Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel

International GCSE (9–1)

Centre Number | | | | | |

Candidate Number | | | | |

Wednesday 8 January 2020

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.
- **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.
- 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 ☒.

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 ▶

P59937A

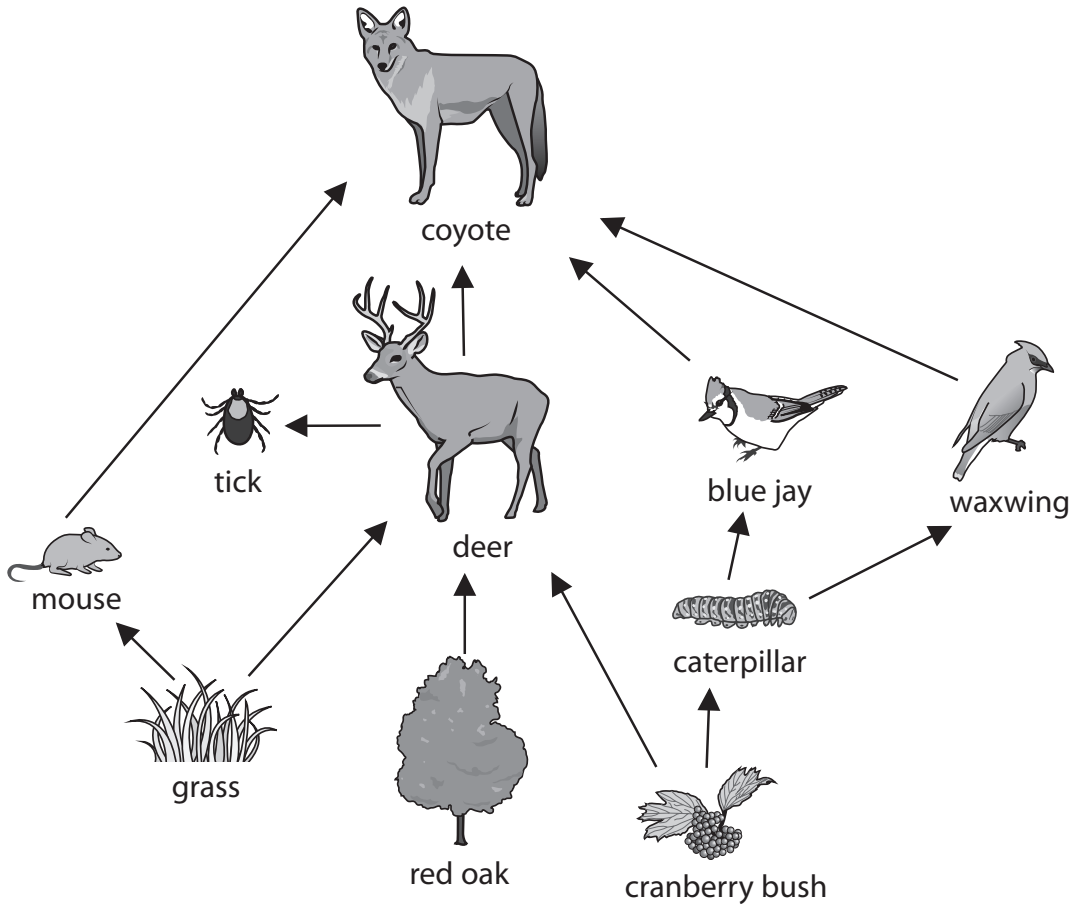
1/1/1/1/1/1/1/1/

P 5 9 9 3 7 A 0 1 3 2

Pearson

Answer ALL questions.

1 The diagram shows a forest food web.



(a) (i) How many producers are shown in this food web?

(1)

- ☒ **A** one
- ☒ **B** three
- ☒ **C** four
- ☒ **D** nine

(ii) How many secondary consumers are shown in this food web?

(1)

- ☒ **A** one
- ☒ **B** three
- ☒ **C** four
- ☒ **D** seven

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(b) The coyote uses some of its senses to catch deer.

(i) Name the sense that uses receptor cells in the retina.

(1)

.....

(ii) A coyote runs 530 metres in 30.0 seconds trying to catch a deer.

Calculate the speed of this coyote in metres per second.

(2)

speed = ... m/s

(c) The coyote will not catch the deer if too much lactic acid builds up in its muscles.

Explain why lactic acid builds up in the coyote's muscles when it runs.

(2)

.....

.....

.....

.....

.....

.....

(Total for Question 1 = 7 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

2 Organisms can be classified into groups based on their features.

(a) State three differences between eukaryotic and prokaryotic organisms.

(3)

1 .....

.....

2 .....

.....

3 .....

.....

(b) Give an example of a disease caused by a protoctist.

(2)

name of protoctist .....

name of disease .....

(Total for Question 2 = 5 marks)

3 Squirrels are animals that live in woodland. They feed on nuts produced by the trees.

The diagram shows a squirrel eating a nut.

(a) Describe a method you could use to show that the nut contains fat.

(3)

(b) The table lists substances found in two types of nut, A and B.

The mass of each substance is given in milligram per gram of nut.

Substance	Mass of substance in milligram per gram of nut	
	nut A	nut B
carbohydrate	167	143
protein	150	78
fat	587	693
fibre	96	86
iron	0.05	0.03

(i) Explain the role of fibre in the squirrel's diet.

(2)

.....

.....

.....

.....

(ii) Explain which nut is better at helping the squirrel make red blood cells.

(2)

.....

.....

.....

.....

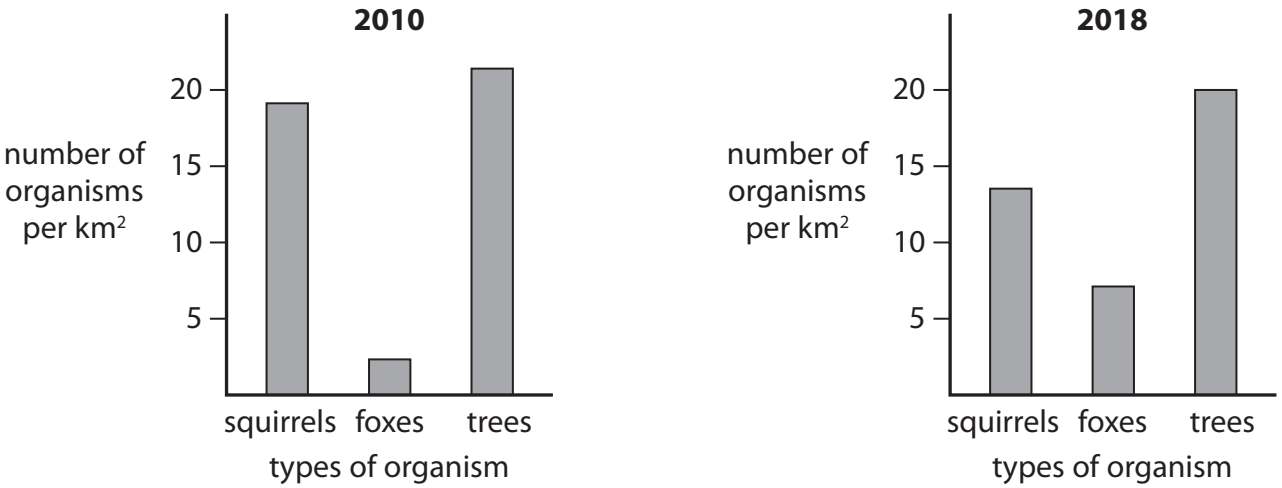
(iii) Nut A has a mass of 28.0 grams.

Calculate the total mass of carbohydrate in this nut.

(2)

total mass of carbohydrate = ... grams

(c) The graphs show the number of squirrels, foxes and trees in a woodland in 2010 and in 2018.



Discuss possible reasons why there is a decrease in the number of squirrels from 2010 to 2018.

Use information from the graphs and your own knowledge in your answer.

(5)

(Total for Question 3 = 14 marks)

4 Enzymes are biological molecules that act as catalysts in metabolic reactions.

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

(1)

.....

.....

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

(1)

.....

.....

(b) A teacher investigates the effect of enzyme concentration on the rate of a reaction.

He uses the enzyme catalase, which is found in potato.

He changes the enzyme concentration by adding different numbers of potato discs.

Catalase breaks down hydrogen peroxide solution into water and oxygen.

This is his method.

- cut same-sized discs from a potato
- put 5 cm^3 of hydrogen peroxide solution into each of five test tubes
- add a different number of potato discs to the hydrogen peroxide
- measure the volume of oxygen gas produced in three minutes

The teacher repeats each test four times for each concentration.

He then calculates the mean rate of oxygen production for each concentration.

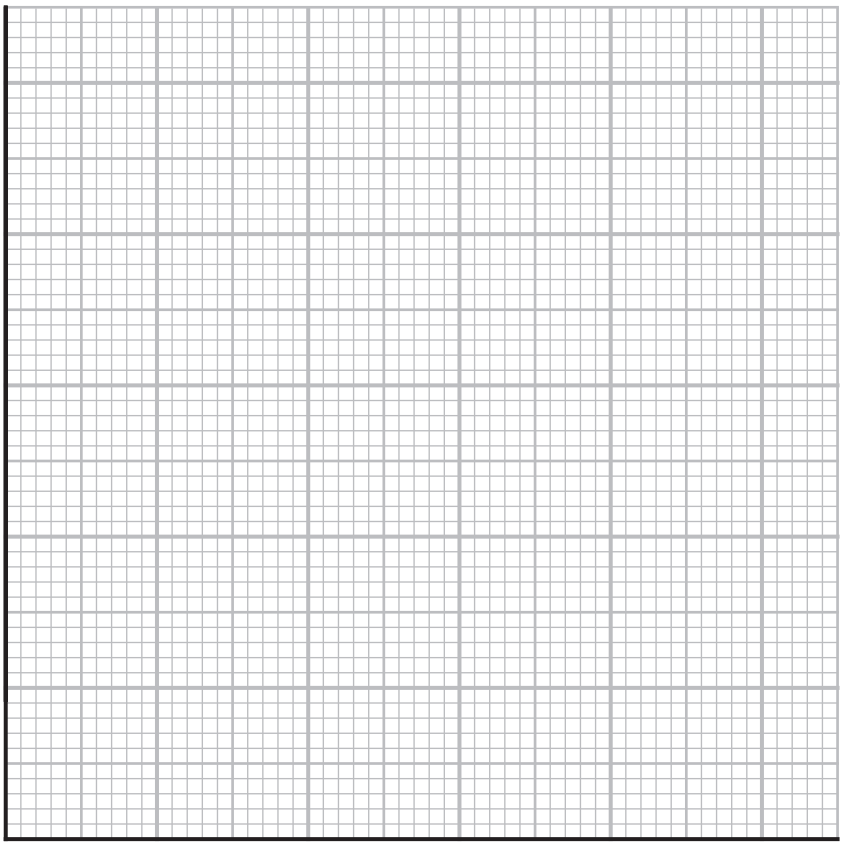
The table shows his results.

Enzyme concentration (number of potato discs)	Mean rate of oxygen production in cm^3 per minute
2	2.0
4	4.4
6	7.0
8	8.2
10	8.2

(i) Plot a line graph to show the effect of enzyme concentration on the mean rate of oxygen production.

Use a ruler to join the points with straight lines.

(5)



(ii) Explain the effect of increasing enzyme concentration on the rate of oxygen production.

(3)

.....

.....

.....

.....

.....

.....

(iii) Name a piece of apparatus suitable for measuring the volume of oxygen produced.

(1)

.....

.....

(iv) Explain why it is important for the teacher to keep the volume and concentration of the hydrogen peroxide constant.

(2)

.....

.....

.....

.....

.....

(v) Name another variable the teacher should keep constant in his investigation.

(1)

.....

(Total for Question 4 = 14 marks)

BLANK PAGE

5 Farmers can increase their crop yield by growing crops in a temperature controlled glasshouse.

(a) (i) Explain how increasing the temperature can result in an increase in crop yield.

(2)

(ii) Farmers sometimes use a type of heater that burns gas or oil to raise the temperature of their glasshouse to improve crop yield.

Explain why they use this type of heater to improve crop yield.

(2)

(b) Some farmers also add chemical fertilisers to their crops in a glasshouse.

(i) Different minerals are added to chemical fertilisers. Explain one mineral that should be added to these fertilisers.

(2)

(ii) Discuss why some farmers limit the amount of chemical fertilisers they add to their crops.

(5)

(Total for Question 5 = 11 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

BLANK PAGE

6 The human liver produces bile.

(a) Explain the role of bile in digestion.

(4)

(b) These are the three main blood vessels attached to the liver.

- hepatic artery
- hepatic vein
- hepatic portal vein

How many of these blood vessels transport deoxygenated blood from the liver?

(1)

☒ **A** 0

☒ **B** 1

☒ **C** 2

☒ **D** 3

(c) A scientist investigates the glucose concentration in a person's hepatic portal vein and hepatic vein after the person has eaten a meal.

This is the scientist's method.

- give a person a meal to eat
- after one hour take a blood sample from the hepatic portal vein and a blood sample from the hepatic vein
- measure the glucose concentration in both samples
- after five hours take another blood sample from each of the two veins
- measure the glucose concentration in both samples

The table shows the scientist's results.

Time in hours	Concentration of glucose in blood sample in mmol per dm^3	
	hepatic portal vein	hepatic vein
1	9.0	6.6
5	5.0	7.1

(i) After **one** hour, the concentration of glucose in the hepatic portal vein is higher than the concentration of glucose in the hepatic vein.

Explain this difference in concentration.

(3)

(ii) After **five** hours, the concentration of glucose in the hepatic vein is higher than the concentration of glucose in the hepatic portal vein.

Explain this difference in concentration.

(2)

.....

.....

.....

.....

.....

.....

(Total for Question 6 = 10 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

7 The diagram shows a male fruit fly with long wings and a female fruit fly with long wings.

male female

Wing length in these flies is controlled by a gene with two alleles.

The dominant allele (L) produces long wings and the recessive allele (l) produces short wings.

A male and a female fruit fly mate.

The table shows the number of male and female offspring with long wings and short wings.

Phenotype	Number of offspring
male with long wings	38
male with short wings	10
female with long wings	36
female with short wings	15

(a) Which of these describes the genotypes of the parent fruit flies?

(1)

☒ **A** both are heterozygous

☒ **B** both are homozygous

☒ **C** both have long wings

☒ **D** one is heterozygous and one is homozygous

(b) (i) Genetic diagrams are used to show how sex is inherited.

Complete the genetic diagram to show that equal numbers of male and female offspring are produced.

(2)

	X	Y

(ii) Explain why the results of the cross might not produce exactly equal numbers of male and female offspring.

(2)

.....

.....

.....

.....

.....

.....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(c) Fruit flies feed on decomposing fruit.

The smell of the fruit attracts the fruit flies.

Design an investigation to find out if the smell of decomposing apples attracts fruit flies more than the smell of decomposing bananas.

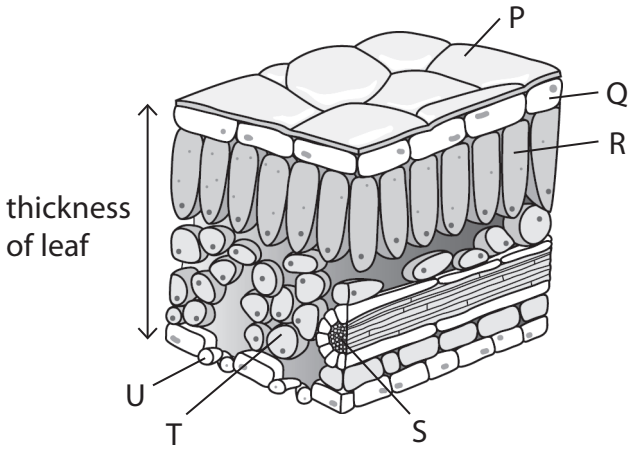
Include experimental details in your answer and write in full sentences.

(6)

(Total for Question 7 = 11 marks)

BLANK PAGE

8 The diagram shows a section through a leaf with different parts labelled P to U.



Magnification ×100

(a) (i) Which part of the leaf transports amino acids?

(1)

☒ **A** R

☒ **B** S

☒ **C** T

☒ **D** U

(ii) Which part absorbs the most sunlight?

(1)

☒ **A** P

☒ **B** Q

☒ **C** R

☒ **D** S

(iii) Which part transports the products of photosynthesis?

(1)

☒ **A** Q

☒ **B** R

☒ **C** S

☒ **D** T

(iv) Which part reduces the amount of water escaping?

(1)

☒ **A** P

☒ **B** Q

☒ **C** R

☒ **D** S

(b) Explain how the structure and position of cells in parts R and T help the leaf to photosynthesise.

(4)

(c) The diagram of the leaf section is magnified 100 times.

Determine the actual thickness of the leaf.

(2)

thickness = ... mm

(d) The photograph shows water lilies, plants that float on the surface of ponds.

Suggest why the leaves of the water lily only have stomata on their upper surface.

(2)

.....

.....

.....

.....

.....

.....

(Total for Question 8 = 12 marks)

9 Phagocytes and lymphocytes are white blood cells involved in the immune response.

(a) Explain the role of lymphocytes in the immune response.

(3)

(b) Phagocytes ingest bacteria.

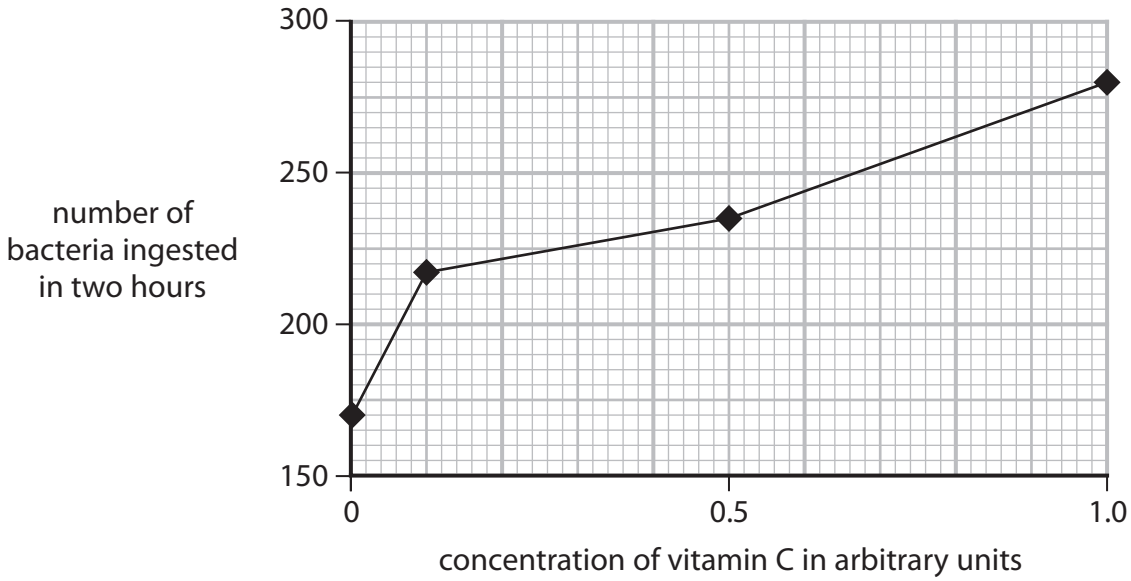
Explain what happens to bacteria after they have been ingested by phagocytes.

(3)

(c) A scientist uses this method to investigate how vitamin C affects ingestion of bacteria by phagocytes.

- add different concentrations of vitamin C solution to three test tubes
- add distilled water to a fourth test tube
- add phagocytes to each tube
- leave the tubes for one day
- add 10 cm^3 of a culture of non-pathogenic bacteria to each tube
- keep each tube at 35 °C for two hours
- measure the number of bacteria ingested

The graph shows the scientist's results.



(i) Which of these is the rate of ingestion of bacteria in the control?

(1)

☒ **A** 85 per hour

☒ **B** 140 per hour

☒ **C** 170 per hour

☒ **D** 280 per hour

(ii) State the independent variable in this investigation.

(1)

.....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(iii) State two biotic variables the scientist should control.

(2)

1 .....

.....

2 .....

.....

(iv) The scientist concludes that vitamin C in a person's diet will protect people from pathogens.

Comment on this conclusion.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

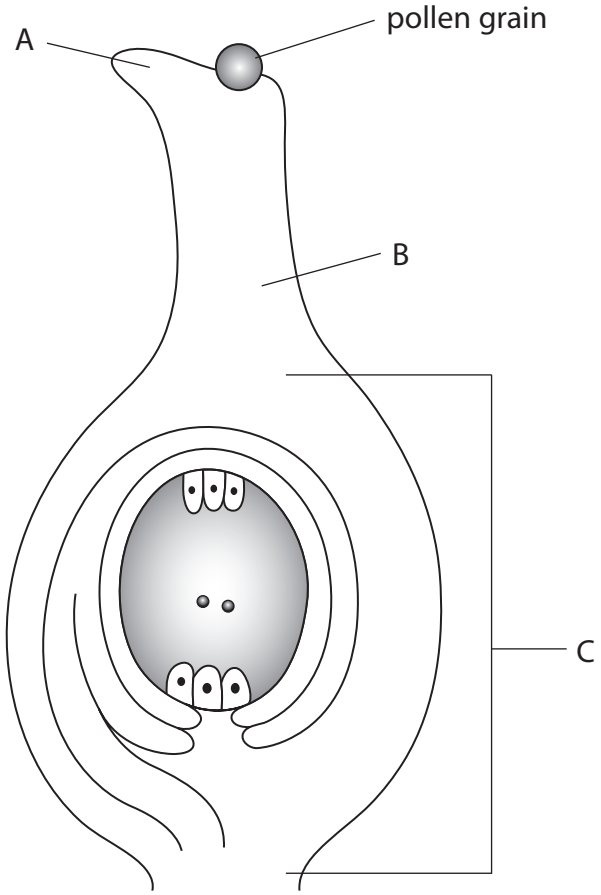
(Total for Question 9 = 14 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

10 (a) The diagram shows some of the structures involved in fertilisation in a flowering plant.



(i) Name the parts labelled A, B and C.

(3)

A .....

B .....

C .....

(ii) On the diagram, draw the path the pollen tube takes after the pollen grain has germinated.

(2)

(iii) Describe what happens to the structures in part C after fertilisation.

(2)

(b) A scientist investigates the effect of four different storage conditions on the germination of grass seeds.

She stores 500 seeds in each storage condition for two months.

She then counts the number of seeds that germinate when planted.

The table shows her results.

Storage condition	Number of seeds that germinate
wet and cold	476
dry and cold	444
dry and warm	440
wet and warm	432

(i) Calculate the percentage increase in the number of seeds that germinate in wet and cold conditions compared to the number of seeds that germinate in wet and warm conditions.

(2)

percentage increase = ... %

(ii) Suggest why fewer seeds germinate when they are stored in wet and warm conditions than in the other conditions.

(2)

.....

.....

.....

.....

(iii) Give one observation that shows a seed has germinated.

(1)

.....

.....

(Total for Question 10 = 12 marks)

TOTAL FOR PAPER = 110 MARKS

BLANK PAGE

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

BLANK PAGE