

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

**Biology**  
**Unit: 4BI1**  
**PAPER: 2B**

<b>Total Marks</b>
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**Time: 1 hour 15 minutes plus your additional time allowance**

**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**

**Source Booklet for Question 1**

**Diagram Booklet**

**INSTRUCTIONS**

**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 ☐.**

**Turn over**

## **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.**

## **ADVICE**

**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 Read the passage in the Source Booklet. Use the information in the passage and your own knowledge to answer the questions that follow.**

**(a) Suggest why the men in the study had to be able to produce sperm with no abnormalities in shape or movement (lines 13 to 15).  
(2 marks)**

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**Turn over**

**1 continued.**

**(b) (i) The contraceptive injection contained the drug progestin (lines 28 to 30).**

**Progestin is similar in structure and function to progesterone.**

**Describe the roles of progesterone in the human female body.  
(2 marks)**

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**1 continued.**

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**(ii) Suggest why the injections also contain the hormone testosterone (lines 30 and 31).  
(1 mark)**

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**Turn over**

**1 continued.**

**(iii) State where in the male body  
testosterone is produced.  
(1 mark)**

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**(c) (i) Give the purpose of the initial  
suppression phase of the study  
(lines 24 to 28).  
(1 mark)**

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**1 continued.**

**(ii) State why the sperm count is monitored during the suppression phase (lines 34 to 36). (1 mark)**

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**1 continued.**

**(iii) State why alternative  
contraception was used during  
the suppression phase  
(lines 36 to 38).  
(1 mark)**

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**Turn over**

**1 continued.**

**(d) Suggest why sperm count continues to be monitored during the testing phase (lines 48 to 50).  
(1 mark)**

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**1 continued.**

- (e) Calculate the number of men whose partners became pregnant during the study (lines 10 and 54).  
(2 marks)**

**number of men =**

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**Turn over**

**1 continued.**

**(f) Evaluate the use of progestin and testosterone injections as a method of contraception.  
(4 marks)**

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**1 continued.**

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**(Total for Question 1 = 16 marks)**

- 2 P. multocida is a bacterium that causes cholera in chickens.**

**Look at the diagram for Question 2 in the Diagram Booklet. It shows the bacterium.**

- (a) Give two structures in this bacterium that are also found in all eukaryotic cells.  
(2 marks)**

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

\_\_\_\_\_

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

\_\_\_\_\_

**(continued on the next page)**

**2 continued.**

**(b) Scientists investigated the survival of chickens injected with normal *P. multocida* or with weakened *P. multocida*.**

**The table shows the scientists' results.**

<b>Type of injection</b>	<b>Result</b>
<b>normal <i>P. multocida</i></b>	<b>chickens die</b>
<b>weakened <i>P. multocida</i></b>	<b>chickens stay alive</b>

**(continued on the next page)**

**Turn over**

**2 continued.**

**(i) What is a correct conclusion about *P. multocida* from these results?  
(1 mark)**

☐ **A they are decomposers**

☐ **B they are pathogens**

☐ **C they are microscopic**

☐ **D they are non-living**

**(continued on the next page)**

**Turn over**



**2 continued.**

**(ii) The scientists took the living chickens that had been injected with weakened *P. multocida* and then injected them with normal *P. multocida*.**

**The chickens did not die, as they were now immune.**

**Explain why these chickens did not die.  
(4 marks)**

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**2 continued.**

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**(Total for Question 2 = 7 marks)**

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**3 Plant root hair cells absorb water from the soil by osmosis.**

**(a) (i) Explain how the structure of a root hair cell is adapted to absorb water.  
(2 marks)**

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**3 continued.**

**(ii) Give one difference between osmosis and diffusion.  
(1 mark)**

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3 continued.

(b) A student investigates the effect of light on the volume of water taken up and lost by a plant shoot in one hour.

The table shows the student's results.

	Volume of water in cm <sup>3</sup>	
	taken up	lost
Dark	2.0	1.6
Light	10.2	9.1

(i) Explain these results.  
(3 marks)

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**3 continued.**

**(ii) Give two abiotic variables the student should control.  
(2 marks)**

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

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

\_\_\_\_\_

**(continued on the next page)**



**3 continued.**

**(c) Look at the diagram for Question 3(c) in the Diagram Booklet. It shows some apparatus. Another student uses this apparatus and a stop clock to find the mean (average) rate of water taken up by a plant shoot.**

**(i) Name the apparatus used by the student.  
(1 mark)**

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**3 continued.**

**(ii) Describe how the student could use this apparatus to find the mean rate of water taken up by the plant.  
(3 marks)**

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**3 continued.**

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**(Total for Question 3 = 12 marks)**

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**4 A scientist uses this method to investigate the effect of water quality on the growth of fish.**

- **fill a pond with filtered water**
- **fill another pond with unfiltered water**
- **place the same mass of fish of the same species in each pond**
- **determine the increase in total mass of fish in each pond after 180 days**

**Look at the graph for Question 4 in the Diagram Booklet. It shows the scientist's results.**

**(a) The mean rate of increase in total mass of the fish in the filtered water is 0.214 kg per day.**

**(continued on the next page)**

**4 continued.**

**Calculate the difference between the mean rate of increase in the total mass of the fish in filtered and unfiltered water.  
(3 marks)**

**difference in mean rate =**

**\_\_\_\_\_ kg per day**

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**Turn over**

**4 continued.**

**(b) Unfiltered water contains more bacteria.**

**Explain why unfiltered water containing more bacteria affects the growth of fish.  
(3 marks)**

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**4 continued.**

**(c) Give one biotic variable the scientist controlled in the investigation.  
(1 mark)**

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**(d) Give a method the scientist could use to control interspecific predation in the ponds.  
(1 mark)**

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**(Total for Question 4 = 8 marks)**

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**Turn over**



**5 Decomposer bacteria are involved in the nitrogen cycle.**

**The bacteria release an enzyme called urease.**

**(a) Look at the diagram for Question 5(a) in the Diagram Booklet. It shows part of one strand of DNA used to make urease.**

**Complete the diagram by giving the missing bases on the other strand of DNA.**

**(1 mark)**

**(continued on the next page)**

**5 continued.**

**(b) Urease acts on urine to produce ammonia.**

**Look at the graph for Question 5(b) in the Diagram Booklet. It shows how pH affects the activity of urease.**

**(i) Which of these is the optimum pH for urease?  
(1 mark)**

☐ **A     2·5**

☐ **B     4·5**

☐ **C     7·5**

☐ **D     8·5**

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**Turn over**

**5 continued.**

**(ii) Explain the activity of urease at  
pH 8.5  
(2 marks)**

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**5 continued.**

**(c) Describe the role of the  
other bacteria involved in the  
nitrogen cycle.  
(5 marks)**

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**5 continued.**

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

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**6 Look at the diagram for Question 6 in the Diagram Booklet. It shows a nephron of a kidney, with some of the structures labelled.**

**(a) (i) From which structure are substances forced out of the blood by ultrafiltration?  
(1 mark)**

☐ **A**

☐ **B**

☐ **C**

☐ **D**

**(continued on the next page)**

**Turn over**

**6 continued.**

**(ii) From which structure is glucose reabsorbed into the blood by selective reabsorption?  
(1 mark)**

☐ **A**

☐ **B**

☐ **C**

☐ **D**

**(continued on the next page)**

**Turn over**



**6 continued.**

**(b) In homeostasis, the kidney is involved in the control of blood concentration.**

**(i) State the name for the control of blood concentration.  
(1 mark)**

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**(ii) Another function carried out by the kidney is excretion.**

**State what is meant by the term excretion.  
(1 mark)**

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**Turn over**

**6 continued.**

**(c) Diabetes insipidus is a medical condition in which the body is unable to produce ADH.**

**Explain how diabetes insipidus affects the control of blood concentration.  
(4 marks)**

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**6 continued.**

**(d) Desmopressin is a drug used to reduce the symptoms of diabetes insipidus.**

**(i) Suggest what effect the drug would have on the nephron.  
(1 mark)**

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**6 continued.**

**(ii) Describe the effects the drug  
would have on urine production.  
(2 marks)**

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**(Total for Question 6 = 11 marks)**

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**Turn over**

**7 The biodiversity in an ecosystem can be determined by counting the number of different species present and the number of individuals of each species present.**

**(a) Give the term that describes the number of individuals of one species present in a habitat at one time.  
(1 mark)**

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**7 continued.**

**(b) Students compared the biodiversity of two fields, A and B.**

**They determined the number of individual plants of three species in each field.**

**They also calculated the percentage of each species of plant compared to the total number of plants of all three species for each field.**

**Look at the table for Question 7(b) in the Diagram Booklet. It shows the results.**

**(continued on the next page)**

**7 continued.**

- (i) Complete the table by calculating the missing values.  
(2 marks)**

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**7 continued.**

**(ii) Explain which field has the greater biodiversity.  
(2 marks)**

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**Turn over**

**7 continued.**

**(c) Explain how a shortage of one named mineral could affect the size of plants in the fields.  
(2 marks)**

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

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**TOTAL FOR PAPER = 70 MARKS  
END**