

**Biology**  
**UNIT: 4BI1**  
**PAPER: 2BR**

Total Marks
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**Time: 1 hour 15 minutes**

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

<b>Surname</b>					
<b>Other names</b>					
<b>Centre Number</b>					
<b>Candidate Number</b>					

**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.**

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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 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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**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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**Turn over**

**1 continued.**

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**(Total for Question 1 = 17 marks)**

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**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<sup>3</sup> 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**

**(continued on the next page)**

**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.**

$$\text{energy (in J)} = \text{mass of water (in g)} \times 4.2 \times \begin{array}{l} \text{increase in} \\ \text{temperature} \\ \text{(in } ^\circ\text{C)} \end{array}$$

**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)**

**Turn over**

**2 continued.**

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

**[1 cm<sup>3</sup> 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)**

**1** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**2** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**(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**

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**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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**Turn over**

**3 continued.**

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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)**

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- 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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**4 continued.**

- (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)**

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- 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)**

**1** \_\_\_\_\_

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**2** \_\_\_\_\_

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\_\_\_\_\_

**3** \_\_\_\_\_

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**(Total for Question 5 = 9 marks)**

**Turn over**

- 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.**

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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)**

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**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**

**(continued on the next page)**

**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 = \_\_\_\_\_ %**

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**7 continued.**

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

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**(Total for Question 7 = 7 marks)**

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**TOTAL FOR PAPER = 70 MARKS**  
**END OF PAPER**