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

Total Marks

Biology
Unit: 4BI1
PAPER: 2B

Time: 1 hour 15 minutes plus your additional time allowance

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

Surname					
Other names					
Centre Number					
Candidate Number					

Y67077A

Pearson

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 ☒.

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)

(continued on the next page)

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)

(continued on the next page)

1 continued.

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

(continued on the next page)

1 continued.

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

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

(continued on the next page)

1 continued.

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

(continued on the next page)

1 continued.

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

(continued on the next page)

1 continued.

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

(continued on the next page)

1 continued.

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

number of men =

_____

(continued on the next page)

1 continued.

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

(continued on the next page)

1 continued.

(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.

Type of injection	Result
normal *P. multocida*	chickens die
weakened *P. multocida*	chickens stay alive

(continued on the next page)

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)

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)

(continued on the next page)

2 continued.

(continued on the next page)

2 continued.

(Total for Question 2 = 7 marks)

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)

(continued on the next page)

3 continued.

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

(continued on the next page)

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^3	
	taken up	lost
Dark	2·0	1·6
Light	10·2	9·1

(i) Explain these results. (3 marks)

(continued on the next page)

3 continued.

(continued on the next page)

3 continued.

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

1 _____

_____

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)

(continued on the next page)

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)

(continued on the next page)

3 continued.

(Total for Question 3 = 12 marks)

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

(continued on the next page)

4 continued.

(b) Unfiltered water contains more bacteria.

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

(continued on the next page)

4 continued.

(continued on the next page)

4 continued.

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

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

(Total for Question 4 = 8 marks)

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

(continued on the next page)

5 continued.

(ii) Explain the activity of urease at pH 8·5
(2 marks)

(continued on the next page)

5 continued.

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

(continued on the next page)

5 continued.

(continued on the next page)

5 continued.

(Total for Question 5 = 9 marks)

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)

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)

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)

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

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

(continued on the next page)

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)

(continued on the next page)

6 continued.

(continued on the next page)

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)

(continued on the next page)

6 continued.

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

(Total for Question 6 = 11 marks)

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)

(continued on the next page)

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)

(continued on the next page)

7 continued.

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

(continued on the next page)

7 continued.

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

(Total for Question 7 = 7 marks)

TOTAL FOR PAPER = 70 MARKS
END