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Candidate surname					Other names				
Centre Number					Candidate Number				
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Pearson Edexcel Level 1/Level 2 GCSE (9–1)

Time 1 hour 10 minutes **Paper reference** **1SC0/2BH**

Combined Science
PAPER 4
Higher Tier

You must have:
 Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- In questions marked with an **asterisk** (*), marks will be awarded for your ability to structure your answer logically, showing how the points that you make are related or follow on from each other where appropriate.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Q:1/



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Answer ALL questions. Write your answers in the spaces provided.

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 ☒.

- 1 (a) Figure 1 shows xylem and phloem from the stem of a plant.

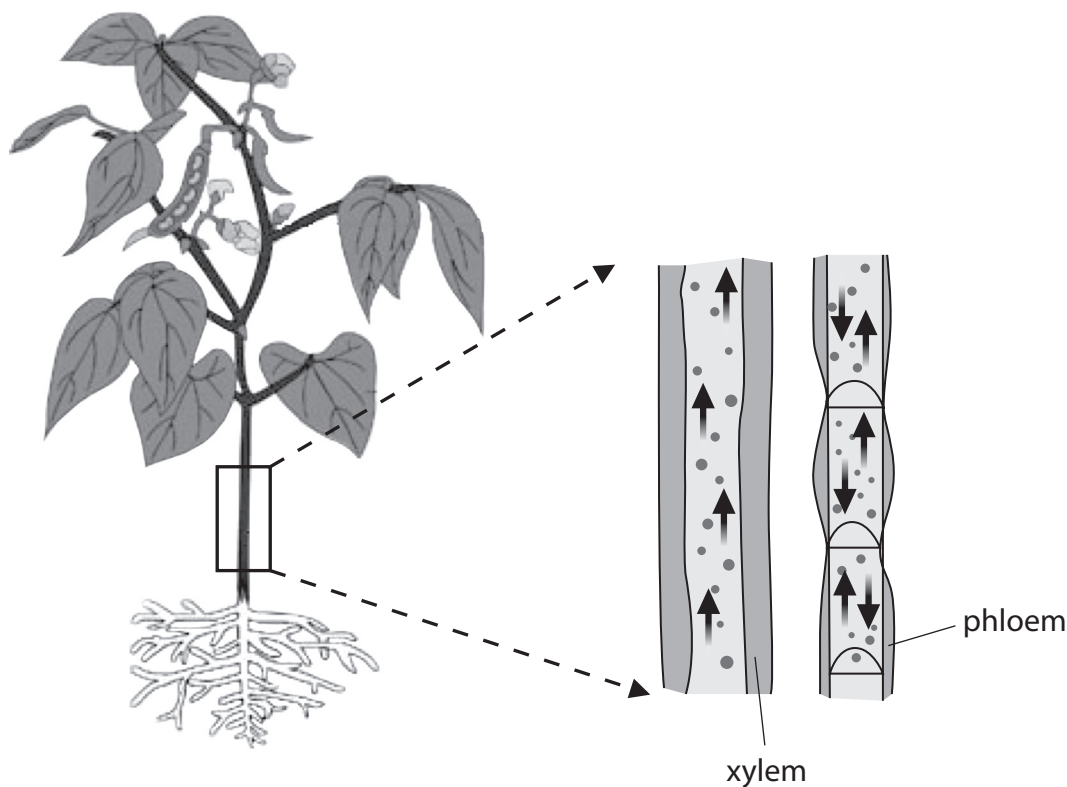


Figure 1

- (i) Living cells in phloem use energy to transport sucrose.

Which organelles release energy in living cells?

(1)

- ☐ A vacuoles
- ☐ B mitochondria
- ☐ C nuclei
- ☐ D ribosomes

- (ii) Describe **two** features of the structure of xylem vessels that can be seen in Figure 1.

(2)

1

2

(b) A scientist investigated how the flow of air affected the rate of transpiration in a plant.

A fan was used to change the flow of air.

The volume of water taken up by the plant was measured.

Figure 2 shows the results of this investigation.

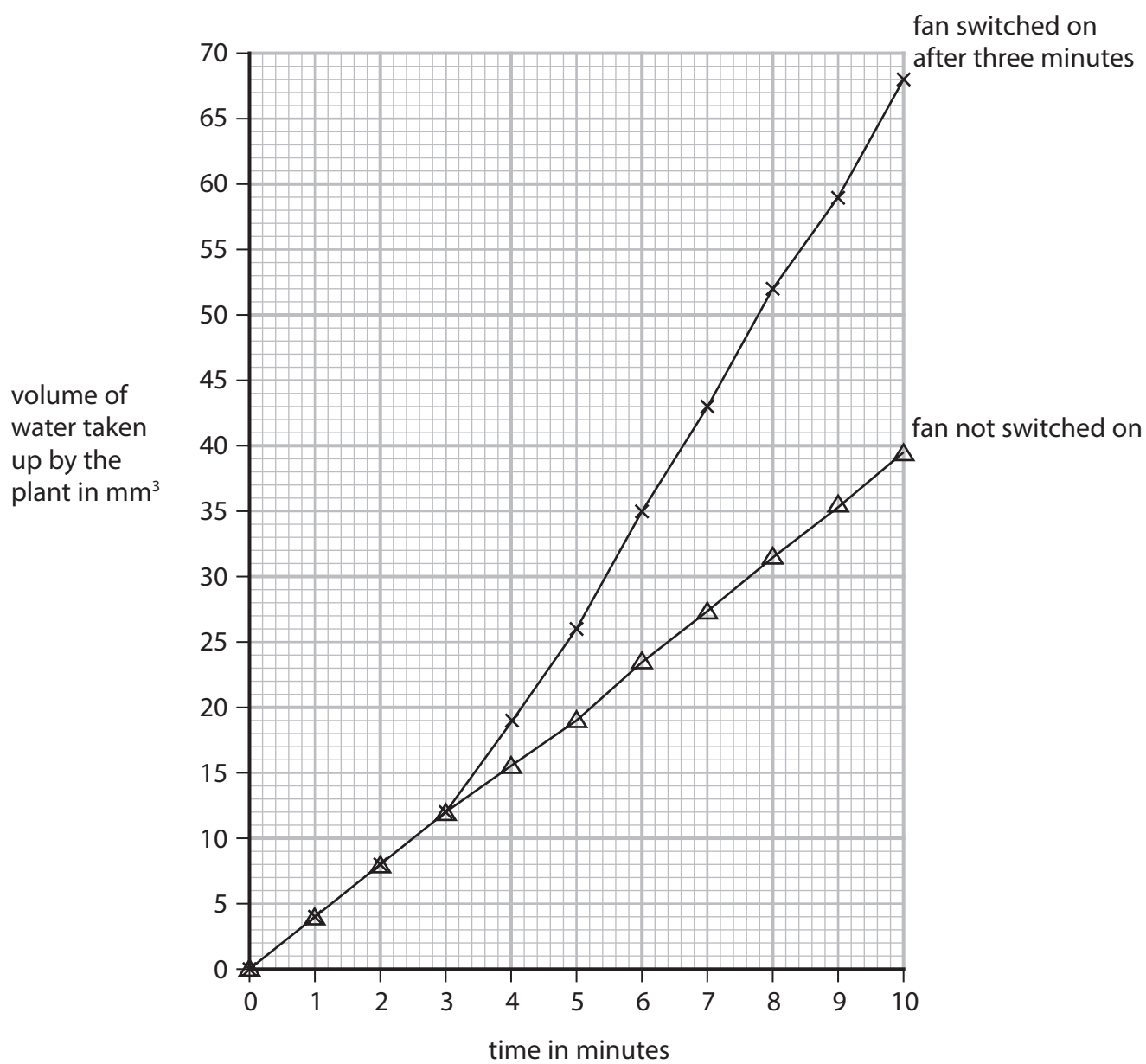


Figure 2

- (i) Explain why switching on the fan caused a change in the volume of water taken up by the plant.

(3)

- (ii) Give **one** reason why the volume of water taken up by the plant was also measured when the fan was not switched on.

(1)

- (iii) Calculate the rate of water uptake from 8 minutes to 10 minutes when the fan was switched on.

Use the equation

$$\text{rate of water uptake} = \frac{\text{volume of water taken up}}{\text{time taken}}$$

(2)

mm³ per minute

(Total for Question 1 = 9 marks)

- 2 (a) Figure 3 shows a cross-section of an artery and a vein.



(Source: © The University of Kansas Medical Center)

Figure 3

- (i) Explain **one** difference between the artery wall and the vein wall shown in Figure 3.

(2)

- (ii) Name **one** structure that is found in veins but not found in arteries.

(1)

(b) A human body has 5 dm^3 of blood.

At rest 20% of the blood travels to the muscles.

During exercise 60% of the blood travels to the muscles.

(i) Calculate the volume of blood travelling to the muscles during exercise.

(2)

dm^3

(ii) Explain **one** reason why there is an increase in blood flow to muscles during exercise.

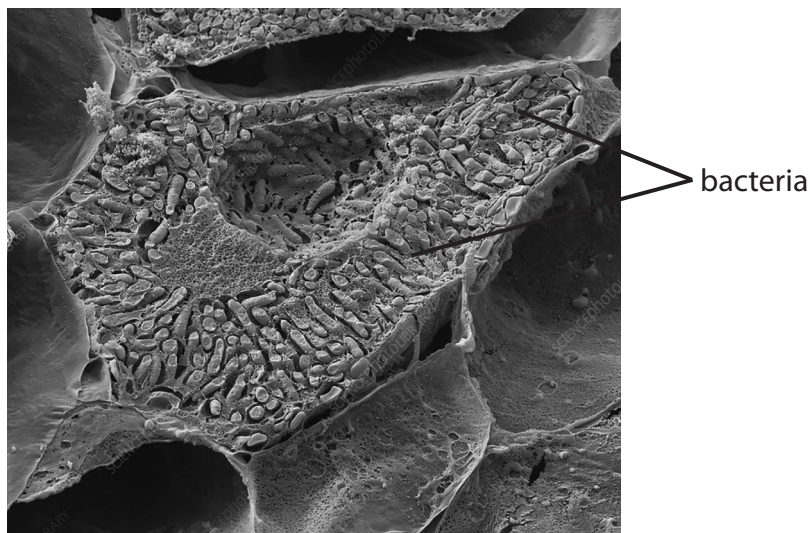
(2)

(Total for Question 2 = 7 marks)

- 3 (a) Figure 4 shows a cross-section of a root nodule on a leguminous plant.

Bacteria in the root nodule provide the leguminous plant with nitrogen compounds.

The leguminous plant provides the bacteria with sugars.



(Source: © Nigel Downer / Science Photo Library)

Figure 4

- (i) Which term describes the relationship between this leguminous plant and the bacteria?

(1)

- ☐ **A** parasitism
- ☐ **B** indigenous
- ☐ **C** biodiversity
- ☐ **D** mutualism

- (ii) The width of this root nodule is 7.5 mm.

Give the width in μm .

(1)

μm

(b) Figure 5 shows part of the nitrogen cycle.

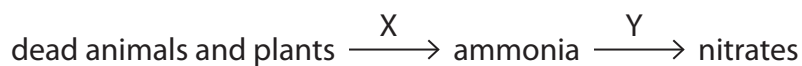


Figure 5

- (i) Identify the types of microorganism involved in process X and process Y. (2)

X

Y

- (ii) Explain how crop rotation increases nitrate levels in the soil. (3)

- (iii) Explain why increased nitrate levels in the soil improve crop yield. (2)

(Total for Question 3 = 9 marks)

- 4 (a) The combined contraceptive pill contains artificial versions of oestrogen and progesterone.

(i) Explain how the combined contraceptive pill prevents pregnancy.

(2)

(ii) When taken correctly, the combined pill can be over 99% effective.

Taking the combined pill can lead to weight gain.

Give **one** other disadvantage of using the combined pill as the only method of contraception.

(1)

- (b) Excessive weight gain and obesity increase the likelihood of developing type 2 diabetes.

Explain the effect of type 2 diabetes on the body.

(3)

- (c) A woman had unexplained weight loss and fatigue.
She had blood tests to investigate the cause of these symptoms.

Figure 6 shows the results.

blood test	woman's result	normal range
TSH level	5.6 mU/l	0.4 to 4.9 mU/l
thyroxine level	27.5 pmol/l	9.0 to 21.0 pmol/l
red blood cell count	5.2×10^6 cells/ μ l	4.2 to 5.4×10^6 cells/ μ l
glucose level	82.0 mg/dl	72.0 to 99.0 mg/dl

Figure 6

Comment on the results of these blood tests and the possible causes of the woman's weight loss and fatigue.

(4)

(Total for Question 4 = 10 marks)

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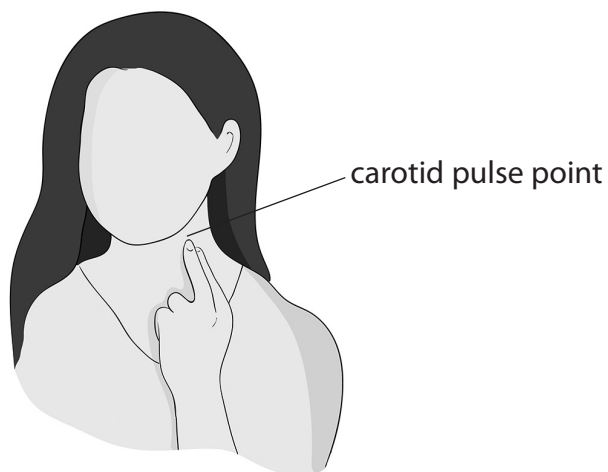
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- 5 The effect of different types of exercise on the heart rate of an athlete was investigated.

The athlete counted the number of beats in 10 seconds at the carotid artery pulse point, as shown in Figure 7.

This measurement was used to calculate the heart rate.



(Source: © dityazemli/Shutterstock)

Figure 7

The athlete exercised for 20 minutes.

The heart rate was recorded every 5 minutes during each type of exercise.

- (a) (i) State how the heart rate was calculated using this method.

(1)

- (ii) Give **two** ways of improving the method used to obtain the data needed to calculate the heart rate.

(2)

1

2

Figure 8 shows the results of this investigation.

type of exercise	heart rate in bpm				
	0 minutes	5 minutes	10 minutes	15 minutes	20 minutes
running	90	156	168	180	180
walking	90	96	90	96	90

Figure 8

(iii) Comment on the difference in the heart rates during these types of exercise.

(3)

(b) Exercise increases adrenalin levels.

(i) State which endocrine gland secretes adrenalin.

(1)

(ii) Explain the effect of adrenalin on liver cells during exercise.

(3)

(c) After high intensity exercise, the pH of muscles can decrease from pH 7.0 to pH 6.3.

Explain this change in pH.

(2)

(Total for Question 5 = 12 marks)

- 6 (a) Scientists use a technique called mark and recapture to estimate animal populations in a habitat.

A sample of the population is captured and a harmless mark is added to each animal.

These animals are released and after a period of time the population is sampled again.

This second sample includes some recaptured animals that have marks on them.

The population can be estimated using this equation

$$\text{population size} = \frac{\text{number marked in the first sample} \times \text{size of the second sample}}{\text{number recaptured in the second sample}}$$

A scientist used this technique to determine the change in the population size of snails in a pond from March to July.

Figure 9 shows the results.

month	number marked in the first sample	size of the second sample	number of recaptured animals	population size
March	18	22	8	50
July	12	18	10	

Figure 9

- (i) Using data from Figure 9, calculate the difference in the population size from March to July.

(3)

Difference in the population size

(ii) State **two** factors the scientist should control when sampling the habitat in March and July.

(2)

1

2

(b) This pond is affected by eutrophication.

Explain **one** possible cause of eutrophication.

(2)

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*(c) Reforestation has a beneficial effect on air composition and biodiversity.

Animal conservation projects can also have a beneficial effect on biodiversity.

Explain the beneficial effects of reforestation and animal conservation projects.

(6)

(Total for Question 6 = 13 marks)

TOTAL FOR PAPER = 60 MARKS

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