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)

Friday 10 May 2024

Morning (Time: 2 hours)

Paper reference 4BI1/1B 4SD0/1B

Biology

UNIT: 4BI1
Science (Double Award) 4SD0
PAPER: 1B

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.*

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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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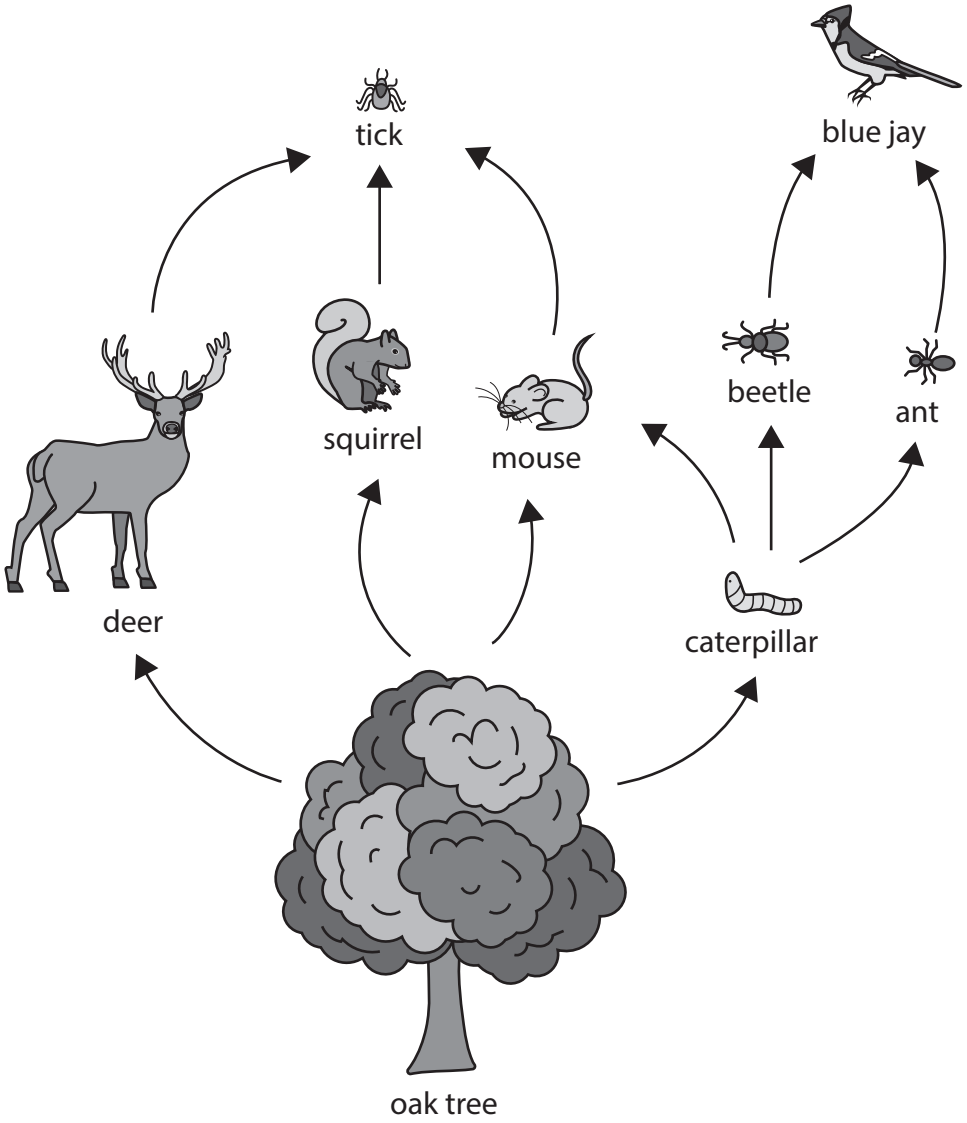
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Pearson

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 The diagram shows part of a food web from an oak woodland.



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(a) (i) Which is the producer in this food web?

(1)

- ☒ **A** beetle
- ☒ **B** deer
- ☒ **C** oak tree
- ☒ **D** tick

(ii) Draw a food chain, from this web, that includes the mouse and contains four trophic levels.

(2)

(iii) Which one of these organisms is in two different trophic levels in this food web?

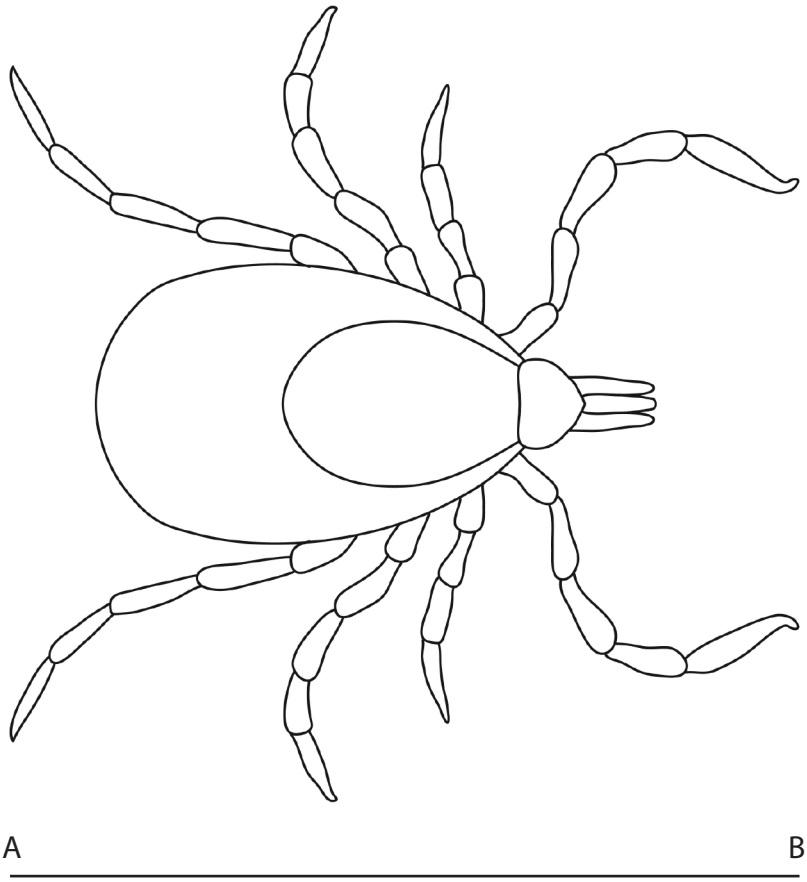
(1)

- ☒ **A** ant
- ☒ **B** blue jay
- ☒ **C** caterpillar
- ☒ **D** mouse

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(b) A tick is a small spider-like organism that bites and then takes in blood from the mammals as it feeds.

This is a magnified image of a tick.



(Source: © Evgdemidova / Shutterstock)

(i) The actual length of the tick, as shown by line A-B, is 3.5 mm.

Calculate the magnification of the image of the tick.

(2)

magnification = ×.....

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(ii) The tick absorbs substances from the mammal's blood it has taken in.

Give the function of two named substances absorbed by the tick.

(4)

substance 1

substance 2

(iii) Ticks can pass diseases between organisms.

Suggest how ticks can pass diseases from one organism to another.

(2)

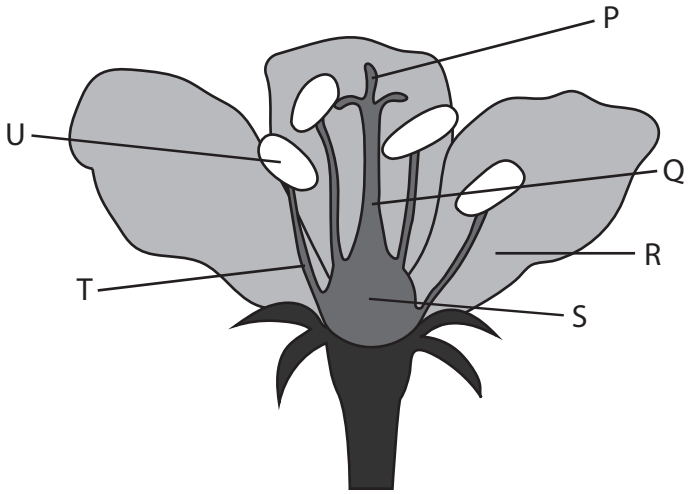
(Total for Question 1 = 12 marks)

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2 The diagram shows a flower with some structures labelled.



(a) (i) Which structure is the style?

(1)

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

(ii) Which structure releases pollen?

(1)

- ☒ **A** P
- ☒ **B** R
- ☒ **C** T
- ☒ **D** U

(iii) On which structure do the pollen grains germinate?

(1)

- ☒ **A** P
- ☒ **B** R
- ☒ **C** S
- ☒ **D** U

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(b) This flower is insect-pollinated.

Describe how structures P, R and T would be different in a wind-pollinated flower.

(3)

P .....

.....

R .....

.....

T .....

.....

(c) Flowering plants can reproduce asexually.

(i) Give an example of a natural method of asexual reproduction in plants.

(1)

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(ii) Give an example of an artificial method of asexual reproduction in plants.

(1)

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(d) Give three differences between asexual and sexual reproduction.

(3)

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2 .....

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3 .....

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(e) A farmer has two varieties of a plant species.

One variety has a red flower colour and no scent.

The other variety has a white flower colour and a perfumed scent.

The farmer wants to produce a variety that has the red flower colour and the perfumed scent.

Explain how the farmer could achieve this.

(3)

(Total for Question 2 = 14 marks)

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3 The passage describes the process used to produce yoghurt.

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

(7)

Yoghurt is made by heating ..... to a high temperature.

This heating process is known as ..... .

This ensures that bacteria present in the liquid are ..... .

The liquid is then cooled to between 40 °C and 46 °C.

A type of bacteria called ..... is then added.

These bacteria use a sugar called ..... for

..... respiration.

The pH of the yoghurt decreases because this respiration produces a substance called

..... .

(Total for Question 3 = 7 marks)

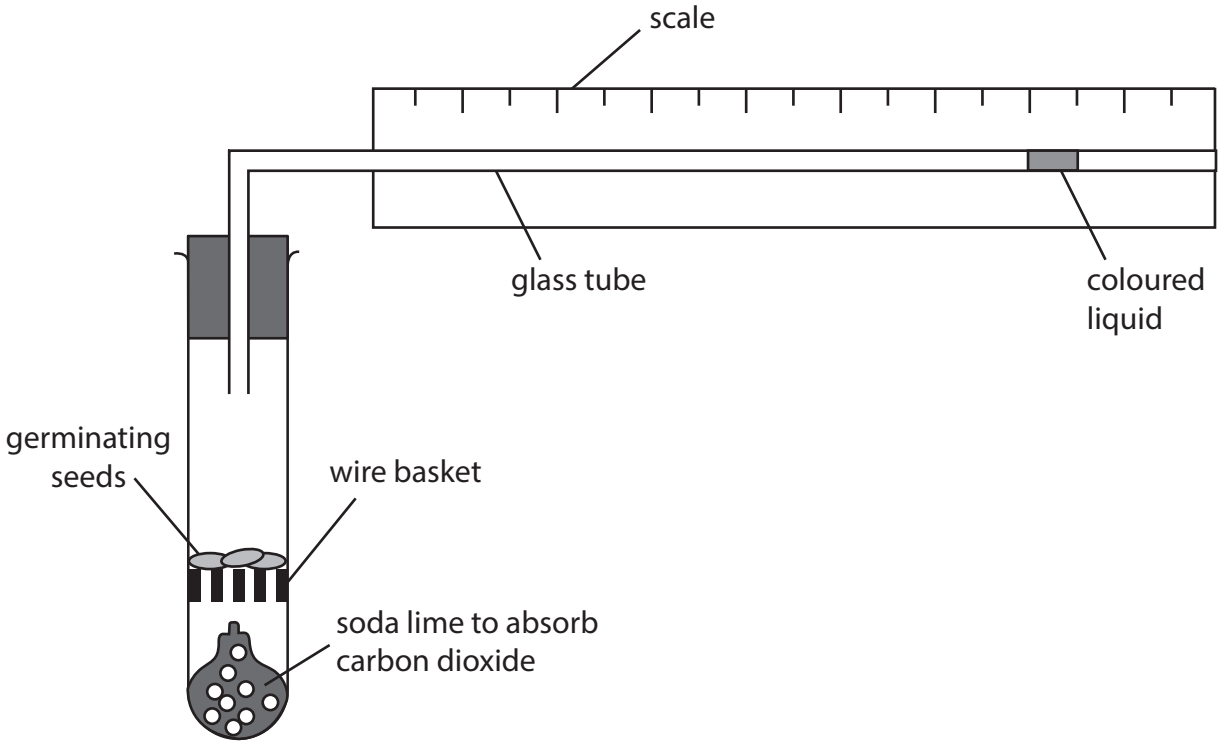
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4 A respirometer is a simple apparatus that can be used to measure the rate of respiration in small organisms.

A student uses the respirometer to investigate the rate of respiration in some germinating seeds.



(a) Give the balanced chemical symbol equation for aerobic respiration.

(2)

(b) The student measures the rate of respiration of 10 g of germinating seeds at 20 ^{O}C.

They then repeat this with another sample of 10 g of germinating seeds at 30 ^{O}C.

The rate of respiration can be measured by recording the distance, in mm, the bubble of coloured liquid moves on the scale in one minute.

They measure the rate three times at each temperature.

(i) Explain why carbon dioxide needs to be absorbed by the soda lime when measuring the rate of aerobic respiration.

(2)

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(ii) State how the student could have changed the temperature in this investigation.

(1)

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(c) The table shows the student's results.

Temperature in °C	Distance moved by bubble in one minute in mm			
	reading 1	reading 2	reading 3	mean
20	14	12	14	13
30	22	25	24	

(i) Calculate the mean distance moved by the bubble at 30 °C.

(2)

mean distance = ... mm

(ii) Explain the effect of increasing the temperature on the movement of the bubble.

(3)

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(Total for Question 4 = 10 marks)

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5 (a) Increased release of greenhouse gases are a threat to many ecosystems.

(i) Which of these are greenhouse gases?

(1)

1 CFCs

2 methane

3 oxygen

4 water vapour

☒ **A** 1 and 2 only

☒ **B** 1, 2 and 3 only

☒ **C** 1, 2 and 4 only

☒ **D** all of them

(ii) Explain what is meant by the term **greenhouse effect**.

(2)

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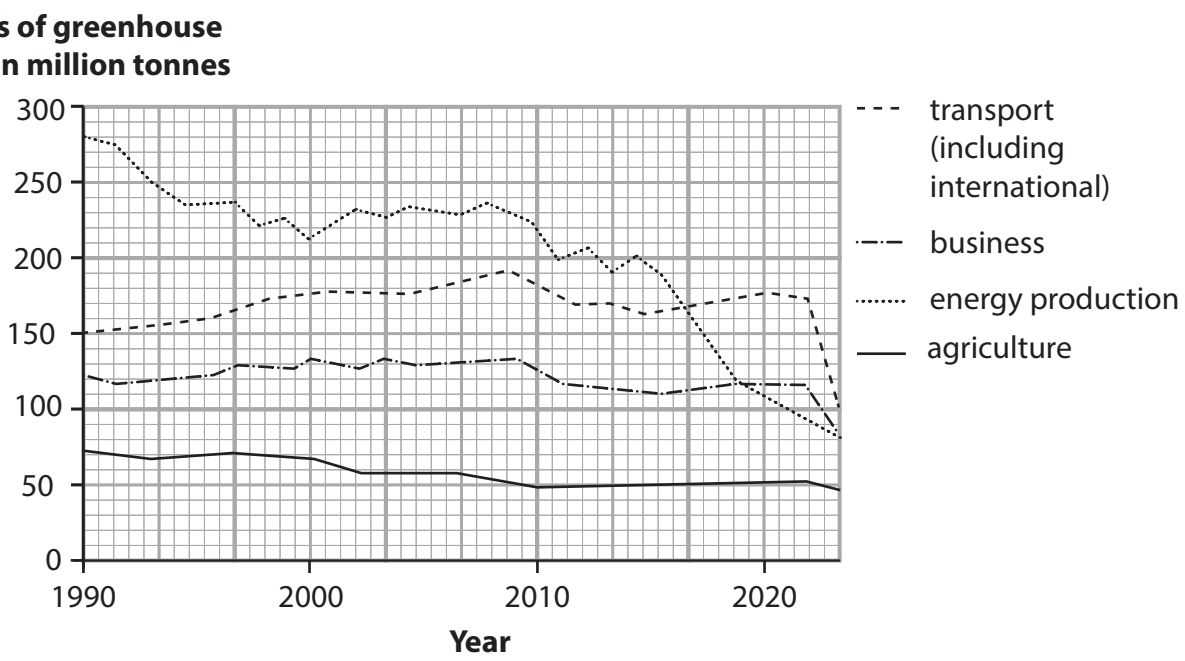
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(b) The graph shows the mass of greenhouse gases emitted from four sources in the United Kingdom from 1990 to 2020.



(i) Calculate the percentage of the total greenhouse gases emitted that came from energy production in 2020.

(3)

percentage = ... %

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(ii) Comment on the changes in the four sources of greenhouse gases from 1990 to 2020.

Use the information in the graph and your own knowledge to support your answer.

(5)

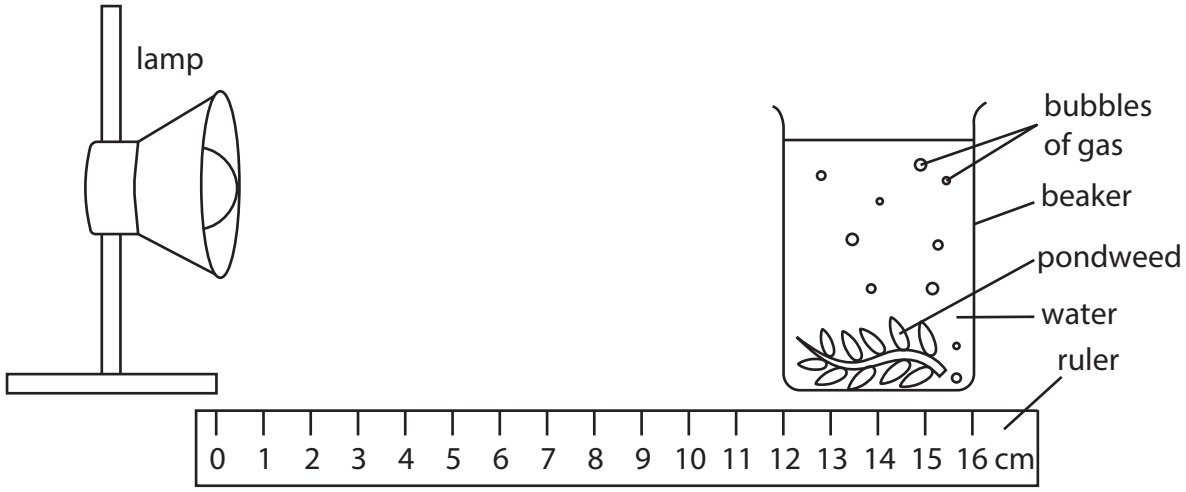
(Total for Question 5 = 11 marks)

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6 A student uses this apparatus to investigate the effect of light intensity on the rate of photosynthesis in pondweed.



This is the student's method.

- put a cut piece of pondweed in a beaker of water
- put a lamp 12 cm from the beaker
- count the number of bubbles of gas released from the cut end of the pondweed in one minute
- repeat this count for two more one-minute periods

The student repeats the method, moving the lamp 2 cm nearer the beaker each time.

(a) (i) Which gas is released by the plant during photosynthesis?

(1)

- ☒ **A** carbon dioxide
- ☒ **B** oxygen
- ☒ **C** methane
- ☒ **D** nitrogen

(ii) Which of these is the site of photosynthesis in a plant cell?

(1)

- ☒ **A** chloroplast
- ☒ **B** mitochondrion
- ☒ **C** nucleus
- ☒ **D** ribosome

(iii) Give one abiotic variable the student should control in this investigation.

(1)

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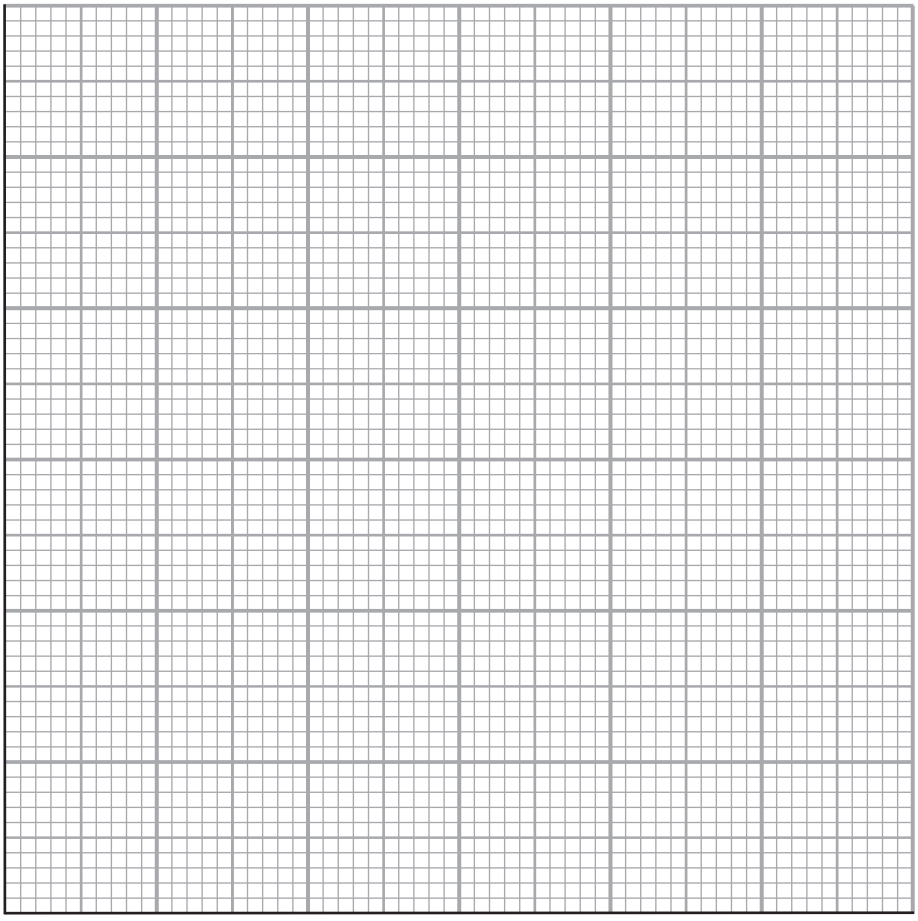
(b) The table shows the student's results

Distance of lamp from beaker in cm	Number of bubbles released per minute			
	count 1	count 2	count 3	mean (average)
2	20	18	20	19
4	16	15	15	15
6	12	14	13	13
8	10	9	8	9
10	8	7	8	8
12	5	6	4	5

(i) Plot a line graph to show the relationship between the distance of the lamp from the beaker and the mean number of bubbles released.

Use a ruler to join your points with straight lines.

(5)



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(ii) Explain the effect of increasing the distance of the lamp from the beaker on the mean number of bubbles released per minute.

(3)

(Total for Question 6 = 11 marks)

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7 (a) Human blood contains red blood cells and white blood cells.

Give three differences in structure between red blood cells and white blood cells.

(3)

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2 .....

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3 .....

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(b) Scientists collect data from men and women living at different altitudes.

The scientists determine

- the mean mass of haemoglobin in one litre of blood
- the mean number of red blood cells in one litre of blood

The table gives the scientists' results.

Altitude in m	Mean mass of haemoglobin in 1 litre of blood in g		Mean number of red blood cells in 1 litre × 10^{12}		Number of people in sample	
	men	women	men	women	men	women
0 (sea level)	148	138	5.15	4.84	18 453	27 559
1890	152	147	5.37	5.20	2175	3510
2270	151	142	5.18	4.88	2023	2943

(i) The blood volume of a woman living at an altitude of 1890 m is 4.3 litres.

Calculate the total number of red blood cells in this person.

Give your answer in standard form.

(3)

number of red blood cells = ...

(ii) Calculate the percentage difference in mean mass of haemoglobin in 1 litre of blood in men living at 2270 m compared with men living at sea level.

(2)

percentage difference = ... %

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(iii) Discuss the relationship between altitude and mean mass of haemoglobin in 1 litre of blood and the number of red cells in 1 litre of blood in men and women.

Use the data in the table and your own knowledge in your answer.

(5)

(Total for Question 7 = 13 marks)

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8 Cystic fibrosis (CF) is a condition that affects the mucus produced in the lungs and in other organs.

The condition is caused by a recessive allele.

(a) State what is meant by a recessive allele.

(1)

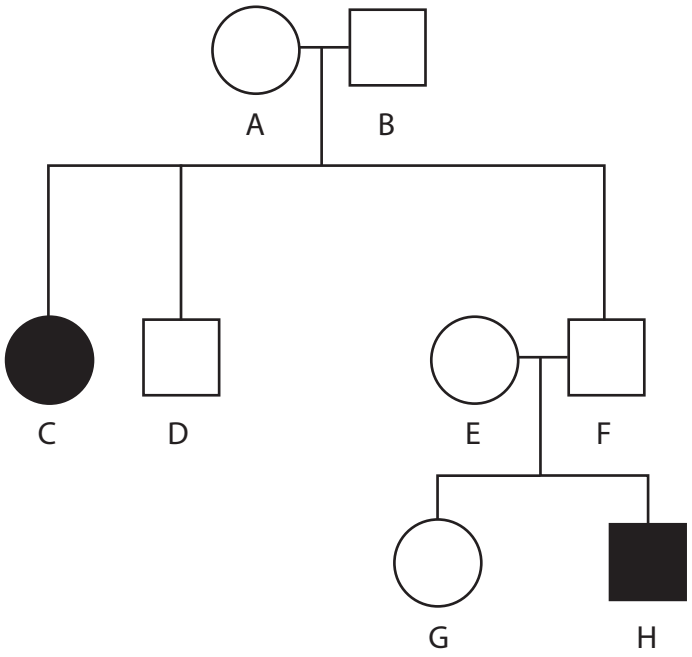
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(b) The diagram below shows a family pedigree.

Some people in the family have CF.



Key



female with CF | unaffected female | male with CF | unaffected male

(i) Use the pedigree to determine the genotypes of individuals A, B and C.

(3)

A .....

B .....

C .....

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(ii) Individuals E and F have a third child.

Draw a genetic diagram to show the genotypes of E and F, the gametes they produce and the possible genotypes and phenotypes of the offspring.

(3)

(c) The gene for cystic fibrosis affects many different body systems including the digestive system and the reproductive system.

(i) The mucus that is produced in the pancreas is much thicker and blocks the pancreatic duct.

Explain the effects this would have on human digestion.

(3)

(ii) Cystic fibrosis can result in the production of thick mucus which builds up in the cervix.

Explain the effect this will have on reproduction.

(2)

(Total for Question 8 = 12 marks)

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9 Students investigate the effect of mineral ions on plant growth.

They use four solutions A, B, C and D.

- A is a complete mineral solution that contains all of the mineral ions that a plant needs to grow normally
- B is a complete mineral solution without nitrate ions
- C is a complete mineral solution without magnesium ions
- D is a complete mineral solution without iron ions

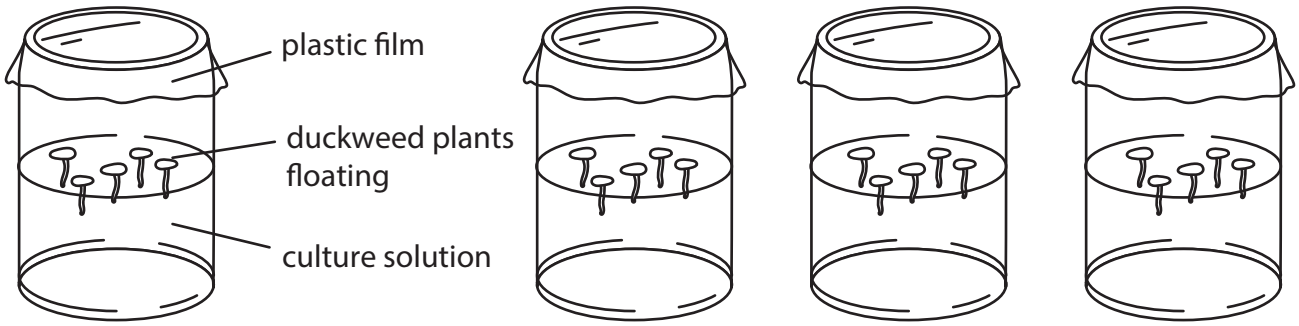
The plant they use is duckweed, which grows on the surface of water.



Duckweed plant with one leaf

This is the students' method.

- place each of the four solutions (A, B, C and D) into separate jars
- float five plants of duckweed in each jar
- use plants with the same number of leaves, are the same size and are healthy
- cover each jar with plastic film



- put the jars containing the plants in sunlight
- after four weeks count the total number of leaves in each jar
- make a note of the size and colour of the leaves in each jar

(a) (i) State two variables the students kept constant in their experiment.

(2)

1 .....

2 .....

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(ii) Explain why the students used complete mineral solution rather than distilled water to compare the effects of lacking a mineral ion.

(2)

(iii) Explain why the jars are kept in sunlight.

(2)

(iv) State the independent variable in this investigation.

(1)

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(b) The students record the total number of leaves in each jar.

They classify the leaf size as large, medium and small.

They record leaf colour as how green the leaves were between 0 for white to 5 for dark green.

The students' results are shown in the table.

Solution	Mineral lacking	Total number of leaves	Leaf size	Leaf colour
A	none	13	large	4
B	nitrate	7	small	2
C	magnesium	8	medium	2
D	iron	9	medium	1

(i) Some of the observations such as number of leaves are quantitative and some such as leaf size are qualitative.

Give the difference between quantitative and qualitative results.

(1)

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(ii) Comment on the students' results.

In your answer you should use data from the table and your own knowledge.

(6)

(Total for Question 9 = 14 marks)

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10 Carbon dioxide can be added to a glasshouse to increase the yield of a crop plant.

Design an investigation to find the carbon dioxide concentration needed for maximum crop yield.

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

(6)

(Total for Question 10 = 6 marks)

TOTAL FOR PAPER = 110 MARKS

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