinated against flu from 1990 to 2003.

[1 mark]

0 9 . **2** Calculate the change in the total number of people being vaccinated between 1990-91 and 2000-01.

Show your working.

[2 marks]

0 9 . **3** A student suggested that some people were being vaccinated every year.

Explain how the information in the bar chart supports this suggestion.

[2 marks]

0 9 . **4** An influenza virus consists of a protein coat surrounding nucleic acid.

The influenza vaccine consists only of the protein coat of the virus.

Explain how the influenza vaccine produces immunity in the body.

[2 marks]

0 9 . **5** Explain why new antibiotics need to be developed to control bacterial infections

[3 marks]

END OF QUESTIONS

There are no questions printed on this page

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