Paper Reference(s)   4BI1/2BR
Pearson Edexcel International GCSE (9–1)

Biology
UNIT: 4BI1
PAPER: 2BR

Time: 1 hour 15 minutes

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

Surname	
Other names	
Centre Number	
Candidate Number	

Pearson

YOU MUST HAVE

Calculator, ruler

YOU WILL BE GIVEN

Diagram Booklet

Text 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.

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. 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   Look at the text for Question 1 in the Text Booklet.

     Use the information in the passage and your own knowledge to answer the questions that follow.

     (a) Give one way that a person can change their diet to lower their risk of developing high cholesterol (lines 6 to 9).
          (1 mark)

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(continued on the next page)

1   continued.

(b) One function of the kidney is excretion (lines 13 to 14). Another function is osmoregulation.

Explain what is meant by the term OSMOREGULATION.
(2 marks)

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1   continued.

(c) Explain why a person with severe kidney disease
     will need dialysis to continue for life
     (lines 23 to 25).
     (2 marks)

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1   continued.

(d) The peritoneum acts as a partially
     permeable membrane.

     (i)   Explain what is meant by a partially permeable
            membrane (lines 37 to 38).
            (2 marks)

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1   continued.

        (ii) Explain why the dialysis solution must contain purified water, glucose and mineral ions (lines 29 to 32).
               (2 marks)

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1   continued.

(e) Explain how the composition of the dialysis
     solution results in the waste products being
     removed from the blood (lines 32 to 35).
     (2 marks)

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1   **continued.**

    (f)   **(i)**   **A person is using APD.**

           Calculate the percentage of their time used for treatment in a week
           (lines 51 to 55).
           (2 marks)

           percentage = _____ %

(continued on the next page)

1 **continued.**

(ii) **Suggest why people may prefer to use CAPD instead of haemodialysis (lines 48 to 51).**
(1 mark)

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(g) **Describe how the structures in a human kidney result in the correct substances being retained in the blood.**
(3 marks)

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(Total for Question 1 = 17 marks)

2 Look at the diagram for Question 2 in the
   Diagram Booklet.

   A student uses this method to measure the energy
   value of a sample of bread.

   ● measure the mass of a sample of bread

   ● put $20\,cm^3$ of water in a boiling tube

   ● place a thermometer in the boiling tube and record
     the initial temperature of the water

   ● place the sample of bread on a mounted needle

   ● light the bread sample in a Bunsen flame

   ● quickly move the burning bread sample and place
     it directly under the boiling tube

   ● if the bread stops burning, relight the bread in the
     Bunsen flame

   ● place it back under the boiling tube

   ● repeat until the bread does not burn

   ● record the final temperature of the water in the
     boiling tube

Turn over

2 continued.

The student repeats the experiment 3 times.

Look at the table for Question 2 in the Diagram Booklet. It shows some of the student's results.

(a) To calculate the energy released from the burning bread the student uses this formula.

energy (in J) = mass of water (in g) × 4·2 × increase in temperature (in °C)

They then calculate the energy in joules released by 1 g of bread.

(i) Calculate the increase in water temperature for the third sample of bread.
(1 mark)

temperature increase = _____ °C

(continued on the next page)

2 **continued.**

      (ii) **Calculate the energy released in joules by the third sample of bread.**

          [1 cm^3 of water has a mass of 1 g]
          (1 mark)

      energy released = _____ J

(continued on the next page)

2   continued.

(iii) **Calculate the energy released in joules by 1 g of bread for the third sample of bread.**
(1 mark)

energy released by 1 g = _____ J

(continued on the next page)

2 **continued.**

(b) The energy value given on the packaging of the bread is 10 400 J for 1 g of bread.

Comment on why the student's method gives a different value.
(5 marks)

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2   **continued.**

(c) **Give two ways that the student could modify this apparatus to achieve an answer nearer to the energy value given on the packaging of the bread. (2 marks)**

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(Total for Question 2 = 10 marks)

3   Look at the diagram for Question 3(a) in the Diagram Booklet. It shows a cell found in the lining of the human small intestine.

(a) (i)   Which of the labelled structures is a microvillus?
(1 mark)

☐ Structure A

☐ Structure B

☐ Structure C

☐ Structure D

(ii)   Which of the labelled structures produces ATP?
(1 mark)

☐ Structure A

☐ Structure B

☐ Structure C

☐ Structure D

Turn over

3   continued.

(b) These cells form the lining of the small intestine.

Explain how the structure of the small intestine is adapted for absorption.
(4 marks)

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3   continued.

(c) Cells in the human placenta also have microvilli.

     Describe the role of the human placenta.
     (3 marks)

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(Total for Question 3 = 9 marks)

4   Sewage pollution affects the distribution of organisms in a river.

Scientists measured the oxygen level, the number of bacteria, the number of mayfly nymphs and the number of tubifex worms in the river.

The mayfly nymph is an immature form of an insect and the tubifex is a small worm usually growing to a length of about 10 cm.

Look at the graphs for Question 4 in the Diagram Booklet. The scientists recorded how these measurements changed at different distances from the sewage outlet.

(a) Comment on the changes in the measurements as the distance from the sewage outlet increases.

You should use information from the graphs and your own knowledge in your answer.
(5 marks)

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4 **continued.**

(b) Scientists often use information about the organisms present in a habitat as an indication of the level of pollution and as a measure of biodiversity.

    (i) Explain what is meant by the term BIODIVERSITY.
       (2 marks)

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(ii) Suggest how the number of mayfly nymphs and the number of tubifex worms can be used to indicate the level of pollution.
(2 marks)

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(Total for Question 4 = 9 marks)

5 **(a)** Look at the table for Question 5(a) in the Diagram Booklet. It gives some information about different hormones.

In the Diagram Booklet, complete the table by giving the missing information.
(6 marks)

(b) Give three differences between hormones and neurotransmitters.
(3 marks)

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(Total for Question 5 = 9 marks)

6 **Scientists can now produce farm animals by cloning. Since Dolly the sheep was born in 1996 many different species have been cloned.**

The form of cloning used is called somatic cell cloning.

The first ever clone of a champion racehorse was announced in 2005 in Italy.

The foal was cloned from Pieraz, a world champion in long-distance horse races.

(a) **Describe the stages scientists could use to clone a male horse.**
(4 marks)

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6 continued.

(b) **Pieraz was castrated (had his testicles removed) at a young age.**

Explain why this stopped him reproducing normally but did not stop him being used to produce a foal by cloning.
(3 marks)

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6 **continued.**

(c) Suggest why horseracing does not allow the use of non-natural methods of breeding, including cloning.
(1 mark)

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(d) State one difference between cloning an organism and genetically modifying an organism.
(1 mark)

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(Total for Question 6 = 9 marks)

7   Look at the diagram for Question 7(a) in the
     Diagram Booklet.

     A student uses this method to investigate the water
     loss from leaves.

     ● select 4 leaves of equal size from the same
        species of plant

     ● wrap thin wire around the leaf stalk of each leaf
        and use the remaining wire to produce a hook

     ● cover the upper surface on leaf 1 with
        petroleum jelly

     ● cover the lower surface on leaf 2 with
        petroleum jelly

     ● cover the upper surface and the lower surface on
        leaf 3 with petroleum jelly

     ● do not cover leaf 4 with petroleum jelly

     ● record the mass of each leaf

     ● attach the leaves, by their wire hooks, at intervals
        along a horizontal string

     ● remove the leaves from the string after 3 hours

     ● record the new mass of each leaf

Turn over

7 **continued.**

(a) (i) **Which of these is the independent variable in this experiment?**
(1 mark)

☐ **A   leaf size**

☐ **B   leaf surface covered**

☐ **C   mass lost**

☐ **D   time**

(ii) **State why leaves of the same species were selected.**
(1 mark)

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(continued on the next page)

7 **continued.**

(b) **Look at the table for Question 7(b) in the Diagram Booklet. It shows some of the student's results.**

      (i) **Calculate the percentage change in mass for leaf 3.**
          (2 marks)

      percentage change = _____ %

(continued on the next page)

7   continued.

    (ii) Explain the differences in water loss from the
          four leaves in the student's experiment.
          (3 marks)

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7   continued.

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(Total for Question 7 = 7 marks)

TOTAL FOR PAPER = 70 MARKS
END OF PAPER