

Biology
UNIT: 4BI1
PAPER: 2BR

Total Marks

Friday 9 June 2023 – Afternoon

Time: 1 hour 15 minutes

In the boxes below, write your name, centre number and candidate number.

Surname					
Other names					
Centre Number					
Candidate Number					

YOU MUST HAVE

Calculator, ruler

YOU WILL BE GIVEN

Diagram Booklet

INSTRUCTIONS

Answer ALL questions.

Answer the questions in the spaces provided in this Question Paper or in the separate Diagram Booklet – there may be more space than you need.

Show all the steps in any calculations and state the units.

INFORMATION

The total mark for this paper is 70.

The marks for EACH question are shown in brackets – use this as a guide as to how much time to spend on each question.

There may be spare copies of some diagrams in case you need them.

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.

Answer ALL questions.

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 Read the passage for Question 1 in the Diagram Booklet. Use the information in the passage and your own knowledge to answer the questions below.**

- (a) State what is meant by the term *in vitro*. (line 1)
(1 mark)**

(continued on the next page)

1 continued.

(b) Explain how plant cells differ from human cells in their ability to differentiate and specialise.

(lines 2–3)

(2 marks)

(continued on the next page)

1 continued.

- (c) Give the function of two named minerals included in the culture media. (lines 7–8)
(4 marks)**

1 _____

2 _____

(continued on the next page)

1 continued.

- (d) Explain why the pH of the media needs to be kept constant. (line 8)
(2 marks)**

(continued on the next page)

1 continued.

(e) Auxin also controls the response of plants to light.

Describe a simple experiment you could do to show the phototropic response of plant stems to light.

(3 marks)

Answer lines continue on the next page.

1(e) continued.

(continued on the next page)

1 continued.

- (f) Explain why scientists want to conserve endangered plant species and varieties.
(lines 15 and 16)
(2 marks)**

(continued on the next page)

1 continued.

- (g) Explain why plant cell suspension culture media are maintained under suitable conditions of agitation, light and temperature. (lines 28 and 29) (3 marks)**

(Total for Question 1= 17 marks)

2 Look at the diagram for Question 2 in the Diagram Booklet. It shows two cells from a plant root.

**(a) (i) Which structure is the vacuole?
(1 mark)**

☐ A F

☐ B G

☐ C H

☐ D I

**(ii) Which structure is the nucleus?
(1 mark)**

☐ A F

☐ B G

☐ C H

☐ D J

(continued on the next page)

2 continued.

- (b) The actual length of the root cell from P to Q is 80 μm .**

Determine the magnification of the diagram.

[1000 μm = 1 mm]

(3 marks)

magnification = \times _____

(continued on the next page)

Turn over

2 continued.

- (c) Root hair cells are specialised cells adapted for their functions.**

Explain how root hair cells are adapted for their functions in the plant.

(4 marks)

Answer lines continue on the next page.

2(c) continued.

(Total for Question 2 = 9 marks)

- 3 Look at the picture and table for Question 3 in the Diagram Booklet. It shows two biscuits, A and B, and some nutritional information supplied by the manufacturers of the two biscuits.**

- (a) Calculate the percentage of the total carbohydrate in biscuit A that is starch.
(2 marks)**

percentage = _____%

(continued on the next page)

3 continued.

(b) A doctor has advised a person to lose weight.

Comment on which biscuit, A or B, would be most suitable for the person to maintain a healthy diet and to lose weight.

Use the information in the table and your own knowledge in your answer.

(4 marks)

Answer lines continue on the next page.

Turn over

3(b) continued.

[illegible]

(continued on the next page)

Turn over

3 continued.

(c) A teacher tells some students to carry out an experiment to compare the energy values of biscuit A and biscuit B.

**(i) Describe a suitable method the students could use for their experiment.
(4 marks)**

Answer lines continue on the next page.

3(c)(i) continued.

(continued on the next page)

3(c) continued.

- (ii) The energy values the students determined for the biscuits were much lower than the energy values supplied by the manufacturers.**

**Give two reasons why this is the case.
(2 marks)**

1 _____

2 _____

(Total for Question 3 = 12 marks)

Turn over

- 4 Look at the diagram for Question 4 in the Diagram Booklet. It shows the nitrogen cycle. Some of the stages have been labelled.**

**(a) (i) Which stage shows nitrogen fixation?
(1 mark)**

☐ A P

☐ B Q

☐ C T

☐ D V

**(ii) Which stage shows nitrification?
(1 mark)**

☐ A Q

☐ B U

☐ C T

☐ D W

(continued on the next page)

4(a) continued.

**(iii) Which stage shows denitrification?
(1 mark)**

☐ **A P**

☐ **B T**

☐ **C V**

☐ **D W**

(continued on the next page)

4 continued.

(b) Farmers sometimes add chemical fertiliser to the soil.

(i) Describe how pollution by fertiliser can affect aquatic ecosystems.

(5 marks)

Answer lines continue on the next 2 pages.

4(b)(i) continued.

[illegible]

Turn over

4(b)(i) continued.

(continued on the next page)

4(b) continued.

- (ii) Give an alternative to chemical fertiliser that a farmer could use.
(1 mark)**

(Total for Question 4 = 9 marks)

- 5 (a) Look at Diagram 1 for Question 5 in the Diagram Booklet. It shows part of a DNA molecule.**
- (i) Complete Diagram 1 in the Diagram Booklet by writing the letters of the missing bases in the empty boxes for strand 2.
(2 marks)**
- (ii) Give the maximum number of amino acids that are coded for by this DNA strand (strand 2).
(1 mark)**
-
-

- (iii) The original DNA strand is used to produce mRNA.**

**Complete the empty boxes in Diagram 2 in the Diagram Booklet to show the mRNA coded for by this DNA strand.
(2 marks)**

(continued on the next page)

5 continued.

(b) A length of DNA consists of 25 000 base pairs.

This makes a total of 50 000 bases.

In this length of DNA, 30% of the bases are adenine (A).

Determine the number of thymine (T) bases, cytosine (C) bases, and guanine (G) bases in this length of DNA.

(3 marks)

number of thymine bases (T) = _____

number of cytosine bases (C) = _____

number of guanine bases (G) = _____

(continued on the next page)

Turn over

5 continued.

(c) Describe the differences between the process of transcription and the process of translation. (4 marks)

Answer lines continue on the next page.

[illegible]

Turn over

5(c) continued.

(Total for Question 5 = 12 marks)

6 Smoking cigarettes has harmful effects on the body.

Look at Graph 1 for Question 6(a) in the Diagram Booklet. It shows the number of hospital admissions in thousands due to conditions caused by smoking each year from 2009 to 2019.

- (a) Using information from Graph 1, calculate the percentage increase in the number of hospital admissions caused by smoking in 2019 compared with 2009.**
(2 marks)

percentage increase = _____%

(continued on the next page)

6 continued.

- (b) Look at Graph 2 for Question 6(b) in the Diagram Booklet. It shows the percentage of all hospital admissions that were due to conditions caused by smoking each year from 2009 to 2019.**

Comment on the changes in the number of hospital admissions caused by smoking and the percentage of all hospital admissions that were caused by smoking.

**Use data from graph 1 and graph 2 in your answer.
(4 marks)**

Answer lines continue on the next page.

6(b) continued.

(continued on the next page)

6 continued.

(c) Smoking causes harmful effects on the lungs.

**Describe the consequences of smoking cigarettes
for the functioning of the lungs.**

(5 marks)

Answer lines continue on the next 2 pages.

6(c) continued.

[illegible]

Turn over

6(c) continued.

(Total for Question 6 = 11 marks)

TOTAL FOR PAPER = 70 MARKS

END OF PAPER