

Paper Reference(s) 4BI1/1B 4SD0/1B

Pearson Edexcel International GCSE (9–1)

Biology

Unit: 4BI1

Science (Double Award) 4SD0

Paper: 1B

Tuesday 14 May 2019 – Afternoon

Time: 2 hours plus your additional time allowance

INSTRUCTIONS TO CANDIDATES

Write your centre number, candidate number, surname, other names, your signature and complete the paper reference for which you have been entered in the boxes below. Check that you have the correct question paper.

Centre No.					
Candidate No.					
Surname					
Other names					
Signature					
Paper Reference					/ 1 B

- Use **BLACK** ink or ball-point pen.
- Answer **ALL** questions.
- Answer the questions in the spaces provided – there may be more space than you need.
- Show all the steps in any calculations and state the units.
- Some questions must be answered with a cross in a box ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.

MATERIALS REQUIRED FOR EXAMINATION

Calculator, ruler

ITEMS INCLUDED WITH QUESTION PAPERS

Nil

INFORMATION FOR CANDIDATES

- The total mark for this paper is 110.
- The marks for **EACH** question are shown in brackets – use this as a guide as to how much time to spend on each question.

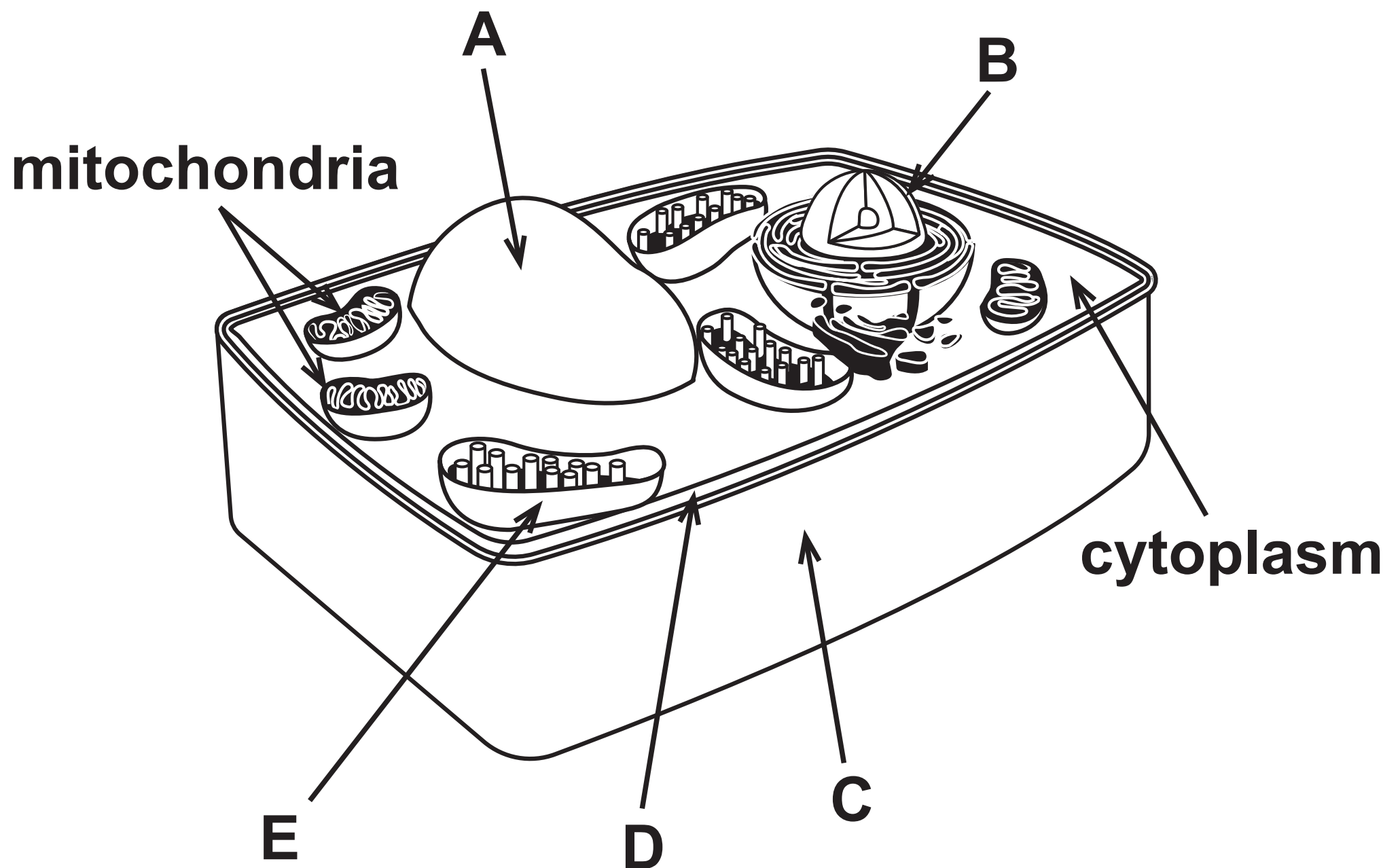
(Turn over)

ADVICE TO CANDIDATES

- **Read each question carefully before you start to answer it.**
- **Write your answers neatly and in good English.**
- **Try to answer every question.**
- **Check your answers if you have time at the end.**

Answer ALL questions.

- 1 This is a three-dimensional diagram of a plant cell.**



(Question continues on next page)

(Turn over)

(a) Name the structures labelled A, B, C, and D. (4 marks)

A _____

B _____

C _____

D _____

(b) Structure E is a chloroplast.

Chloroplasts are not found in animal cells.

(i) Give the letter of another structure shown in the diagram but not found in animal cells. (1 mark)

(Question continues on next page)

(Turn over)

(ii) Explain why some plant cells contain many chloroplasts, some plant cells contain few chloroplasts and some plant cells contain no chloroplasts. (3 marks)

(Continue your answer on next page)

(Turn over)

(Question continues on next page)

(Turn over)

(c) Ribosomes are found in plant cells and in animal cells.

Name the process that occurs at the ribosomes. (1 mark)

(TOTAL FOR QUESTION 1 = 9 MARKS)

(Questions continue on next page)

(Turn over)

- 2 The photograph shows a type of fish called a salmon.**



(Source: © Alexander Rath/Shutterstock)

Some humans eat salmon as a source of protein.

Protein is a component of a balanced diet.

(Question continues on next page)

(Turn over)

(a) Which statement describes what happens to salmon protein in the human stomach? (1 mark)

☐ **A it is digested into amino acids**

☐ **B its surface area is increased by bile**

☐ **C its pH is raised by hydrochloric acid**

☐ **D it is absorbed by villi**

(Question continues on next page)

(Turn over)

(b) The table lists other components of a balanced diet and their functions.

Complete the table by giving a function of each component.

**The first one has been done for you.
(3 marks)**

Component	Function
lipid	store of energy
vitamin D	
iron	
fibre	

(Question continues on next page)

(Turn over)

- (c) A student investigates the effect of genetic modification on the growth of salmon.**

The student measures the mass and length of one normal salmon and one genetically modified salmon when both salmon are 18 months old.

The table shows the student's results.

Type of salmon	Mass in g	Length in cm
normal	1250	33
genetically modified	3000	61

(Question continues on next page)

(Turn over)

- (i) It is recommended that a 15-year-old person needs 50 g of protein per day for a balanced diet.

A normal salmon contains 20% protein.

Calculate how many 15-year-olds can have their recommended daily allowance of protein supplied by the 18-month-old normal salmon. (2 marks)

number = _____

(Question continues on next page)

(Turn over)

- (ii) The student concludes that his results show that genetically modified (GM) salmon are useful in providing a balanced diet.

**Discuss the student's conclusion.
(6 marks)**

(Continue your answer on next page)

(Turn over)

[illegible]

(Continue your answer on next page)
(Turn over)

(Question continues on next page)

(Turn over)

(d) The passage describes the role of enzymes involved in the genetic modification of salmon.

**Complete the passage by writing a suitable word in each space.
(3 marks)**

All salmon contain a length of DNA

**called a _____ ,
which controls the production of growth hormone. Another length of DNA, from a different species of fish, is cut out**

**using a _____
enzyme. This DNA is then joined to the salmon DNA using an enzyme called**

_____ .

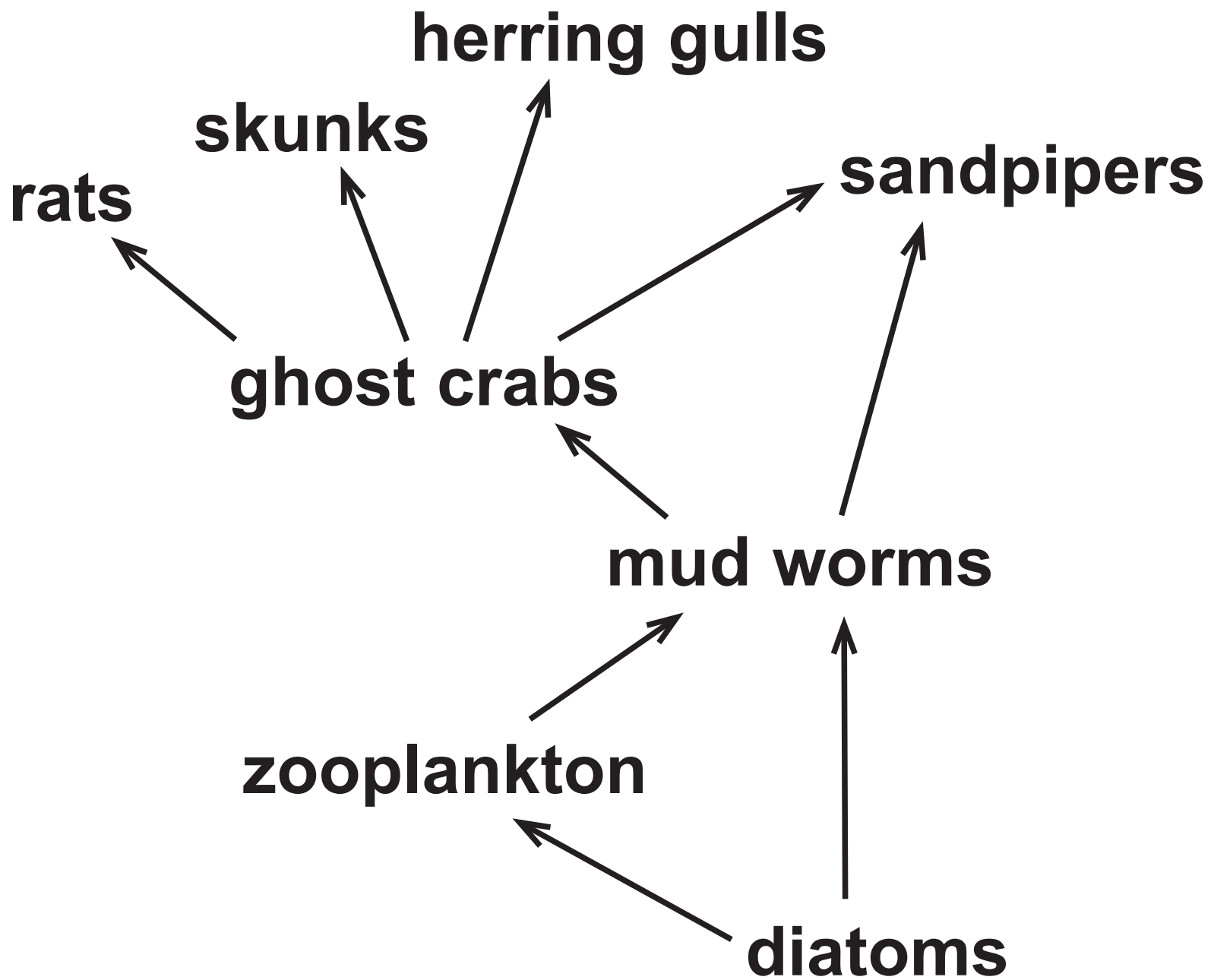
This causes the salmon to produce growth hormone at all times.

(TOTAL FOR QUESTION 2 = 15 MARKS)

(Questions continue on next page)

(Turn over)

3 The diagram shows a food web.



(Question continues on next page)

(Turn over)

(a) Use information from the food web to complete the table.

**The first one has been done for you.
(3 marks)**

number of organisms	8
number of producers	
number of primary consumers	
number of food chains	

(Question continues on next page)

(Turn over)

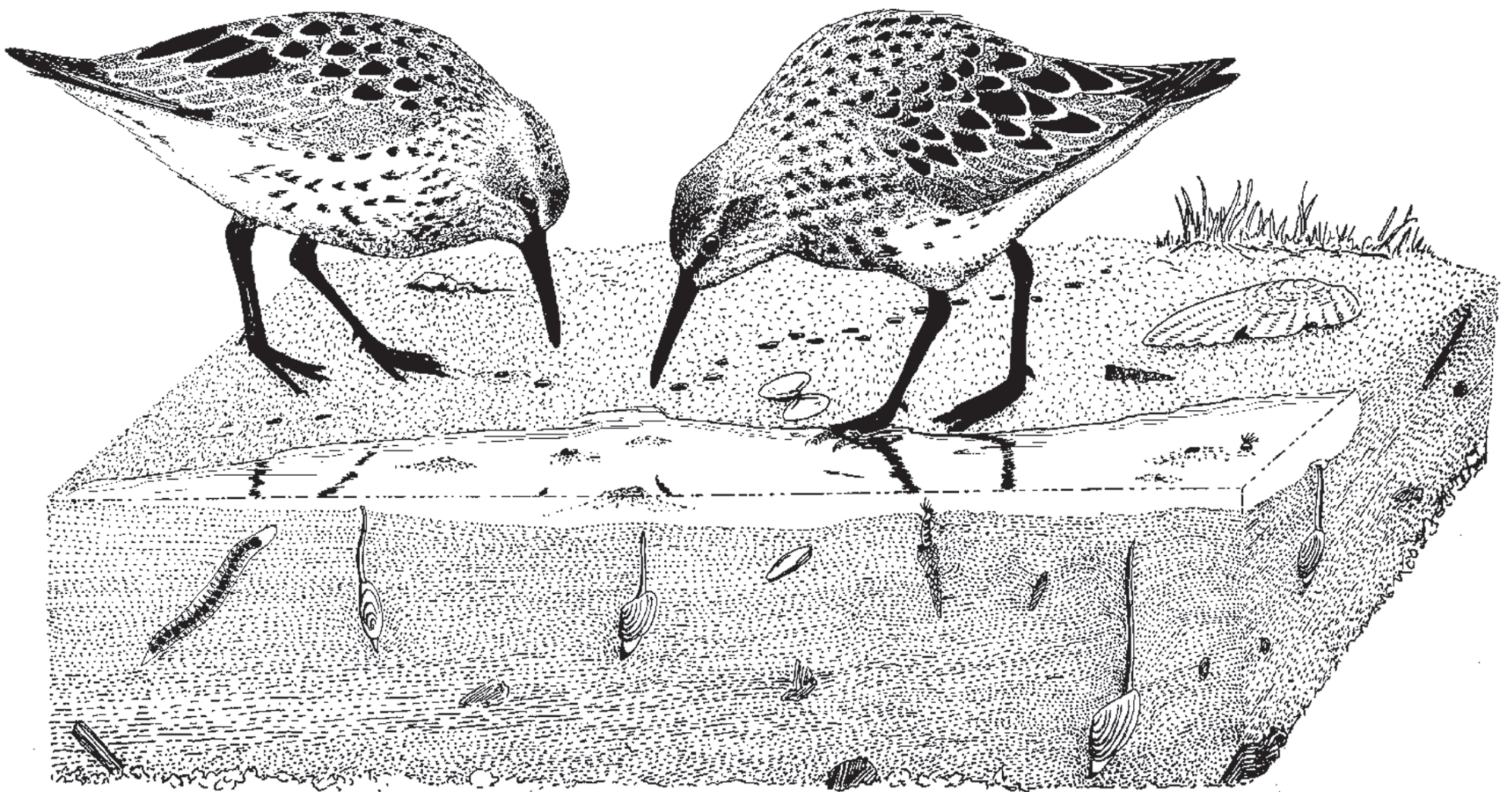
(b) Explain why the energy in the mud worms is not all transferred to the organisms that eat them. (4 marks)

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(Question continues on next page)
(Turn over)

(c) The diagram shows sandpipers feeding.

Sandpipers have long beaks so that they can dig for worms in the mud.



(Source: © Birchside www.fotosearch.com)

(Question continues on next page)

(Turn over)

Explain how sandpipers evolved to have long beaks. (4 marks)

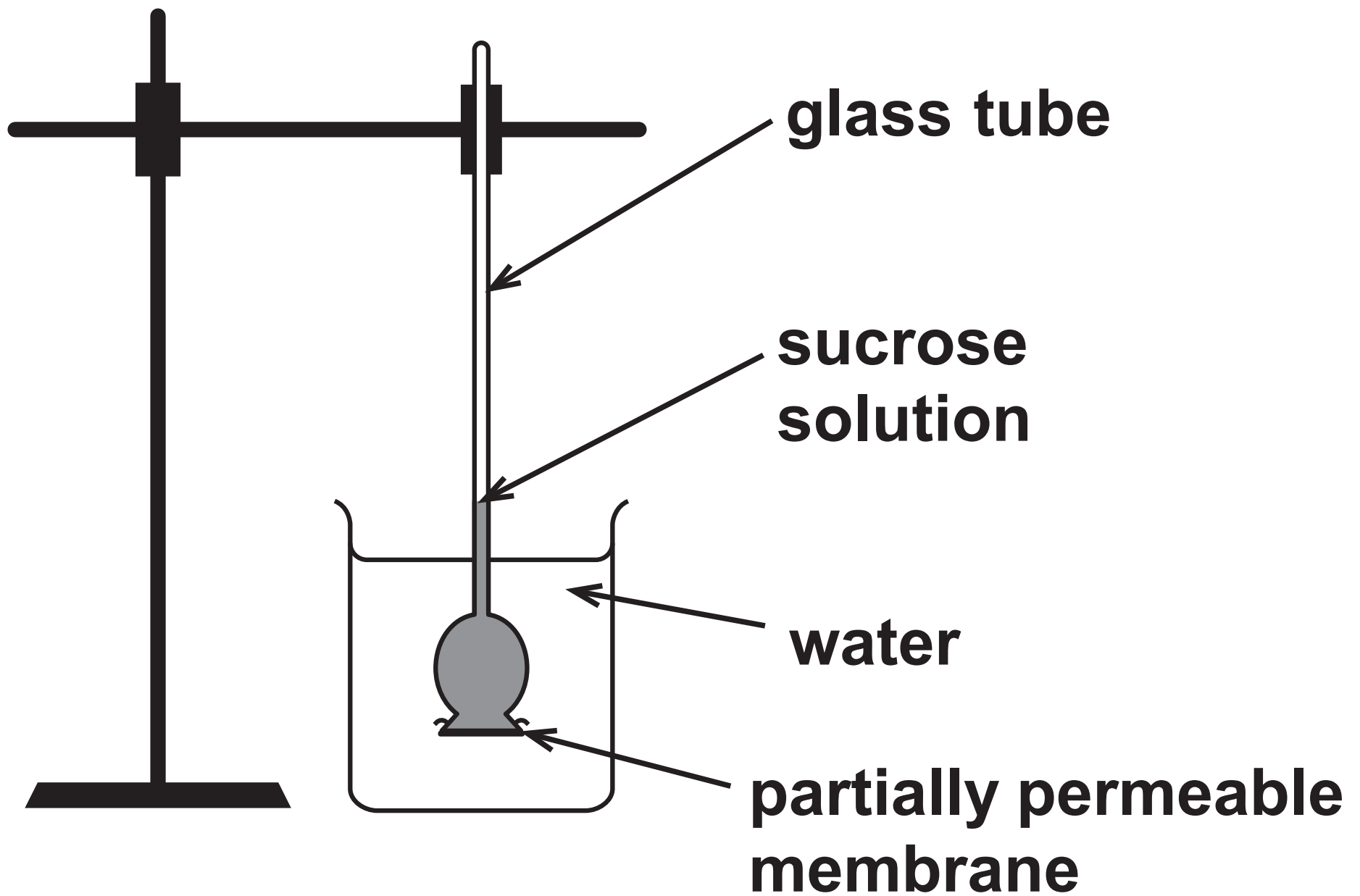
(Continue your answer on next page)
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(TOTAL FOR QUESTION 3 = 11 MARKS)

(Questions continue on next page)

(Turn over)

4 This apparatus can be used to show osmosis.



(a) Explain what happens to the level of the sucrose solution in the glass tube. (3 marks)

(Continue your answer on next page)

(Turn over)

(Question continues on next page)

(Turn over)

(b) Describe how this apparatus could be modified to measure the rate of osmosis at different temperatures. (3 marks)

(Continue your answer on next page)
(Turn over)

(TOTAL FOR QUESTION 4 = 6 MARKS)

(Questions continue on next page)

(Turn over)

5 Wheat seeds contain stores of a large insoluble molecule.

This molecule is digested by amylase as the seeds germinate.

(a) What is the name of this large insoluble molecule? (1 mark)

☐ **A glucose**

☐ **B lipid**

☐ **C protein**

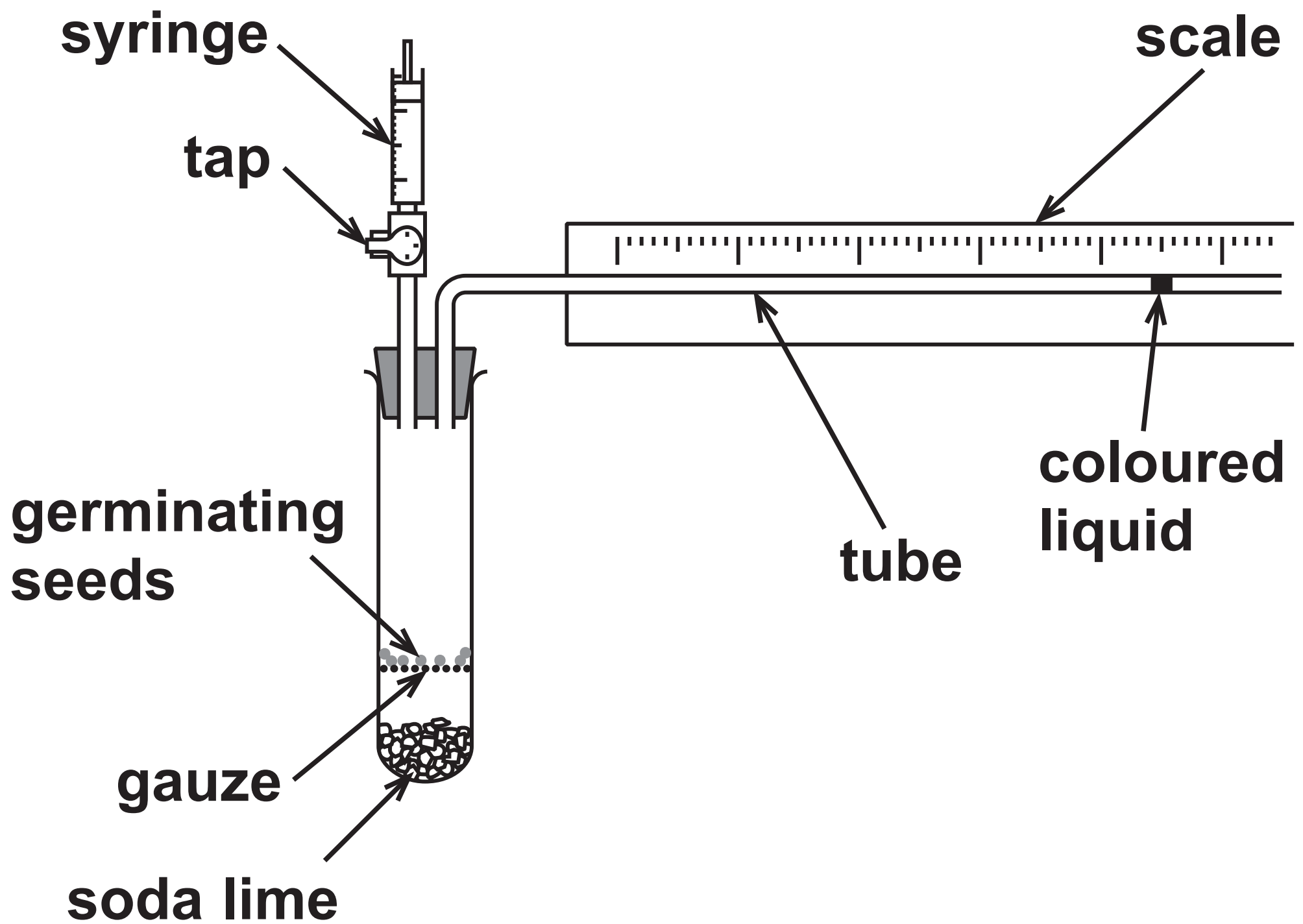
☐ **D starch**

(Question continues on next page)

(Turn over)

(b) A student investigates the oxygen absorbed by germinating seeds at different temperatures.

The diagram shows some of the student's apparatus.



(Question continues on next page)

(Turn over)

- (i) Suggest why the student opens the tap after obtaining one set of results. (2 marks)

(Question continues on next page)

(Turn over)

(ii) What is the function of the soda lime? (1 mark)

☐ **A it absorbs carbon dioxide**

☐ **B it absorbs oxygen**

☐ **C it releases carbon dioxide**

☐ **D it releases oxygen**

(Question continues on next page)

(Turn over)

(iii) The student measures the distance moved by the coloured liquid and converts this to volume of oxygen absorbed.

The volume of oxygen absorbed can be calculated using the formula

$$\text{volume} = \pi \times \text{radius}^2 \times \text{distance}$$

Calculate the volume of oxygen absorbed when the coloured liquid moves a distance of 6.0 mm.

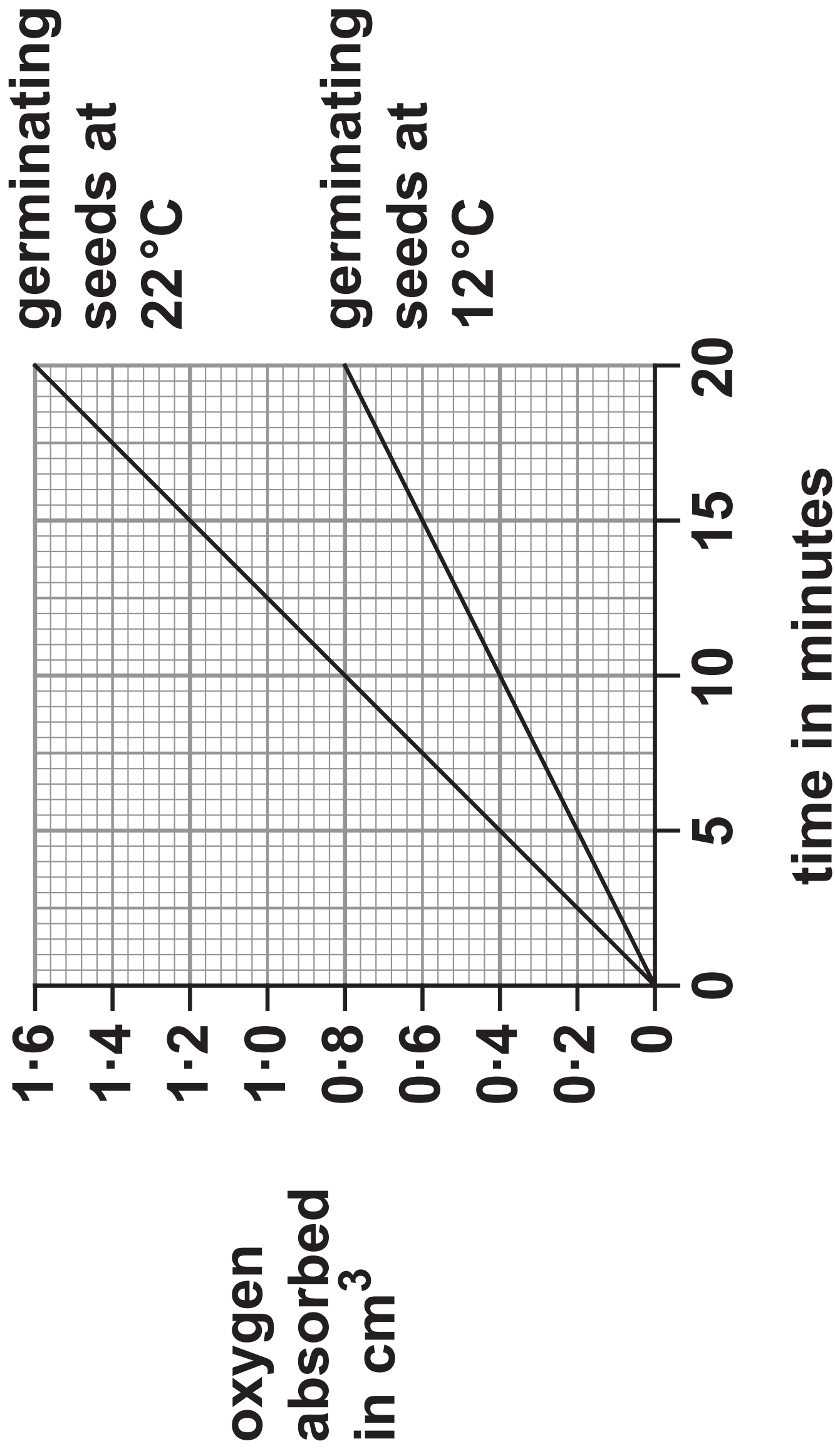
[diameter of tube = 1.0 mm] (3 marks)

volume = _____ cm³

(Question continues on next page)

(Turn over)

(c) The graph shows the results of the student's investigation.



(Question continues on next page)

(Turn over)

- (i) Calculate the percentage increase in the rate of oxygen absorption at 22°C compared to the rate of oxygen absorption at 12°C.
(2 marks)

percentage = _____

(Question continues on next page)

(Turn over)

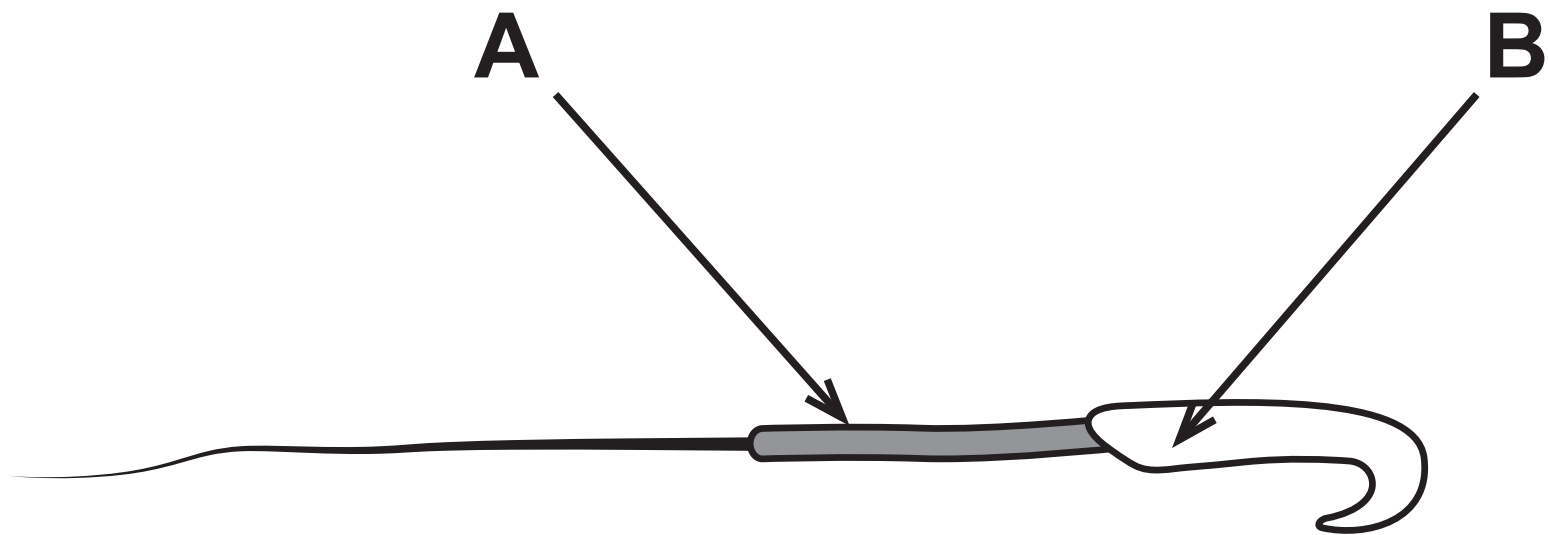
- (ii) Suggest why the rate of oxygen absorption is greater at 22°C than at 12°C. (2 marks)

(TOTAL FOR QUESTION 5 = 11 MARKS)

(Questions continue on next page)

(Turn over)

- 6 The diagram shows a sperm cell from a rat.**



- (a) (i) Describe the role of a sperm cell.
(1 mark)**

(Question continues on next page)

(Turn over)

(ii) Describe the structures found in part B. (2 marks)

(Question continues on next page)

(Turn over)

(iii) Explain why part A contains many mitochondria. (2 marks)

(Question continues on next page)

(b) Nicotine is a chemical found in cigarettes.

A scientist investigates how nicotine affects sperm cells.

The scientist gives male rats different concentrations of nicotine.

He then calculates the percentage of damaged sperm cells in the semen produced by each rat.

The table shows his results.

Concentration of nicotine in mg per kg of rat	Percentage of damaged sperm cells (%)
0·0	6·4
0·5	16·8
1·0	24·8

(Question continues on next page)

(Turn over)

- (i) The sample of semen from a rat given a nicotine concentration of 1.0 mg per kg contains 5.8×10^7 sperm cells.

Calculate the number of damaged sperm cells in this sample.
(2 marks)

number = _____

(Question continues on next page)

(Turn over)

- (ii) The scientist concludes that cigarette smoking could make male humans infertile.**

**Discuss this conclusion.
(5 marks)**

(Continue your answer on next page)

(Turn over)

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(Continue your answer on next page)

(Turn over)

(TOTAL FOR QUESTION 6 = 12 MARKS)

(Questions continue on next page)

(Turn over)

- 7 (a) A student investigates the sugar content of four different fruit juices.**

This is the student's method.

- **add 5 cm³ of fruit juice to a boiling tube**
- **add 5 cm³ of Benedict's solution to the boiling tube**
- **place the boiling tube in a water bath at 70 °C for three minutes**
- **remove the boiling tube and record the colour of the solution**

The student uses this method for each of the four fruit juices.

(Question continues on next page)

(Turn over)

The table shows the student's results.

Fruit juice	Colour of solution after heating for three minutes
A	blue
B	brick red
C	yellow
D	green

(Question continues on next page)

(Turn over)

- (i) Give two variables that the student controls in his investigation. (2 marks)

1 _____

2 _____

- (ii) Give the juices A, B, C and D in order of sugar content, from highest to lowest. (2 marks)

highest

lowest

(Question continues on next page)

(Turn over)

(iii) The student is now given sugar solutions with concentrations of 1%, 5%, 10% and 20%.

Explain how the student could use these solutions to estimate the concentration of sugar in the four fruit juices. (3 marks)

(Continue your answer on next page)

(Turn over)

(Question continues on next page)

(Turn over)

(b) Some fruit juices contain high concentrations of sugar.

These fruit juices increase the number of bacteria in the mouth.

This may lead to an increase in tooth decay.

(i) Suggest why high concentrations of sugar may increase tooth decay. (2 marks)

(Continue your answer on next page)

(Turn over)

(Question continues on next page)

(Turn over)

- (ii) Explain another health risk to children who drink fruit juices with high concentrations of sugars. (2 marks)

(TOTAL FOR QUESTION 7 = 11 MARKS)

(Questions continue on next page)

(Turn over)

8 A scientist investigates the effect of exercise on breathing rate.

She measures the breathing rate in breaths per minute of two people, P and Q, every 5 minutes for 30 minutes.

This is her method.

- **measure their breathing rate every 5 minutes while they exercise for 20 minutes**
- **measure their breathing rate every 5 minutes for a further 10 minutes while they recover from the exercise**

(Question continues on next page)

(Turn over)

The table shows her results.

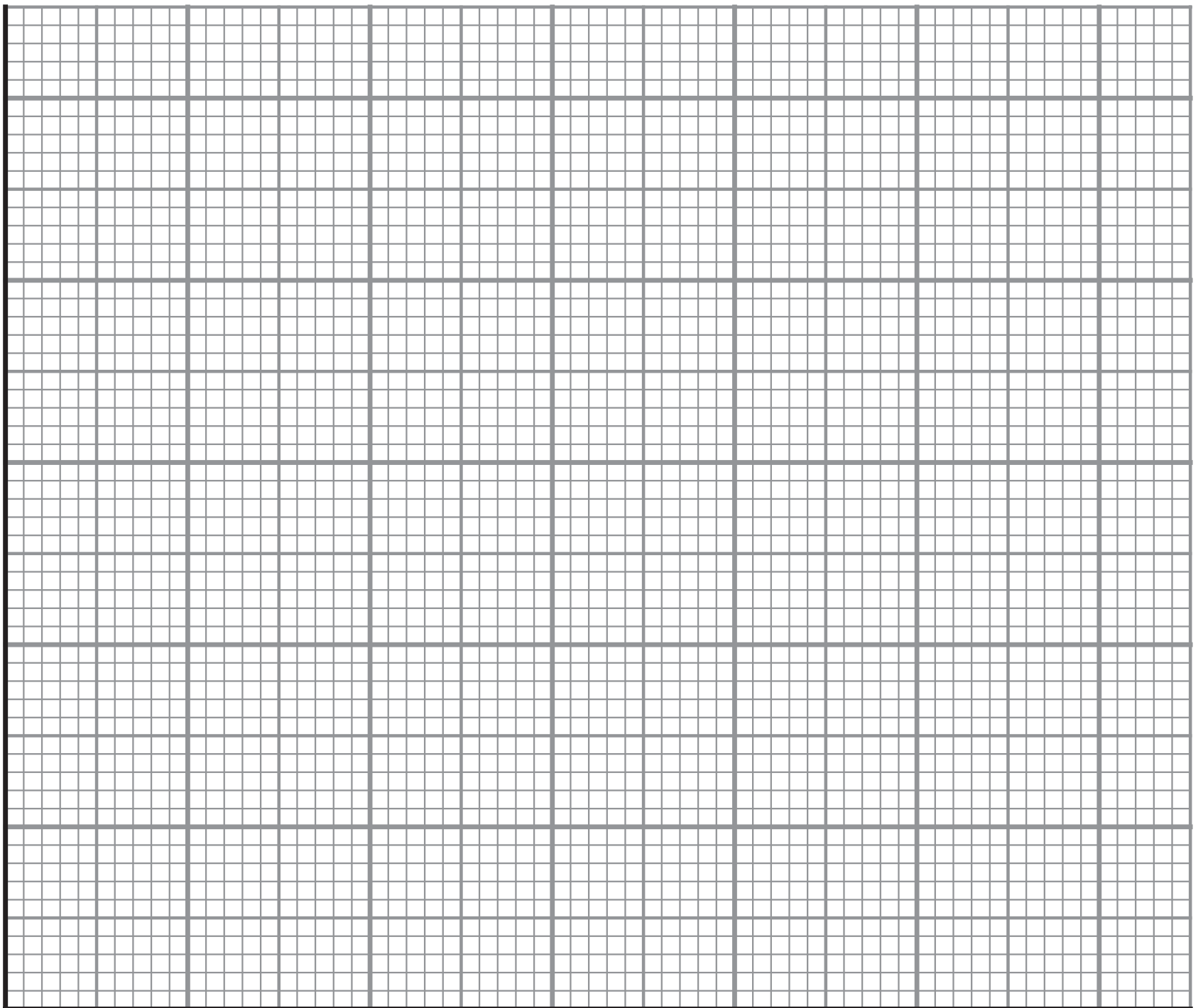
Time in minutes	Breathing rate in breaths per minute	
	Person P	Person Q
0	12	15
5	20	24
10	22	24
15	25	23
20	24	20
25	16	19
30	12	15

(Question continues on next page)

(Turn over)

- (a) (i) Plot a line graph of the results for person P and person Q.**

Use a ruler to join your points with straight lines. (6 marks)



(Question continues on next page)

(Turn over)

(ii) Explain the change in breathing rate during exercise. (3 marks)

(Continue your answer on next page)

(Turn over)

(Question continues on next page)

(Turn over)

(iii) Explain why the breathing rates of persons P and Q remain high for five minutes after they have finished exercising. (2 marks)

(Question continues on next page)

(Turn over)

(b) The time taken to recover from exercise is often a good measure of fitness.

The scientist concluded that person P is much fitter than person Q.

Comment on the validity of this conclusion. (4 marks)

(Continue your answer on next page)

(Turn over)

(TOTAL FOR QUESTION 8 = 15 MARKS)

(Questions continue on next page)

(Turn over)

9 Pollution can occur in the atmosphere and in rivers.

(a) Carbon monoxide can pollute the atmosphere.

**Describe the effects of carbon monoxide pollution on humans.
(3 marks)**

(Question continues on next page)

(Turn over)

(b) Water pollution can occur if sewage enters a river.

Explain the biological consequences of sewage pollution on a river ecosystem. (6 marks)

(Continue your answer on next page)
(Turn over)

(Continue your answer on next page)
(Turn over)

(TOTAL FOR QUESTION 9 = 9 MARKS)

(Questions continue on next page)

(Turn over)

10 (a) Animals produce hormones to communicate between cells.

(i) Which hormone causes the development of secondary sexual characteristics in girls? (1 mark)

☐ **A adrenaline**

☐ **B oestrogen**

☐ **C progesterone**

☐ **D testosterone**

(Question continues on next page)

(Turn over)

**(ii) Which hormone causes an increased blood flow to the muscles during exercise?
(1 mark)**

- ☐ **A adrenaline**
- ☐ **B insulin**
- ☐ **C progesterone**
- ☐ **D testosterone**

(Question continues on next page)

(Turn over)

**(iii) Which of these is a correct statement about hormones?
(1 mark)**

- ☐ **A they always produce short-term changes**
- ☐ **B they are carried by neurones**
- ☐ **C they are transported in the plasma**
- ☐ **D they always produce a rapid response**

(Question continues on next page)

(Turn over)

(b) Plants produce plant growth substances such as auxin.

**Suggest why some biologists do not consider auxin to be a hormone.
(2 marks)**

(Question continues on next page)

(Turn over)

(c) Plant growth substances stimulate root growth from a cut stem.

Describe an investigation to find the best concentration of plant growth substance to stimulate root growth.

You should include experimental details in your answer and write in full sentences. (6 marks)

(Continue your answer on next page)

(Turn over)

(Continue your answer on next page)
(Turn over)

70

(TOTAL FOR QUESTION 10 = 11 MARKS)

TOTAL FOR PAPER = 110 MARKS

END