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 13 May 2025

Afternoon (Time: 2 hours)

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

Biology

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

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 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.

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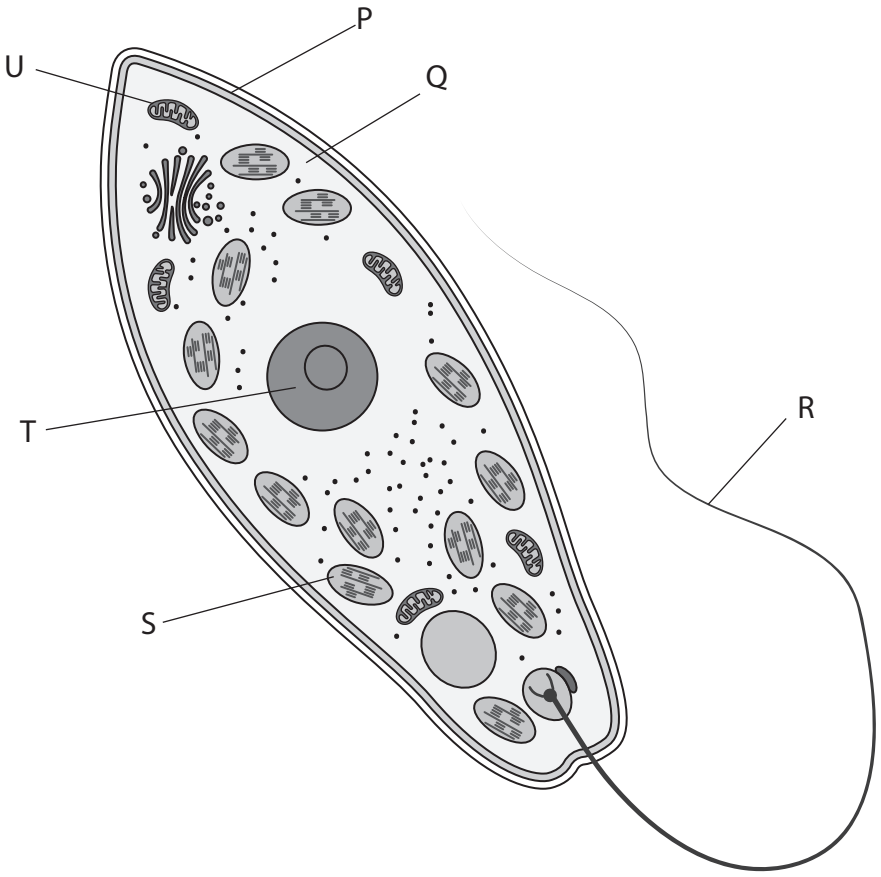
Pearson

Answer ALL questions. Write your answers in the spaces provided.

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 *Euglena* is a microorganism that lives in water.

The diagram shows *Euglena* with some structures labelled.



(a) (i) Which group contains *Euglena*?

(1)

☒ **A** bacteria

☒ **B** fungi

☒ **C** protoctists

☒ **D** viruses

(ii) Which structure is the site of respiration?

(1)

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

(iii) Which structure contains chromosomes?

(1)

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

(iv) Which structure is the cell membrane?

(1)

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

(b) *Euglena* has some structures that are found in plant cells but not in animal cells.

Which labelled structure is found in plant cells but not in animal cells?

(1)

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

(c) Some of the labelled structures are known as organelles.

State what is meant by the term **organelle**.

(1)

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(d) Explain which two labelled structures allow *Euglena* to move through water.

Refer to the diagram and your own knowledge in your answer.

(3)

1 .....

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2 .....

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(Total for Question 1 = 9 marks)

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2 A teacher uses Benedict's solution to investigate the concentration of glucose in four flavoured waters, A, B, C and D.

This is the teacher's method.

Step 1 add 5 cm^3 of flavoured water to a boiling tube

Step 2 add 5 cm^3 of Benedict's solution to the boiling tube

Step 3 keep the boiling tube at 70 °C for five minutes

Step 4 record the colour of the solution

The teacher uses this method for each of the four flavoured waters.

The table shows the teacher's results.

Flavoured water	Colour of the solution after heating for five minutes
A	yellow
B	brick red
C	blue
D	green

(a) (i) Give one variable that the teacher controls in the investigation.

(1)

.....

(ii) Give a method that the teacher could safely use to keep the boiling tube at 70 °C for five minutes in step 3.

(1)

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.....

(b) An athlete wants to drink flavoured water to help them run a long-distance race.

Explain which flavoured water, A, B, C or D, would be most suitable for the athlete to drink during the race.

(4)

(c) Some flavoured waters do not contain glucose.

Suggest why this may be an advantage for some people.

(2)

(Total for Question 2 = 8 marks)

3 Plant cells use photosynthesis to produce carbohydrates.

(a) Give the energy conversion that occurs during photosynthesis.

(2)

from ..... energy to ..... energy

(b) A student investigates whether carbon dioxide is needed for photosynthesis.

(i) Firstly, the student needs to remove all the starch from the plant's leaves.

Explain how the student could do this.

(2)

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(ii) After the starch has been removed from the leaves, the student uses the apparatus in diagram 1 to prevent carbon dioxide from reaching part of one of the leaves.

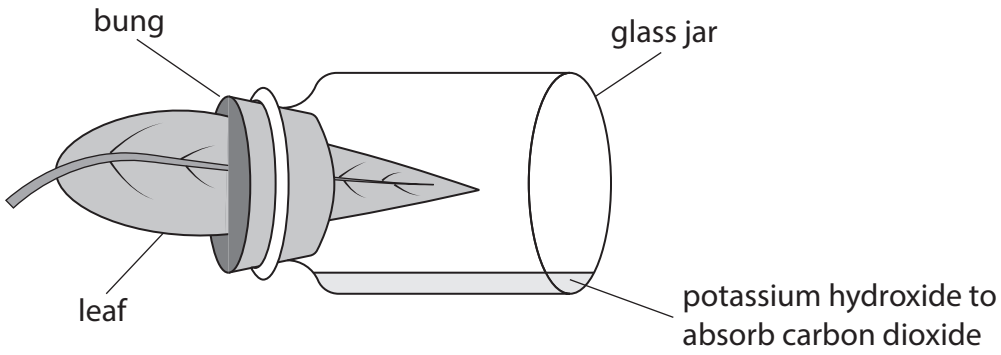

Diagram 1

The student places the apparatus in the light for 24 hours, and then tests the leaf for starch.

Complete and label diagram 2 to show the results of the starch test.

(2)

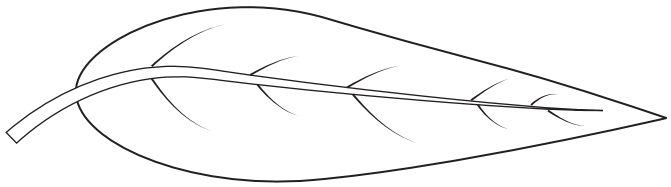

Diagram 2

(c) Plants need mineral ions as well as carbon dioxide and water.

Give the functions of two named mineral ions that a plant needs.

(4)

1 .....

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2 .....

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(d) The concentration of mineral ions in the soil is often lower than the concentration in the plant.

Waterlogged soil does not contain air.

Explain why plants in waterlogged soil cannot absorb mineral ions.

(3)

(Total for Question 3 = 13 marks)

4 Insect pests can eat and damage crop plants.

The cottony cushion scale insect is a pest that feeds on orange trees.

(a) This insect feeds from the phloem of the trees, reducing crop yield.

(i) Name two substances carried in the phloem.

(2)

1 .....

2 .....

(ii) Explain why insects feeding from the phloem can reduce crop yield from the orange trees.

(3)

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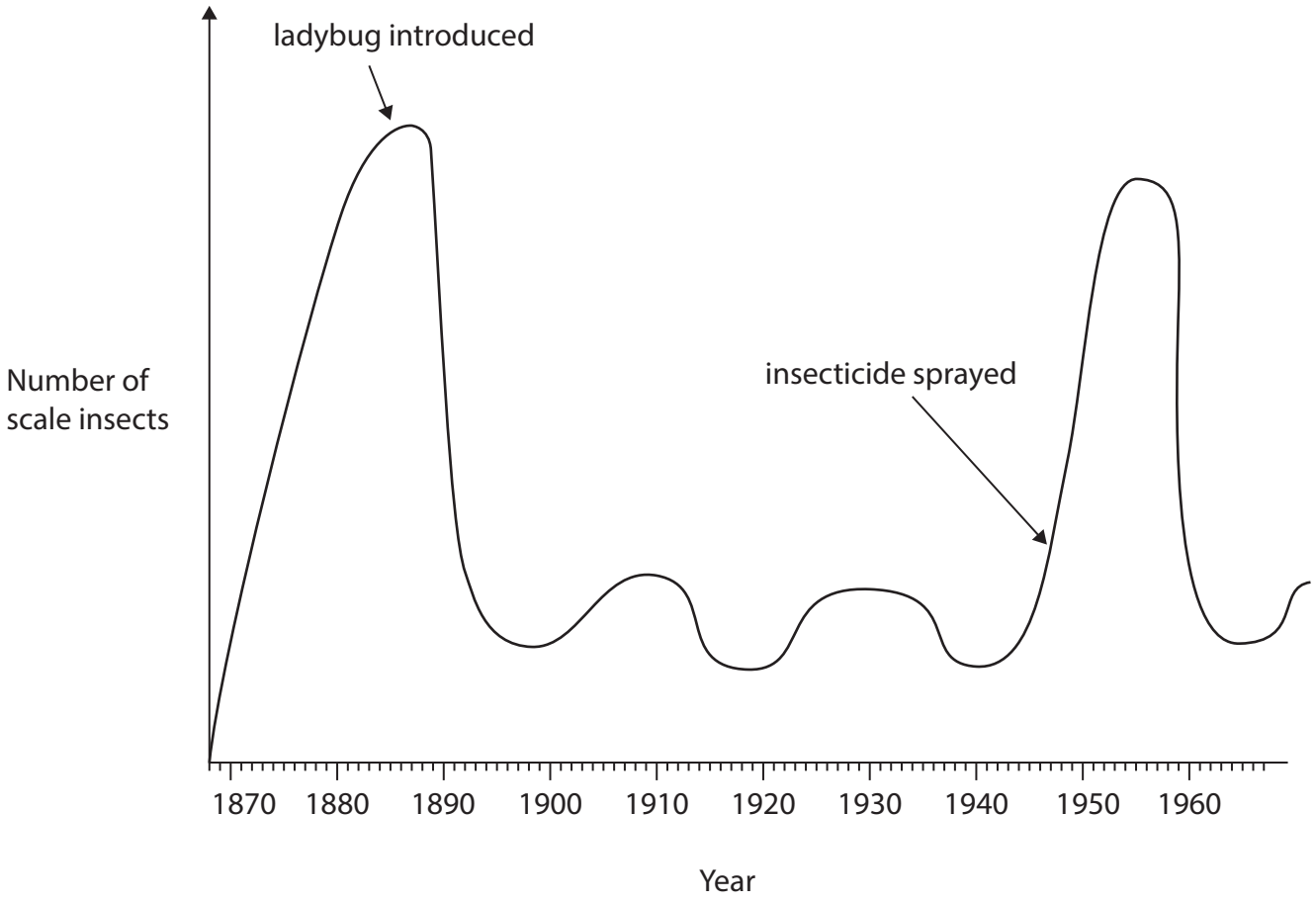
(b) Farmers can reduce insect pests by using chemical pesticide or biological control.

Insects called ladybugs can be used as a method of biological control as they feed on the scale insects.

The graph shows how the number of scale insects changes after the introduction of ladybugs.

The graph also shows how the number of scale insects changes after being sprayed with an insecticide, a pesticide that kills insects.



(i) Discuss the effects that the introduction of ladybugs, and the use of insecticides, has on the numbers of scale insects.

Use information from the graph and your own knowledge to help with your answer.

(5)

(ii) Give three advantages of using biological control instead of pesticides to control pests.

(3)

1 .....

2 .....

3 .....

(Total for Question 4 = 13 marks)

5 (a) Inheritance involves genomes, genes and alleles.

(i) State what is meant by the term **genome**.

(1)

(ii) Explain the difference between a gene and an allele.

(2)

(b) In horses, black hair is caused by a dominant allele, B. The recessive allele, b, codes for brown hair.

A heterozygous black-haired male horse breeds with a heterozygous black-haired female horse.

(i) Draw a genetic diagram to show the genotypes of the parents, the gametes they can produce and the genotypes and ratio of phenotypes of their possible offspring.

(4)

(ii) Calculate the probability that the first offspring will be male and have black hair.

(2)

probability = ...

(c) In horses, eye colour is also controlled by a single gene with two alleles.

The dominant allele causes brown eyes and the recessive allele codes for blue eyes.

A farmer has a male horse with brown eyes.

Explain how the farmer could determine the genotype of this male horse.

(3)

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(Total for Question 5 = 12 marks)

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6 Some scientists investigate the effect of temperature on the growth of maize seedlings.

The scientists keep the seedlings in two rooms, A and B.

- in room A, they keep the temperature between 10 °C and 30 °C for 120 days
- in room B, they keep the temperature between 10 °C and 30 °C for 82 days and above 30 °C for 38 days.

The scientists measure the leaf area in square centimetres for each seedling every 20 days.

(a) (i) Calculate the percentage of the total days that the temperature in room B is between 10 °C and 30 °C.

(2)

percentage = ... %

(ii) Explain why the scientists allow the temperature to vary within a range in each room.

(2)

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(iii) Give the dependent variable in this investigation.

(1)

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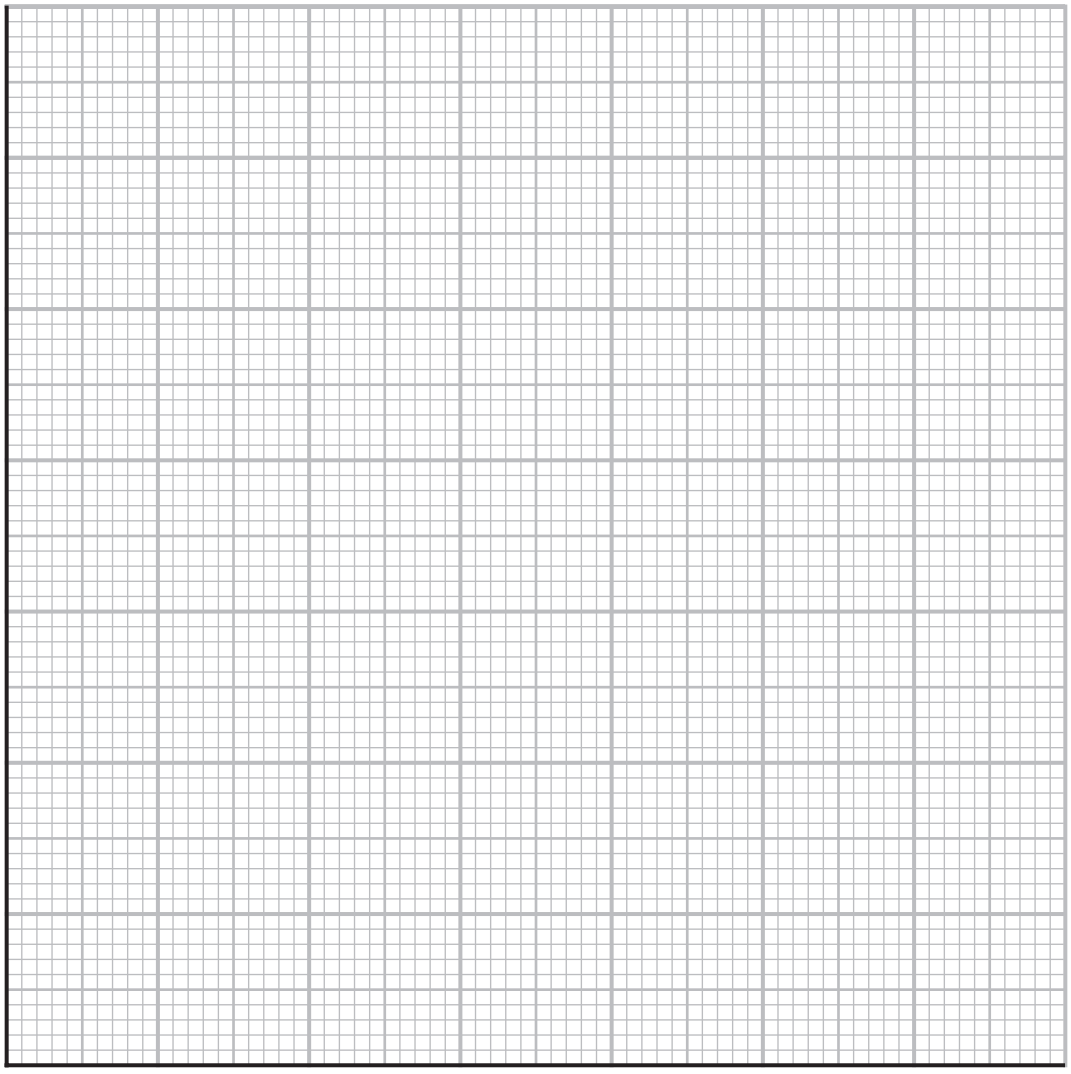
(b) The table shows the scientists' results.

Time in days	Mean leaf area in cm^2	
	room A	room B
20	6	10
40	50	800
60	700	1700
80	2000	4800
100	5000	6000
120	5700	6800

(i) Plot **two** line graphs to show the mean leaf area in each room at each time.

Use a ruler to join your points for each room with straight lines.

(5)



(ii) For room B, calculate the increase in mean leaf area per day from day 20 to day 120.

(2)

increase = ... cm^2 per day

(iii) Explain the effect of temperature on the growth rate of the seedlings.

(2)

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(iv) Describe how the scientists could measure the surface area of a leaf.

(2)

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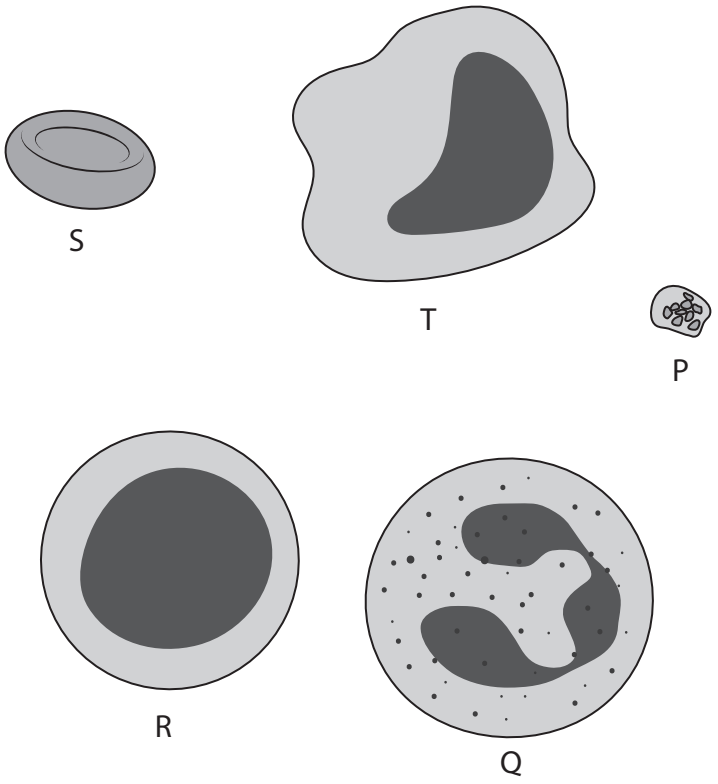
(Total for Question 6 = 16 marks)

7 The diagram shows five components of human blood.



(a) (i) Which component is a red blood cell?

(1)

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

(ii) Which component is a platelet?

(1)

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

(iii) Which component is a lymphocyte?

(1)

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

(iv) Which mineral ion is found in haemoglobin?

(1)

- ☒ **A** calcium
- ☒ **B** iron
- ☒ **C** magnesium
- ☒ **D** sodium

(b) Some types of blood cells are involved in the human immune response.

Describe how the human immune system reacts to an infection.

(4)

(c) Scientists collect blood samples from two people.

One person does not have a blood condition and the other person has a blood condition.

The scientists count the number of platelets, phagocytes, lymphocytes, and red blood cells for each sample.

The table shows the scientists' results.

Blood component	Number of each component in 1 dm^3 of blood	
	person without blood condition	person with blood condition
platelets	2.5×10^{11}	2.5×10^{11}
phagocytes	5.5×10^{11}	1.2×10^{12}
lymphocytes	3.0×10^{11}	9.2×10^{11}
red blood cells	5.0×10^{12}	5.0×10^{12}

(i) Each blood sample has a volume of 2 mm^3.

Calculate the number of red blood cells in a 2 mm^3 sample of blood.

Give your answer in standard form.

[1 $dm^3 = 1 \times 10^6 mm^3$]

(3)

number = ...

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(ii) Comment on the effects that the numbers of each blood component could have on the person with the blood condition.

Use the data in the table and your own knowledge to help with your answer.

(5)

(Total for Question 7 = 16 marks)

8 Ecology is the study of organisms and their environment.

(a) (i) State what is meant by the term **ecosystem**.

(1)

(ii) State what is meant by the term **community**.

(1)

(iii) State what is meant by the term **population**.

(1)

(b) Complete the passage about feeding relationships by writing a suitable word or words in each blank space.

(8)

Food chains show the flow of energy through an ecosystem from one organism to the next. The arrows in a food chain show the ..... of energy flow. The first organism in a food chain is a .....

The position that an organism has in a food chain is known as its ..... level.

Not all the energy from one level reaches organisms in the next level. Some of the energy is released as ..... energy during ..... or movement. Some of the energy remains in undigested food which is released as .....

Some of the energy is released in metabolic waste which is excreted as ..... .

Some of the energy remains in the dead organism until the organism is broken down by decomposers such as ..... and fungi.

(Total for Question 8 = 11 marks)

9 Scientists can produce new varieties of plants by genetic modification.

(a) Describe how two named enzymes are used in genetic modification.

(4)

(b) Scientists can also produce new varieties of plants by selective breeding.

Give two differences between the use of genetic modification and selective breeding to produce new varieties of plants.

(2)

1

2

(Total for Question 9 = 6 marks)

10 Some species of seed will only germinate after they have been exposed to light.

Design an investigation to determine if exposure to light affects germination.

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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