Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International GCSE (9–1)

Monday 9 June 2025

Morning (Time: 1 hour 15 minutes)

Paper reference **4BI1/2BR**

Biology

UNIT: 4BI1

PAPER: 2BR

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- 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.

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.

Turn over ▶

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P 7 8 7 6 5 R A 0 1 2 0

Pearson

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

Pollination in fruit trees

Plants need to be pollinated to produce fruits and seeds. Some plants are self-pollinated and others are cross-pollinated.

Self-pollination is usually the transfer of pollen from flowers on the same tree. In fruit trees, self-pollination also includes the transfer of pollen from another tree of the same cultivar. A cultivar is a genetically identical group of trees produced by selective breeding. Self-pollinating plants need bees or other insects to transfer pollen. Examples of self-pollinated fruit trees are plum, apricot and peach that have sweet-tasting, soft fruits.

(Source: © freya-photographer/Shutterstock)

(Source: © Leena Robinson/Shutterstock)

Other fruit trees require cross-pollination and can only produce fruit by fertilisation from a different cultivar. Cross-pollination is the transfer of pollen from one cultivar to the flower of a different cultivar. Self-incompatibility prevents the same plant or cultivar from fertilising its own flowers. For example, the pollen from one cultivar of an apple tree will not fertilise trees of the same cultivar. Most hard fruit trees such as pear and apple require the presence of two different compatible cultivars for pollination to result in fruit production.

Pollen can be transferred by wind, insects or birds. Many fruit trees are pollinated by insects. Nut trees are usually pollinated by wind.

After pollination the pollen grain must germinate to lead to fertilisation. The success of pollination and fertilisation depends on favourable environmental conditions. It also requires the right pollen grain reaching the right flower, as pollen can only fertilise specific, compatible flowers. For example, pollen from a peach flower will not pollinate apple flowers.

Cross-pollinating fruit trees should be planted no more than 60 m apart. This will ensure that bees visit the trees often enough to ensure pollination. Nut trees need to be planted no more than 15 m apart.

A further complication is that a few apple and pear cultivars, known as triploids, produce sterile pollen. Triploid cultivars have three sets of chromosomes within their cells. A triploid cultivar will require another cultivar for pollination, and the trees must flower at the same time.

(a) Explain the differences between self-pollination and cross-pollination.
(lines 3 to 5 and 9 to 11)

(2)

(b) Describe the sequence of events from pollen landing on a flower to fruit production.

(4)

(c) Fruit trees often produce sweet-tasting fruit containing sugars.

(i) Sugars are carbohydrates.

Name the three elements in carbohydrates.

(1)

(ii) Suggest how production of sweet-tasting fruit may help spread the seeds of fruit trees. (lines 7 to 8)

(2)

(d) Explain how self-incompatibility prevents self-fertilisation. (lines 11 to 13)

(2)

(e) Describe how the structure of insect-pollinated flowers helps to achieve pollination. (line 16)

(3)

(f) Give a reason why nut trees need to be planted closer together than fruit trees. (lines 23 to 25)

(1)

(g) Explain why triploid cultivars produce sterile pollen. (lines 26 to 29)

(2)

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(Total for Question 1 = 17 marks)

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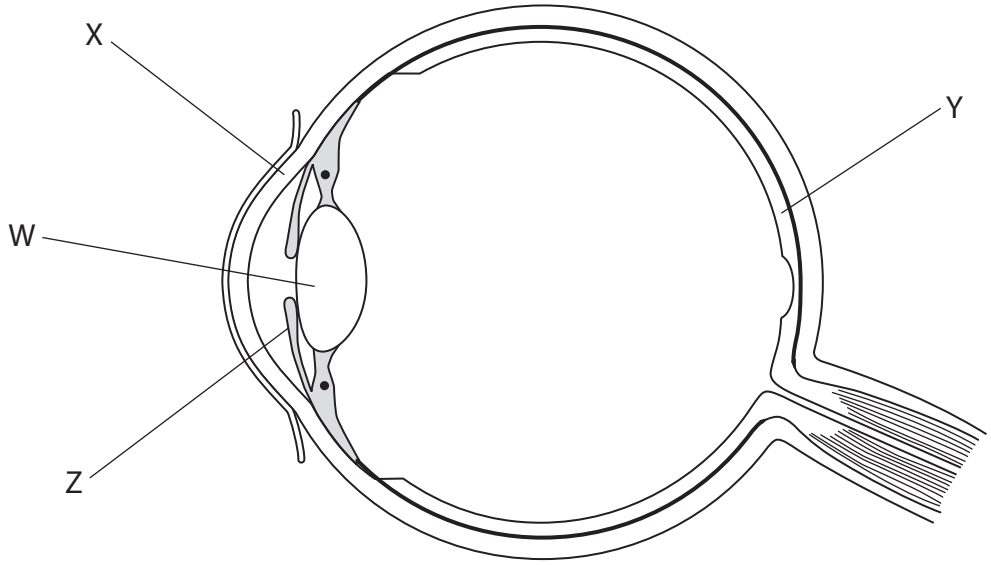
2 The diagram shows a section through an eye with some parts labelled.



(a) Name parts W, X and Y.

(3)

W .....

X .....

Y .....

(b) Describe how structure Z changes when a person moves into a dark room.

(3)

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(Total for Question 2 = 6 marks)

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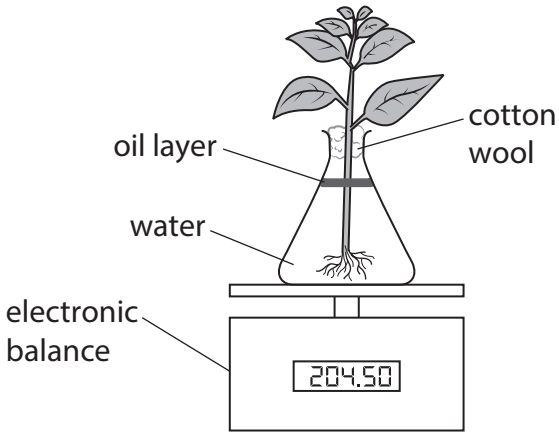
3 A student uses this apparatus to investigate water loss from a plant.



This is the student's method.

step 1 measure the total mass of the flask, water, oil, cotton wool and plant

step 2 leave the apparatus for 48 hours

step 3 measure the new total mass of the flask, water, oil, cotton wool and plant

step 4 calculate the rate of change of mass during the 48 hours

Repeat steps 1–4 with the same conditions.

(a) Name the piece of apparatus used in this investigation.

(1)

- ☒ **A** bubble potometer
- ☒ **B** hydrometer
- ☒ **C** osmometer
- ☒ **D** weight potometer

(b) The total mass changes from 207.25 g to 204.50 g in the first 48 hours.

Calculate, in grams per hour, the rate of change of mass.

Give your answer to two significant figures.

(2)

rate of change of mass = ... grams per hour

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(c) Explain why the student repeats the investigation with the same conditions.

(2)

(d) The student then changes the conditions surrounding the plant.

(i) Describe how the student could investigate the effect that moving air has on the change in mass.

(2)

(ii) Explain the effect that faster moving air has on the change in mass.

(3)

(e) Describe how the student could modify the investigation to study the role of roots in the loss of water from a plant.

(2)

(Total for Question 3 = 12 marks)

4 A group of students investigate the biodiversity in two fields, A and B.

Field A is grazed by cattle and field B has no cattle.

(a) Explain what is meant by the term **biodiversity**.

(2)

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(b) The students investigate the plant species in each field.

They counted the number of each species in five 0.5 m × 0.5 m quadrats.

They repeated this for each field.

Table 1 shows their results.

Species	Number of plants									
	quadrats in field A					quadrats in field B				
	1	2	3	4	5	1	2	3	4	5
ribwort plantain		5	20	15	15					
common tormentil	5				15					
meadow buttercup	4	6		10	5			20		
creeping buttercup	5	5								
yellow rattle	10	20	15	15	5					
common sorrel						20	5		10	
dandelion	1		4							
white clover	5		10	5				5	10	
stinging nettle						10				

Table 1

(i) Describe how the quadrats should be placed to obtain unbiased species numbers for each field.

(2)

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(ii) For the most frequently occurring plant species in field B, calculate the number of plants in one square metre.

(3)

number of plants = ...

(iii) Name the species with the greatest variation in number of plants recorded in quadrats for field B.

(1)

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Table 1 is repeated here.

Species	Number of plants									
	quadrats in field A					quadrats in field B				
	1	2	3	4	5	1	2	3	4	5
ribwort plantain		5	20	15	15					
common tormentil	5				15					
meadow buttercup	4	6		10	5			20		
creeping buttercup	5	5								
yellow rattle	10	20	15	15	5					
common sorrel						20	5		10	
dandelion	1		4							
white clover	5		10	5				5	10	
stinging nettle						10				

Table 1

(iv) The students conclude that grazing affects the species in field A.

Using information in Table 1 and your own knowledge, discuss the students' conclusion.

(5)

(Total for Question 4 = 13 marks)

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5 Scientists collect data to measure how successful cloning is in cattle.

Table 1 shows the scientists' data.

	Number
embryos transferred	3374
live calves born	317
calves surviving 24 hours	279
calves surviving 150 days	225

Table 1

(a) Calculate the percentage of embryos transferred that result in live calves being born.

(2)

percentage = ... %

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(b) Describe the stages in the production of a cloned mammal from an adult mammal.

(4)

(c) There is some evidence that cloned cattle may have weakened immune systems.

Explain why a weakened immune system can affect the health of cloned cattle.

(2)

(d) Scientists also collected data comparing cloned cattle and a control group.

Table 2 shows their results.

	Group	
	clones	**controls**
number of cows	10	11
mean birth mass in kg	45.8	39.6
mean age at puberty in days	419.3	356.5
mean body mass at puberty in kg	359	303
daily mass increase in kg per day	0.75	0.78

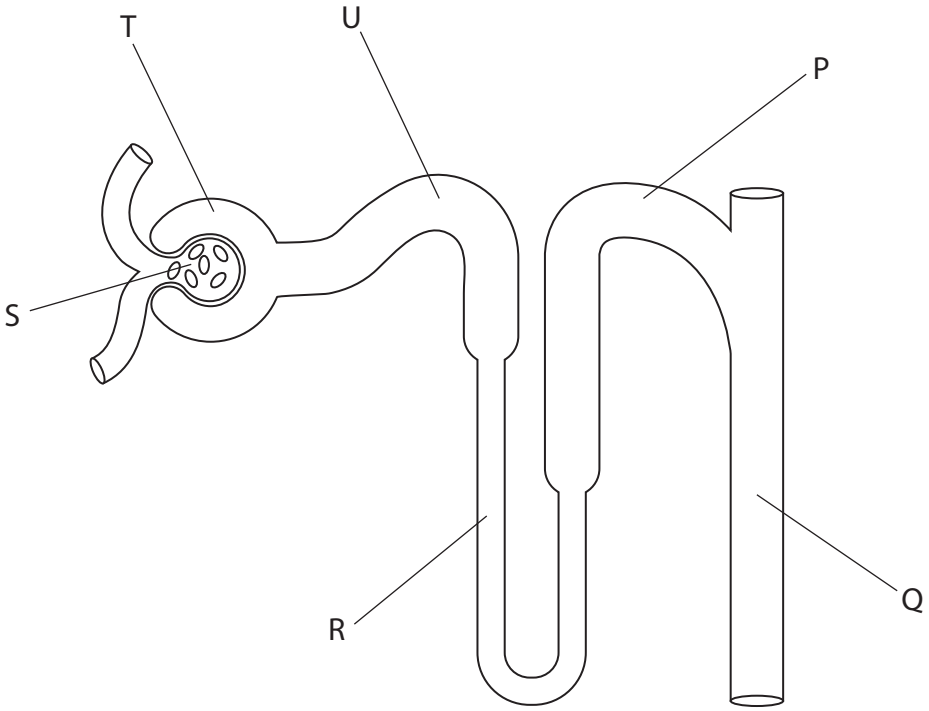
Table 2

Comment on the effects of cloning on the growth and development of these cattle.

(4)

(Total for Question 5 = 12 marks)

6 The diagram shows a nephron from a human kidney with some structures labelled.



(a) (i) Which of these is structure U?

(1)

- ☒ **A** Bowman's capsule
- ☒ **B** collecting duct
- ☒ **C** loop of Henle
- ☒ **D** proximal convoluted tubule

(ii) Which process occurs between structure S and structure T?

(1)

- ☒ **A** ADH production
- ☒ **B** selective reabsorption
- ☒ **C** transpiration
- ☒ **D** ultrafiltration

(iii) Which structure is the collecting duct?

(1)

- ☒ **A** P
- ☒ **B** Q
- ☒ **C** S
- ☒ **D** T

(b) The table shows the concentrations of protein and glucose in blood plasma, in glomerular filtrate and in urine.

Substance	Concentration of substance in grams per 100 cm^3		
	blood plasma	glomerular filtrate	urine
protein	8.0	0.0	0.0
glucose	0.1	0.1	0.0

(i) Calculate the mass of glucose in 5 dm^3 of blood plasma.

(2)

[1000 cm^3 = 1 dm^3]

mass = ... grams

(ii) Explain why there is **no** protein in the urine.

(2)

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(iii) Explain why there is glucose in the glomerular filtrate but **no** glucose in the urine.

(3)

(Total for Question 6 = 10 marks)

TOTAL FOR PAPER = 70 MARKS

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