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)

Tuesday 12 May 2026

Afternoon (Time: 2 hours)

Paper reference 4BI1/1BR 4SD0/1BR

Biology

UNIT: 4BI1
Science (Double Award) 4SDO
PAPER: 1BR

You must have:
Ruler, calculator

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 110.
- 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 9 3 5 7 A 0 1 3 2

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 The image shows a mosquito that transmits malaria.

(Source: © Credit CDC / SCIENCE PHOTO LIBRARY)

(a) (i) Mosquitoes are living organisms.

All living organisms move and respond to their surroundings.

State one **other** characteristic shared by all living organisms.

(1)

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(ii) What is the name of the pathogen that causes malaria?

(1)

☒ **A** *Amoeba*

☒ **B** *Chlorella*

☒ **C** *Plasmodium*

☒ **D** *Pneumococcus*

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(iii) The actual length of the mosquito in the image from P to Q is 3.0 mm.

Calculate the magnification of the image.

(2)

magnification = ×.....

(b) Malaria is caused by a pathogen.

Describe how two named types of white blood cell protect the human body against pathogens.

(3)

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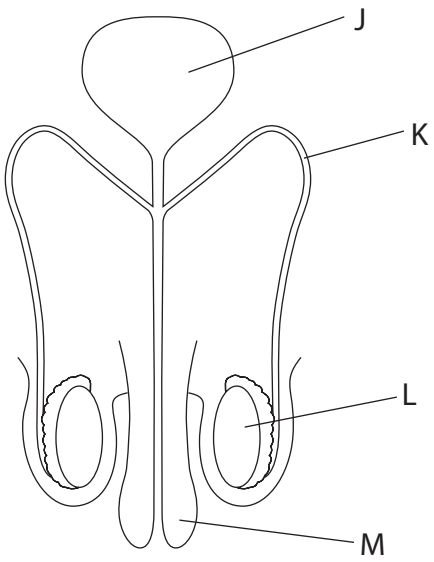
(Total for Question 1 = 7 marks)

2 The diagram shows the human male reproductive system with some structures labelled.



(a) (i) Which of the labelled structures produces sperm?

(1)

- ☒ **A** J
- ☒ **B** K
- ☒ **C** L
- ☒ **D** M

(ii) Explain why meiosis is the type of cell division used to produce sperm cells.

(2)

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(b) The sperm count is the number of sperm in 1 cm^3 of semen.

The human sperm count can vary over a wide range.

(i) Calculate the number of sperm in 2.5 cm^3 of semen that has a sperm count of 75 000 000.

Give your answer in standard form.

(2)

number of sperm = ...

(ii) Explain why a sperm count of below 15 000 000 can cause problems with fertility.

(2)

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(iii) Describe the stages that result in the formation of an embryo after sperm cells reach an egg cell.

(3)

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(Total for Question 2 = 10 marks)

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3 The photograph shows a fruit called a papaya.

(Source: © Pearson Asset Library)

Papaya fruits contain a protease enzyme called papain.

(a) (i) Which of these is produced when protein is digested by a protease enzyme?

(1)

- ☒ **A** amino acids
- ☒ **B** fatty acids
- ☒ **C** glucose
- ☒ **D** maltose

(ii) Which parts of the human digestive system produce protease enzymes?

(1)

- ☒ **A** colon and pancreas
- ☒ **B** gall bladder and stomach
- ☒ **C** stomach and oesophagus
- ☒ **D** stomach and pancreas

(iii) Describe how to test a sample of food for protein.

(2)

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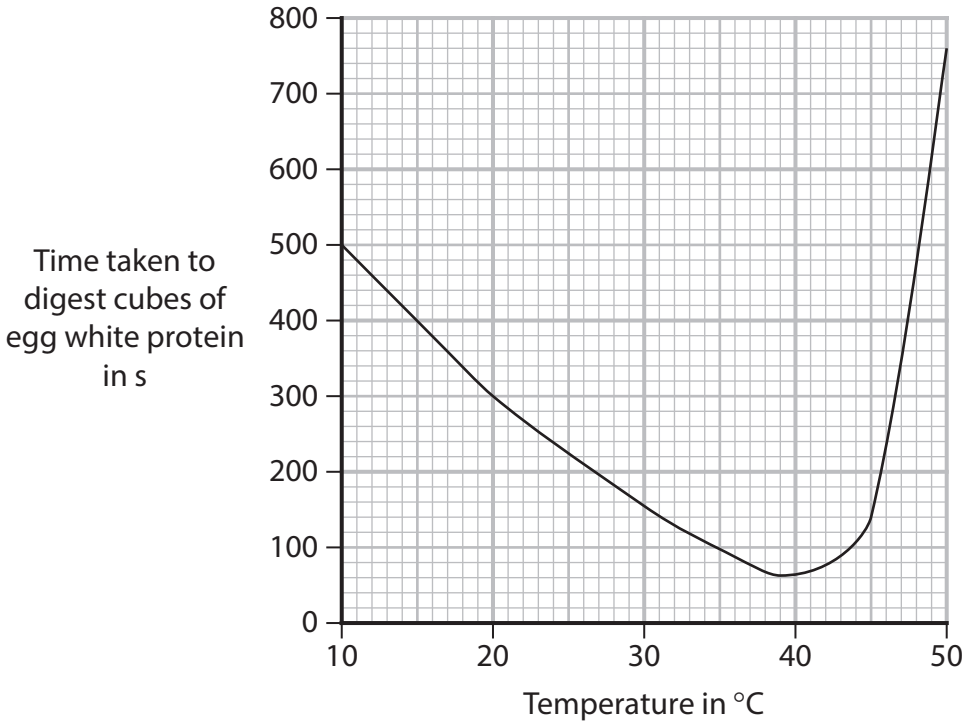
(b) The graph shows the effect of temperature on the time taken for papain to completely digest cubes of egg white protein.



(i) Describe the effect of increasing temperature on the time taken for the cubes of egg white protein to be completely digested.

(2)

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(ii) Explain the effect of increasing the temperature from **10 °C to 40 °C** on the time taken for the cubes of egg white protein to be completely digested.

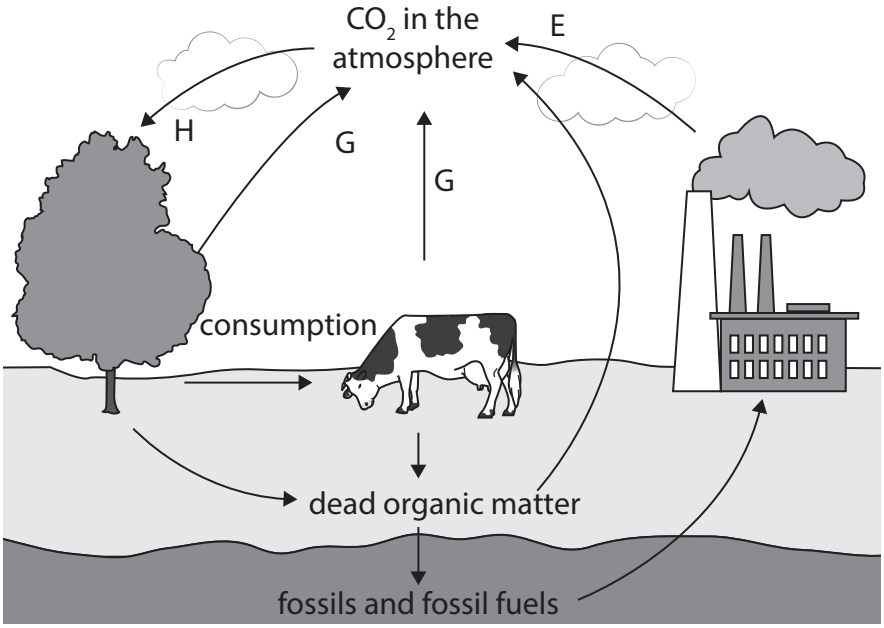
(2)

(iii) Explain the effect of increasing the temperature **above 40 °C** on the time taken for the cubes of egg white protein to be completely digested.

(2)

(Total for Question 3 = 10 marks)

4 The diagram shows the carbon cycle, with some processes labelled.



(a) Which of these is the name of the process labelled G?

(1)

- ☒ **A** combustion
- ☒ **B** decomposition
- ☒ **C** photosynthesis
- ☒ **D** respiration

(b) Carbon dioxide, methane and nitrous oxide are greenhouse gases.

Which of these gases are also greenhouse gases?

(1)

- ☒ **A** CFCs and oxygen
- ☒ **B** CFCs and water vapour
- ☒ **C** nitrogen and water vapour
- ☒ **D** oxygen and water vapour

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(c) Scientists investigated the effect of conventional cattle farming and organic cattle farming on greenhouse gases in the atmosphere.

The table shows the scientists' results.

Type of farming	Mass of greenhouse gas released or removed from atmosphere in grams per kg of cattle				
	methane released by cattle	nitrous oxide released from field	carbon dioxide released from cattle food	carbon dioxide released from machinery	carbon dioxide removed by plants in fields
conventional	14.0	0.7	10.0	1.5	7.0
organic	12.0	0.7	2.0	0.2	30.0

(i) Discuss the different effects of conventional cattle farming and organic cattle farming on the enhanced greenhouse effect.

(5)

(ii) Some people have suggested that many cattle farms should be removed and the land used to generate electricity with solar panels.

Suggest one advantage and one disadvantage of generating electricity from solar panels rather than burning fossil fuels.

(2)

advantage

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disadvantage

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(Total for Question 4 = 9 marks)

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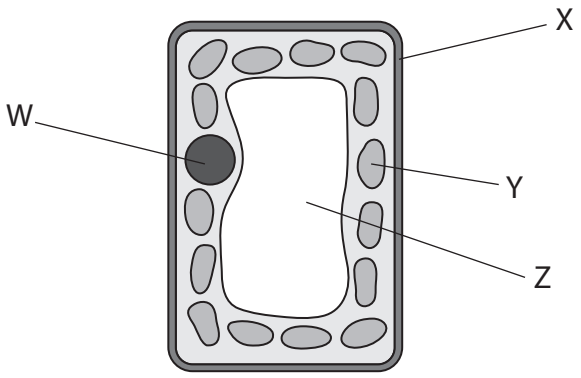
5 The diagram shows a palisade cell from a leaf, with some structures labelled.



(a) (i) Which of the labelled structures is also found in animal cells?

(1)

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

(ii) Explain two ways that the palisade layer of a leaf is adapted to maximise photosynthesis.

(4)

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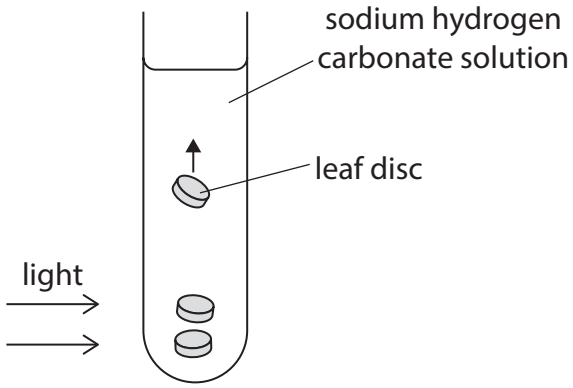
(b) A student uses this method to investigate the effects of temperature and carbon dioxide concentration on the rate of photosynthesis of leaf discs.

- cut discs with a diameter of 1 cm from a plant leaf
- fill a test tube with a solution of 0.5% sodium hydrogen carbonate solution (a source of carbon dioxide)
- place the test tube in a water bath at 10 °C
- after five minutes, place three leaf discs into the solution
- place a lamp 10 cm from the test tube
- record the times taken for the leaf discs to rise to the surface of the sodium hydrogen carbonate solution

The diagram shows some of the apparatus.



The student repeats their method using different temperatures and different concentrations of sodium hydrogen carbonate.

The table shows the student's results.

Temperature in °C	Percentage concentration of sodium hydrogen carbonate (%)	Time taken for leaf discs to rise to surface in s			
		1	2	3	mean
10	0.5	150	135	155	147
10	1.0	155	140	145	147
20	0.5	75	80	85	80
20	1.0	65	85	80	77
30	0.5	85	70	75	77
30	1.0	40	35	35	37

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(i) For a temperature of 30 °C, calculate the percentage decrease in the mean time taken for the discs to rise to the surface when the concentration of sodium hydrogen carbonate is increased from 0.5% to 1.0%.

Give your answer to the nearest whole number.

(2)

percentage decrease = ... %

(ii) State the dependent variable in the student's investigation.

(1)

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(iii) Comment on the results of the student's investigation.

(5)

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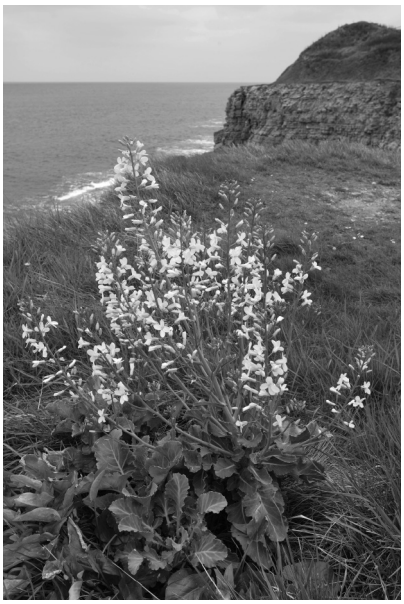
(Total for Question 5 = 13 marks)

6 Photograph 1 shows a flowering plant called wild cabbage.



(Source: © Martin Fowler/Shutterstock)

Photograph 1

(a) (i) Which part of a flower produces pollen?

(1)

- ☒ **A** anther
- ☒ **B** filament
- ☒ **C** stigma
- ☒ **D** style

(ii) Which part of a flower develops into a seed?

(1)

- ☒ **A** anther
- ☒ **B** ovary
- ☒ **C** ovule
- ☒ **D** petal

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(b) Photograph 2 shows a piece of a broccoli plant.

(Source: © Pearson Asset Library)

Photograph 2

Broccoli plants have flowers in compact bunches.

Broccoli plants were developed by selective breeding from wild cabbage plants.

Describe how selective breeding produced broccoli plants from wild cabbages.

(2)

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(c) Many transgenic varieties of crops with improved yields have now been produced.

Transgenic maize that releases insecticide (pesticide) and transgenic maize that is resistant to herbicide (weedkiller) have been produced.

(i) Describe how named enzymes can be used to produce transgenic plants containing a pesticide gene taken from bacteria.

(3)

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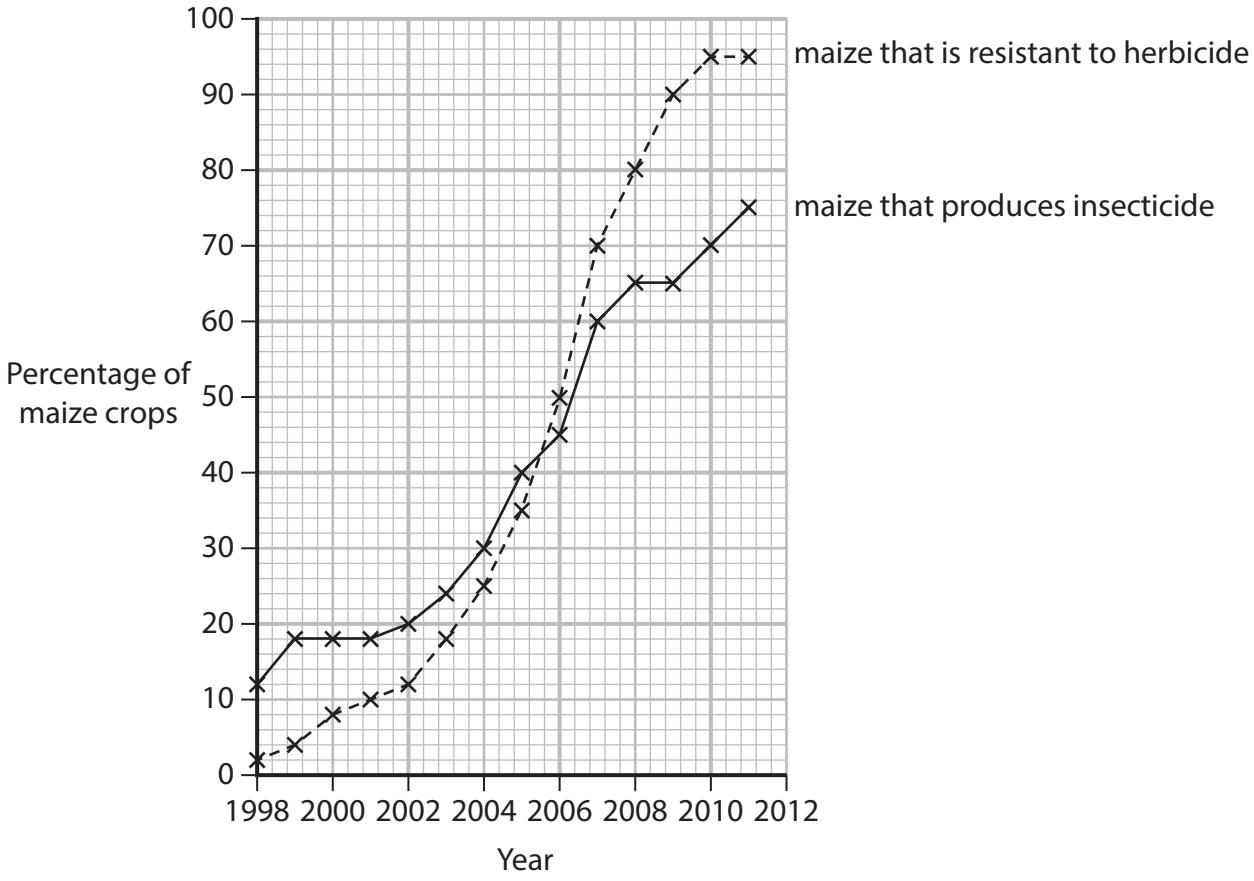
(ii) Graph 1 shows the percentage of maize grown that produces insecticide (pesticide) and the percentage of maize grown that is resistant to herbicide (weedkiller) from 1998 to 2011 in an area of the United States.



Graph 1

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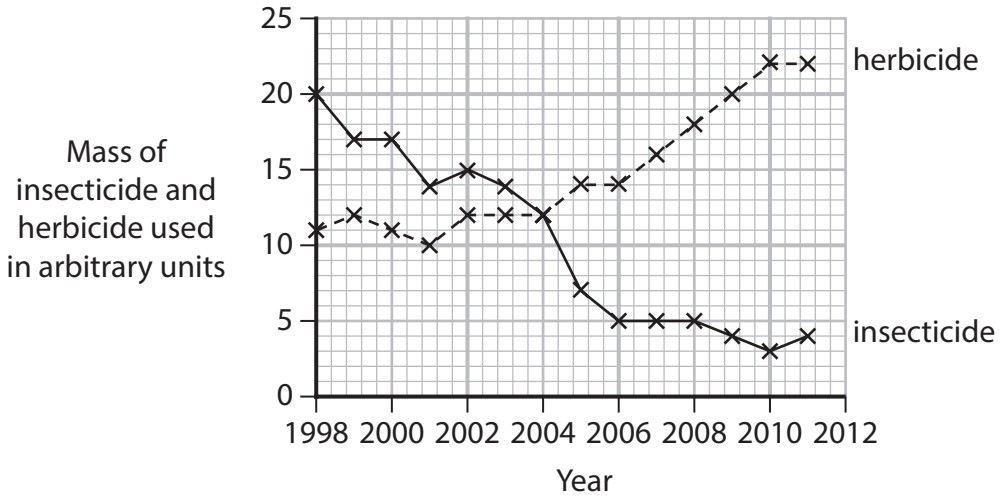
Graph 2 shows the masses of insecticide and herbicides used from 1998 to 2011 in the same area of the United States.



Graph 2

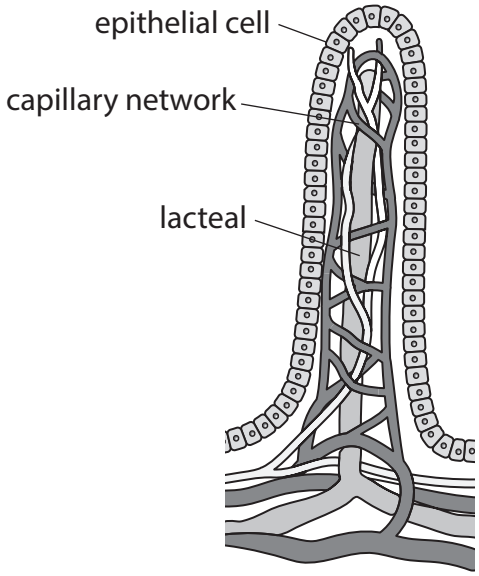
Some scientists have stated that developing genetically modified plants is good for the environment.

Using information from the graph and your own knowledge, discuss the scientists' statement.

(5)

(Total for Question 6 = 12 marks)

7 The diagram shows a villus from the human gut.



(a) (i) There are 30 villi per square millimetre of ileum.

A single villus has a length, **l**, of 0.800 mm and a radius, **r**, of 0.070 mm.

The surface area of a single villus can be calculated using this formula.

$$\text{surface area} = \pi r(r + 2l)$$

Calculate the total surface area, in mm^2, of villi in a part of the ileum that measures 150 square millimetres.

Give your answer to the nearest whole number.

[$\pi = 3.14$]

(3)

total surface area = ... mm^2

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(ii) Explain two ways that a single villus enables the efficient uptake of digested nutrients.

(4)

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(b) Coeliac disease is a condition that occurs in some people if they eat a protein called gluten.

Coeliac disease causes villi to be reduced in size and number.

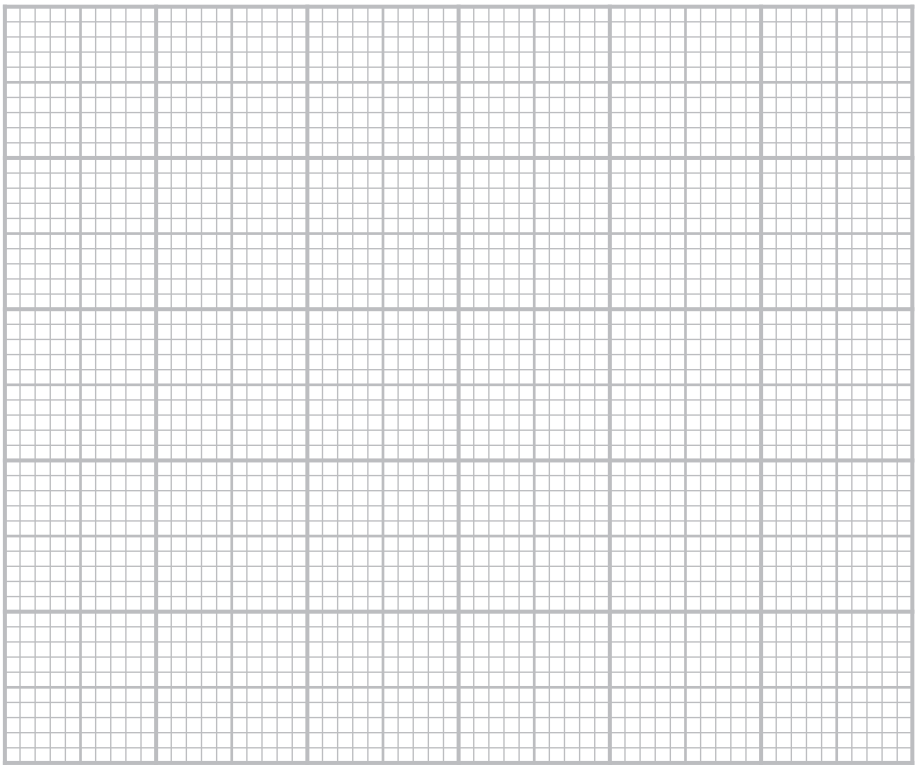
The table shows the growth of a child without coeliac disease and the growth of a child with coeliac disease.

Age in years	Height in cm	
	child without coeliac disease	child with coeliac disease
3	105	95
4	110	97
5	117	100
6	125	104
7	130	110

(i) Draw a line graph to show the variation in heights of both children from age 3 to age 7.

Join your points with straight lines.

(5)



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(ii) Explain why the growth of the child with coeliac disease is slower than the growth of the child without coeliac disease.

(3)

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(iii) State one variable that should be controlled to make a valid comparison of the growth of the two children.

(1)

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(Total for Question 7 = 16 marks)

8 A species of snail has two distinct varieties.

The banded variety has shells with bands.

The second, unbanded variety has shells with no bands.

The photograph shows some of both varieties of snail.

(Source: © GEORGE BERNARD / SCIENCE PHOTO LIBRARY)

(a) There is an allele for having shells with bands and an allele for having shells with **no** bands.

Two unbanded snails mate.

Some of the offspring are banded and some are unbanded.

(i) State the genotypes of the two parent snails.

Use the letters **A** and **a** to represent the alleles.

(1)

.....

(ii) The same pair of unbanded snails produce a total of 120 eggs.

Use a genetic diagram to deduce the number of banded snails that would develop from these eggs.

Show the parental genotypes, gametes formed and the genotypes and phenotypes of the offspring.

(4)

number = ...

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(b) A student investigates the populations of banded and unbanded snails in an area of woodland.

The table shows the student's results.

Type of snail	Number of snails
banded	32
unbanded	146

(i) Describe a method the student could use to estimate the population of snails in an area.

(3)

(ii) The snails are eaten by many different bird species.

Explain why there are different numbers of the two varieties of snail in the woodland.

Refer to natural selection in your answer.

(4)

(iii) The student notices that the colour of the snail shells has a very wide range of variation in phenotype, from bright yellow to dark brown.

However, the bands on the shells are either just present or absent.

Explain how different mechanisms produce the wide range of variation in shell colour compared with the presence or absence of bands.

(3)

(Total for Question 8 = 15 marks)

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9 Reflexes are rapid responses to danger.

(a) The passage gives information about a reflex arc.

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

(6)

If a human picks up a hot object, the temperature of the object stimulates ..... that are in the skin. Electrical ..... then travel along a ..... neurone to the spinal cord and are then passed on to a relay neurone, and finally a ..... neurone. In the spinal cord, chemicals, known as ..... , diffuse across synapses between the neurones. Finally, the muscles ..... to move the hand away or drop the hot object.

(b) Atropine is a drug that is often used by doctors when they need to look inside people's eyes.

A doctor uses this method to investigate the effect of atropine on the diameter of the pupil of an eye in bright light and in dim light.

- place a person in a room with dim light for ten minutes
- measure the diameter of the person's pupil
- increase the light intensity of the room so that the room has bright light
- after ten minutes, measure the diameter of the person's pupil

The doctor then repeats the method after placing drops of atropine on the surface of the person's eye.

The table shows the doctor's results.

Presence or absence of atropine	Diameter of pupil in mm	
	dim light	bright light
without atropine	12	2
with atropine	12	12

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(i) Explain the change in diameter of the pupil when the light is increased from dim light to bright light without atropine.

(2)

(ii) Atropine affects synapses.

Using data from the table, explain the effect of atropine.

(2)

(iii) Explain why doctors use atropine when looking inside a person's eye.

(2)

(Total for Question 9 = 12 marks)

10 The photograph shows an animal called a mayfly nymph.

(Source: © JAN HAMRSKY / NATURE PICTURE LIBRARY / SCIENCE PHOTO LIBRARY)

Mayfly nymphs live in freshwater and use gills for gas exchange.

Mayfly nymphs change the speed of movement of their gills in different environmental conditions.

Design an investigation to determine whether a change in temperature will affect the speed of movement of the gills.

Include experimental details in your answer and write in full sentences.

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(Total for Question 10 = 6 marks)

TOTAL FOR PAPER = 110 MARKS

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