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 40 minutes)

Paper reference **4WBI2/1BR**

Biology (Modular)

UNIT 2: 4WBI2

PAPER: 1BR

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 the calculations and state the units where required.

Information

- The total mark for this paper is 90.
- 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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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.

Genetics of the Murray Grey

DNA (deoxyribonucleic acid) is the molecule that carries the genetic instructions for life. DNA is found in almost every cell of organisms and contains the information needed to synthesise the building blocks that make up all living things. DNA is responsible for the inheritance of characteristics from one generation to the next.

One example of inheritance that can be seen in farming is the Murray Grey breed of cattle.

The photograph shows a Murray Grey.

(Source: © William Edge/Shutterstock)

These cattle are a breed known for their distinctive silver-grey colour. However, the main reason for their increased popularity with cattle farmers over the last 100 years is because Murray Grey cattle are effective converters of feed and so grow quickly.

This led to the deliberate breeding of cattle with these characteristics and the establishment of the breed. A one-year-old bull with a mass of 545 kg will have a mass of 1030 kg when it is two years old. This characteristic makes them valuable to farmers who breed cattle for beef.

The first Murray Grey is said to have been born in the early 20th century, when a Shorthorn cow gave birth to unusually coloured grey calves. Farmers think that the colour of the Murray Grey is caused by a specific gene. This gene has two possible alleles, an allele coding for a black colour and an allele coding for a silver colour.

Murray Grey cattle that have two alleles for black have a black colour. Two alleles for silver produce a silver colour. One allele for black and one allele for silver produce a grey colour. Because of this, a cross between two grey coloured Murray Grey cattle can produce offspring with a variety of different colours, while crossing two silver coloured cattle should only result in silver coloured offspring.

It has recently been suggested that there may also be a dominant silver allele present within some Murray Grey cattle. This could be the result of a mutation or could be an allele inherited from cross breeding with a different breed of cattle.

(a) (i) State where DNA is found in a cell (lines 1 to 3).

(1)

(ii) Describe the structure of DNA (lines 1 to 3).

(2)

(b) State the term used for a genotype that has two copies of the same allele (line 22).

(1)

(c) Describe how selective breeding led to all Murray Grey cattle being effective converters of feed and growing quickly (lines 11 to 14).

(3)

(d) Calculate the percentage increase in mass of the Murray Grey bull from one year old to two years old (lines 14 and 15).

(2)

percentage increase = ...%

(e) There may have been other mutations within Murray Grey cattle.

Explain why most mutations have no effect on the phenotype (lines 29 and 30).

(3)

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(Total for Question 1 = 12 marks)

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2 Microorganisms have an important role in the production of some foods.

Lactobacillus is involved in the production of yoghurt from milk.

The milk must be pasteurised at 85 °C to 95 °C before the *Lactobacillus* is added.

(a) State why the milk needs to be pasteurised.

(1)

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(b) *Lactobacillus* breaks down sugars in the milk to form lactic acid.

Explain what effect this has on the milk proteins.

(2)

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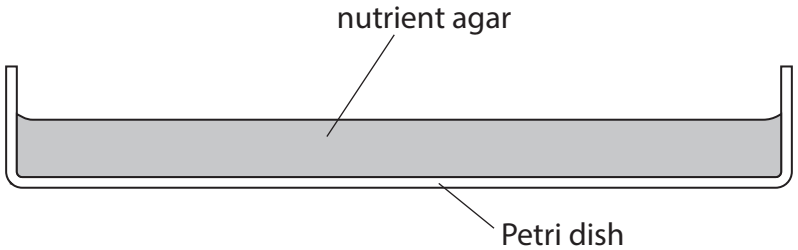
(c) A student investigates which temperature is best for growing *Lactobacillus*.

This is the student's method.

- put *Lactobacillus* samples onto two Petri dishes containing nutrient agar jelly
- place one Petri dish in the laboratory and place one Petri dish in a fridge
- check the Petri dishes after 3 hours and see which dish has grown the most *Lactobacillus*

The diagram shows the student's equipment.



Give three improvements to the student's method.

(3)

1 .....

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2 .....

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3 .....

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(Total for Question 2 = 6 marks)

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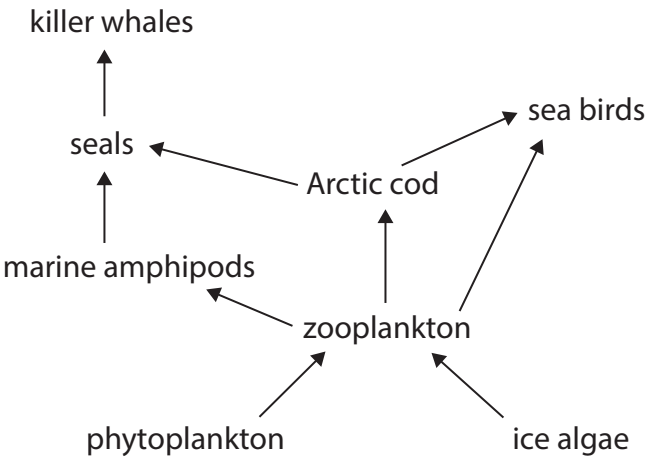
3 This diagram shows part of a food web from an ecosystem in the Arctic.



(a) The table gives some descriptions of organisms in the food web.

Complete the table by giving the names of the organisms.

(3)

Description	Name of organism
a primary consumer	
an organism that photosynthesises	
an organism in the fourth trophic level	

(b) Using information from the food web, draw a food chain that has five trophic levels and includes the Arctic cod.

(2)

(c) Global warming has caused a decrease in the amount of sea ice in the Arctic.

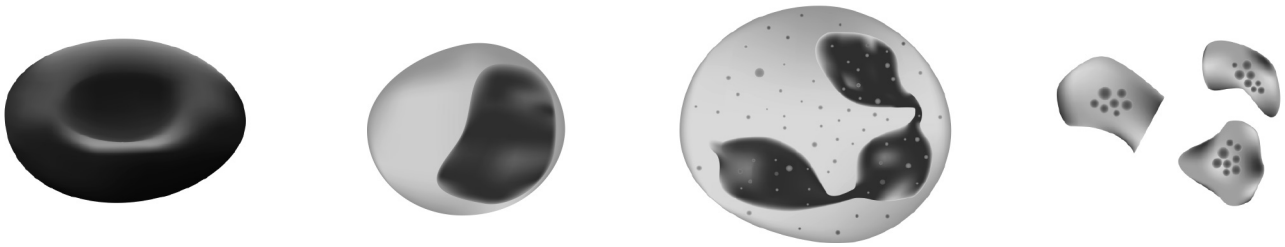
Sea ice is the habitat for ice algae.

Explain how global warming will affect the population of Arctic cod.

(3)

(Total for Question 3 = 8 marks)

4 Diagram 1 shows different components of the blood.



W X Y Z

(Source: © Pearson Asset Library)

Diagram 1

(a) Which component of blood in Diagram 1 is a phagocyte?

(1)

- ☒ **A** W
- ☒ **B** X
- ☒ **C** Y
- ☒ **D** Z

(b) Blood can be separated into three different layers.

Diagram 2 shows the three layers in a blood sample from a healthy person.

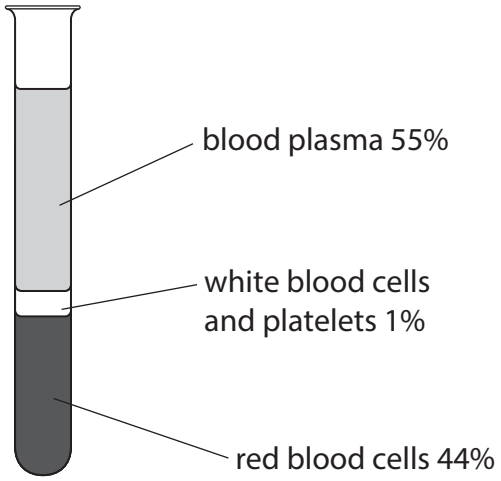


Diagram 2

(i) Give two different functions of blood plasma.

(2)

1 .....

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2 .....

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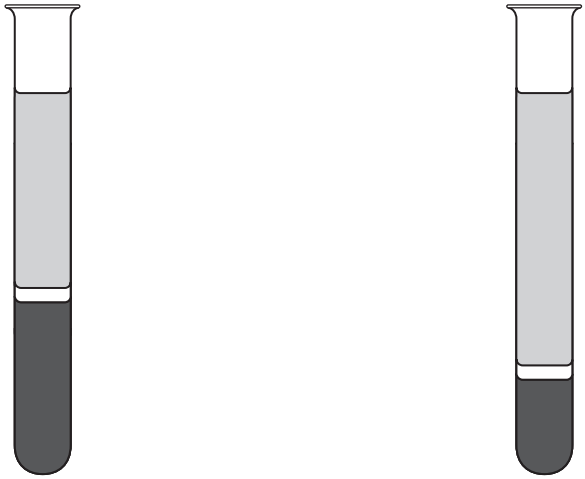
(ii) Explain how a blood sample from a person with an infection would be different from the blood sample in diagram 2.

(2)

(iii) Diagram 3 shows blood samples from two different people, person A and person B.



blood sample from person A blood sample from person B

Diagram 3

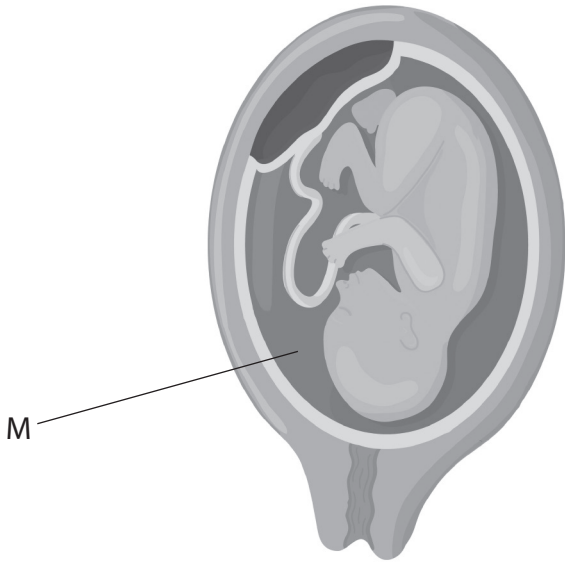
Explain why person B is more likely to feel tired than person A.

(3)

(Total for Question 4 = 8 marks)

5 This question is about human reproduction.

(a) Diagram 1 shows a fetus developing in the uterus.



(Source: © Ana Krasavina/Shutterstock)

Diagram 1

Give the name and function of M.

(2)

name

.....

function

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(b) Hormones control the menstrual cycle.

Diagram 2 shows how hormone levels change during the menstrual cycle.

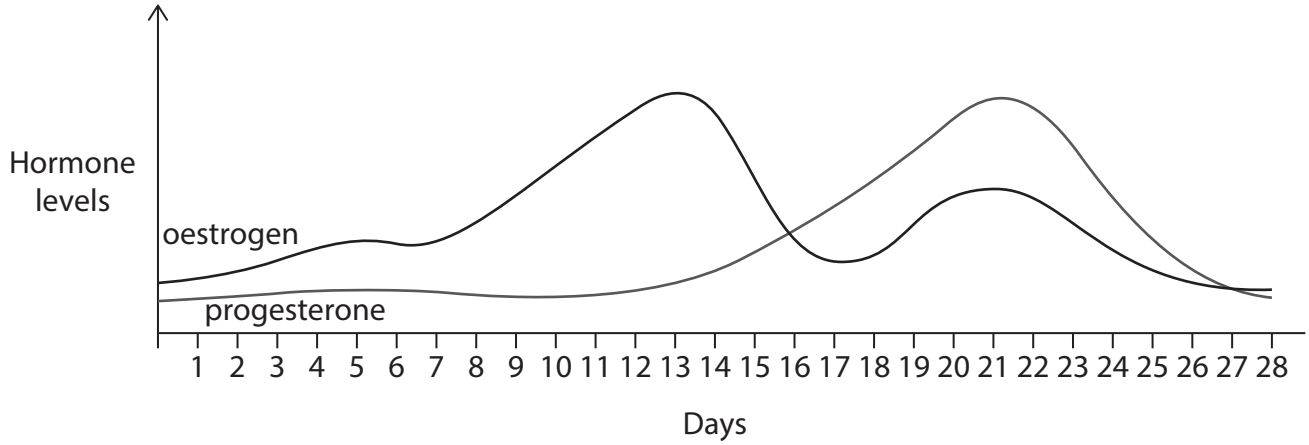

Diagram 2

(i) Determine the day in this menstrual cycle when ovulation is most likely to occur.

(1)

(ii) Discuss the roles of oestrogen and progesterone in the menstrual cycle.

(4)

(c) Some medical conditions can cause high testosterone levels in children.

Give two possible symptoms a child may have if their testosterone levels are high.

(2)

1 .....

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2 .....

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(Total for Question 5 = 9 marks)

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6 Forests are ecosystems where many different species live.

(a) A student wants to compare the population size of a mushroom species in two different forests, A and B.

The forests are of different sizes.

Describe how the student could compare the population sizes of the mushroom species in the two different forests.

(3)

(b) The table gives information about the species observed in forests A and B.

Forest	Number of different species of each type of organism					
	beetle	bird	butterfly	mammal	tree	wildflower
A	32	16	12	2	8	14
B	17	24	16	5	12	37

The data was recorded during daylight for the months from May to July.

Evaluate how useful the data in the table is for comparing the biodiversity of the two different forests.

(5)

(Total for Question 6 = 8 marks)

7 Plants respond to external stimuli.

(a) Light is one example of a stimulus.

(i) The photograph shows plants grown in two different conditions.

(Source: © Nigel Cattlin/Alamy Stock Photo)

plant A plant B

Plant A was grown in the light. Plant B was grown in the dark.

Explain why the response shown by plant B is an advantage to the plant.

(2)

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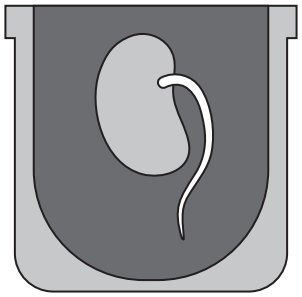
(ii) A plant is exposed to a bright light source on one side only.

The stem of the plant grows towards the light.

Explain what causes the stem to grow in this direction.

(4)

(b) The diagram shows a germinating seed.

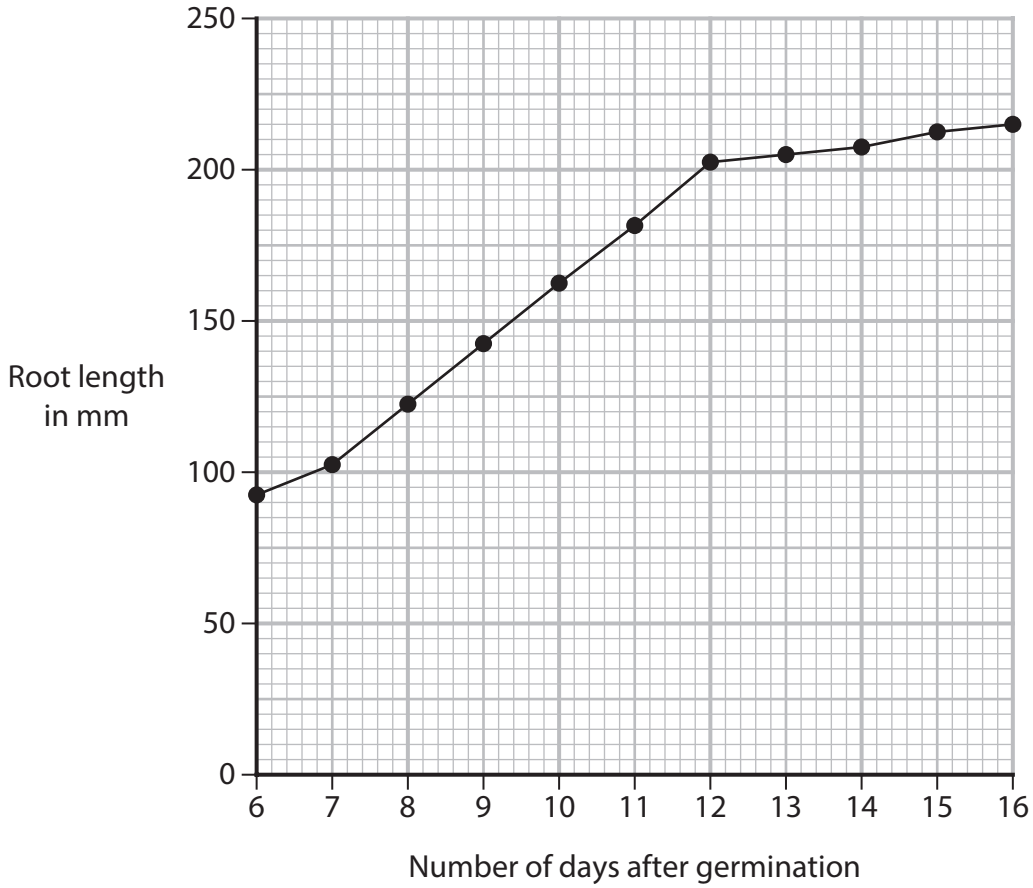


Complete the sentence by writing a suitable word in each blank space.

(2)

A growth response called .... causes the roots to grow downwards.

(c) The graph shows how roots of a different plant grow in length from day 6 to day 16 after germination.



Determine the rate of growth, in mm per day, of the root from day 7 to day 11.

(2)

rate of growth = ... mm / day

(Total for Question 7 = 10 marks)

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8 A scientist investigates the effect of fertiliser on crop yield.

The scientist uses wheat plants and identical trays of soil to model each wheat field.

The scientist adds different masses of fertiliser to each tray and then records the mass of wheat seeds produced.

During the investigation, the trays are watered regularly and kept in direct sunlight in a temperature-controlled glasshouse.

The table shows the scientist's results.

Mass of fertiliser added in grams	Mass of wheat seeds in grams
0	190
1	240
2	280
3	310
4	320
5	330
6	340

(a) State the independent variable in this investigation.

(1)

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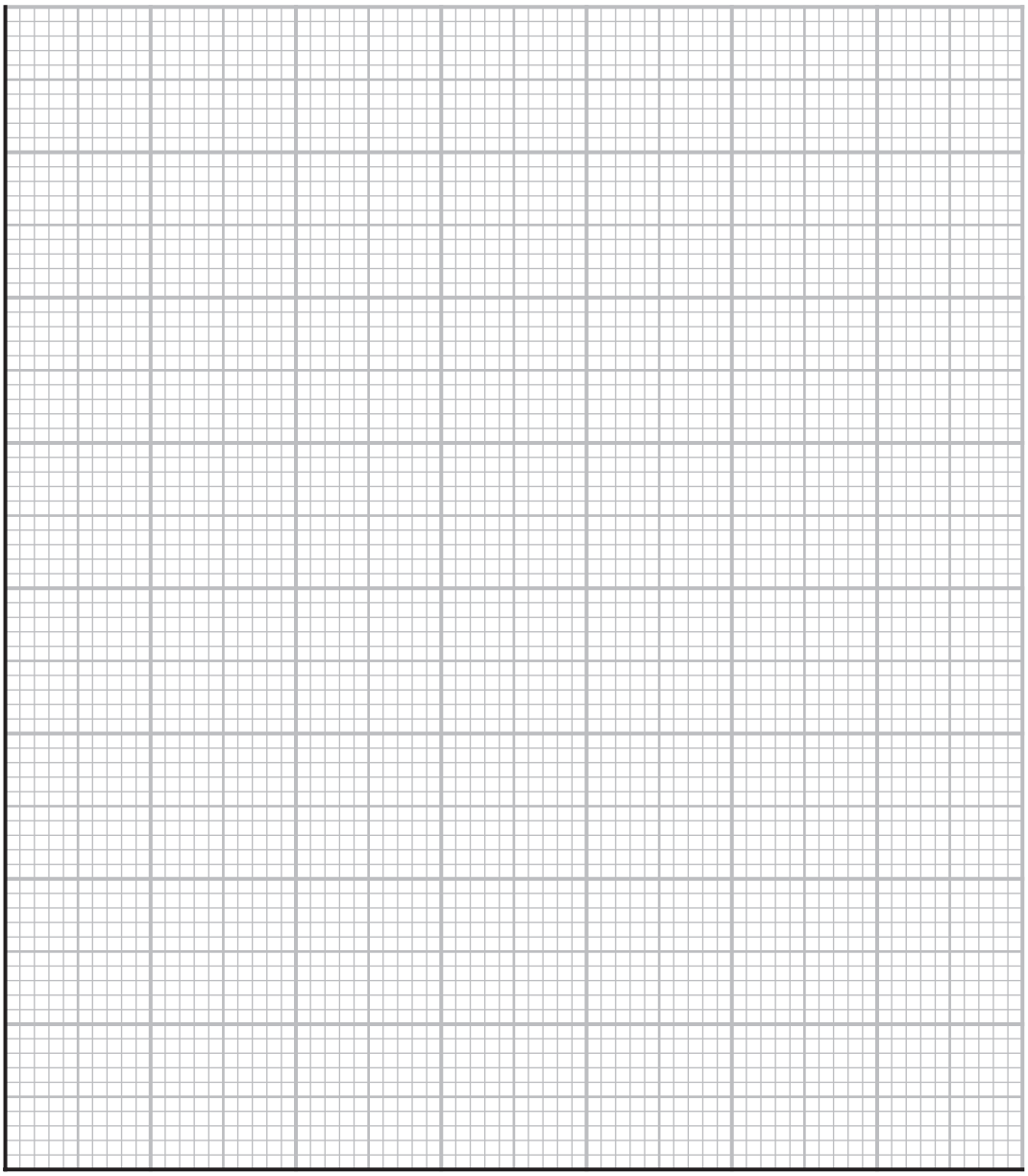
(b) (i) Plot the scientist's results on the grid.

(4)

(ii) Draw a curve of best fit.

(1)



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(c) Explain why the scientist's results may be different from results obtained in fields outside the glasshouse.

(3)

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(Total for Question 8 = 9 marks)

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9 Organisms in a desert environment are adapted to survive high temperatures and low water levels.

(a) Plants absorb water through their roots.

(i) Name the specialised tissue that transports water in plants.

(1)

.....

(ii) Many species of desert plants have long roots to increase water absorption.

The picture shows two species of desert plants.

(Source: S_Sukporn/Shutterstock)

(Source: © nang nang/Shutterstock)

Describe a method that could be used to investigate if the root length of a desert plant is due to the environment or the plant's genes.

(3)

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(b) Some animals are adapted to survive in hot environments.

The photograph shows a desert hare.

(Source: © francesco de marco/Shutterstock)

Explain how natural selection resulted in the desert hare having large ears to help it survive in hot environments.

(6)

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(Total for Question 9 = 10 marks)

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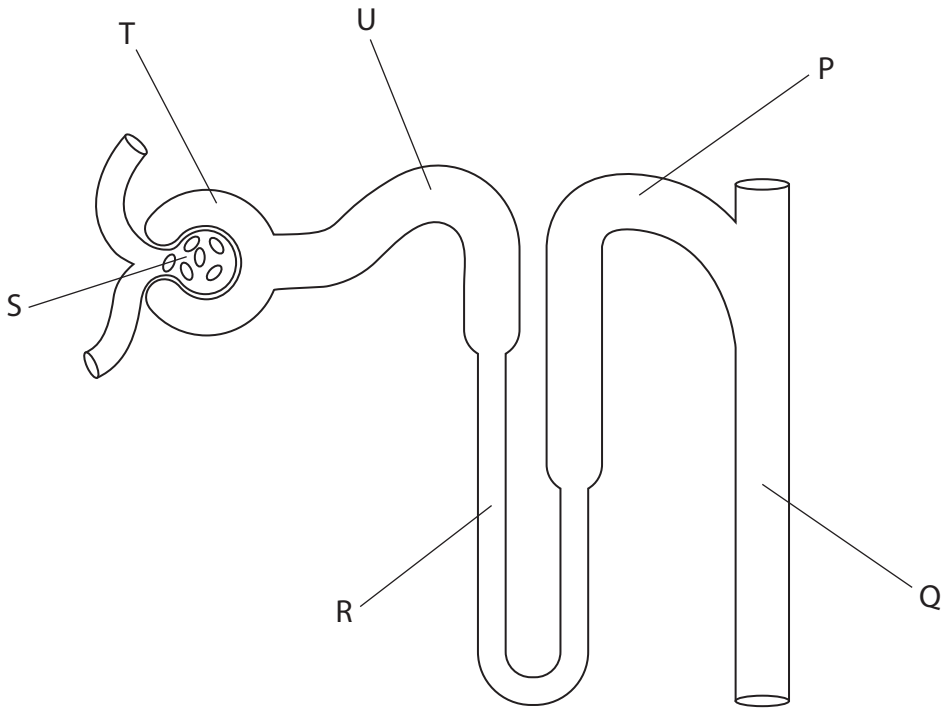
10 The diagram shows a nephron from a human kidney with some structures labelled.



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

(b) The table shows the concentration 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
proteins	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 10 = 10 marks)

TOTAL FOR PAPER = 90 MARKS

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