Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International GCSE

Time 2 hours

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

Biology

UNIT: 4BI1

Science (Double Award) 4BI1/4SD0

PAPER: 1B

You must have:
Ruler, calculator

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.*

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 ▶

P70972A

Q:1/1/1/

P 7 0 9 7 2 A 0 1 3 2

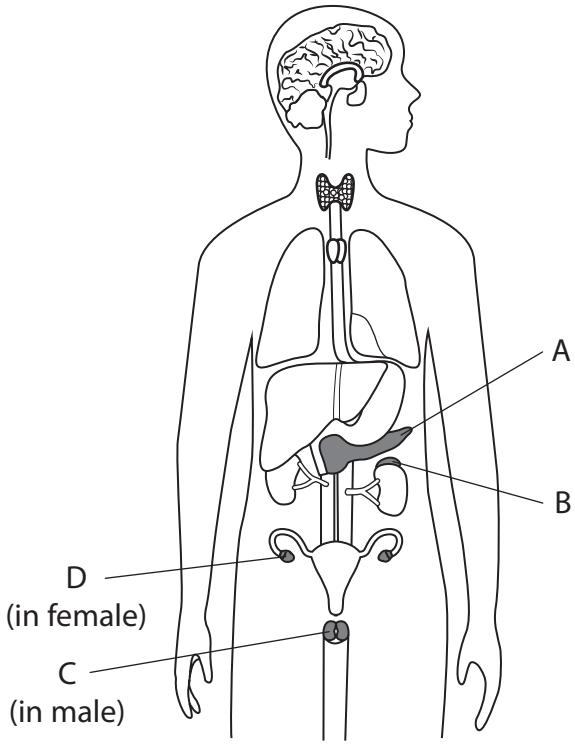
Pearson

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 human body has different hormones that are produced by endocrine glands.

(a) The diagram labels some of the endocrine glands in the body.



(i) Which gland produces insulin?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(ii) Which gland produces progesterone?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(b) The human body has two systems of communication, nervous and hormonal.

(i) Students research the speed of nervous and hormonal communication.

They find this data

- hormones travel at a speed of 420 centimetres per minute
- nerve impulses travel at a speed of 55 metres per second

Determine the ratio of the speed of nervous communication to the speed of hormonal communication.

Give your answer in the form n : 1

(3)

ratio = ...

(ii) Describe three other differences between the nervous system and the hormonal system.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for Question 1 = 8 marks)

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

2 Biologists classify organisms into different groups. One group of organisms is fungi.

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

(4)

Fungi do not carry out photosynthesis. Their body is usually organised into a mycelium made from thread-like structures called ..... .

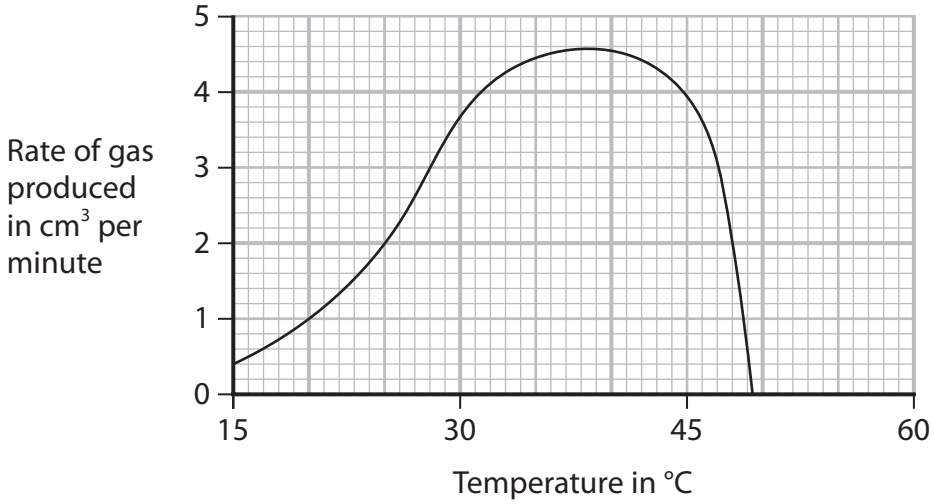
Fungal cell walls are made of ..... .

Fungi feed by extracellular secretion of ..... onto food material and absorption of the organic products. This is known as ..... nutrition.

(b) A student investigates the effect of temperature on the rate of anaerobic respiration in yeast.

The student measures the rate of gas produced in cm^3 per minute.

The graph shows their results.



(i) Name the gas produced by yeast during anaerobic respiration.

(1)

(ii) Explain the effect that increasing temperature has on the rate of gas production by the yeast.

(3)

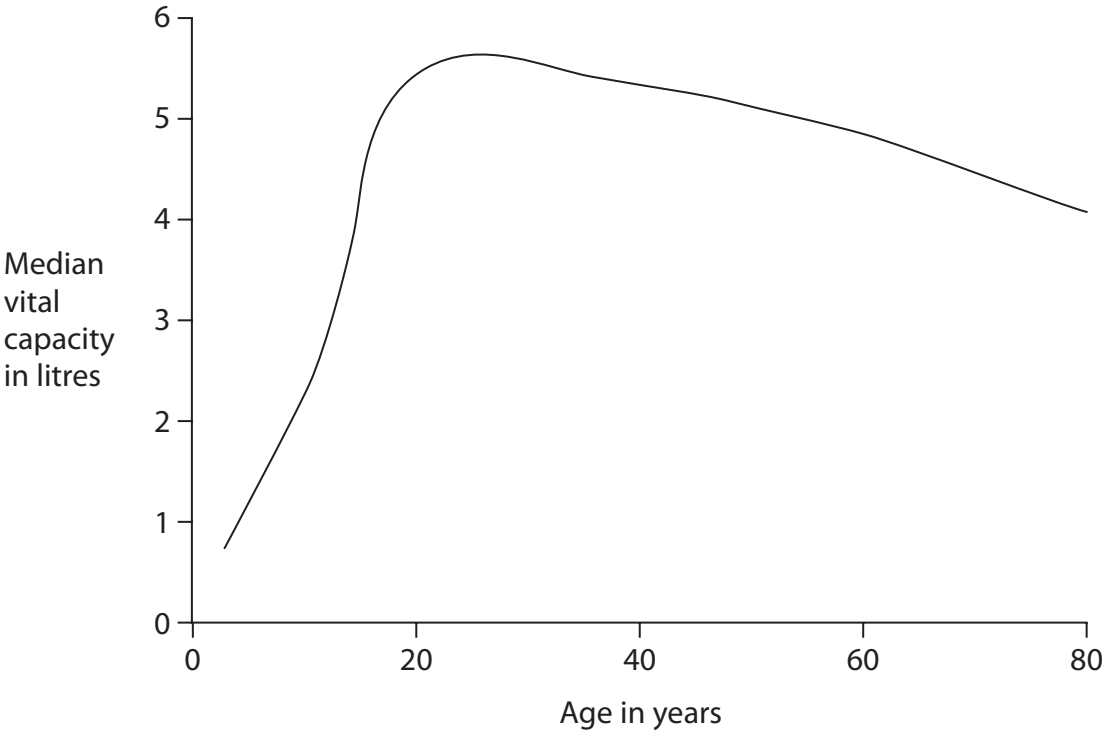
(iii) Describe how the student could measure the rate of gas production in this experiment.

(2)

(Total for Question 2 = 10 marks)

3 (a) Vital capacity is the maximum volume of air that a person can force out of their lungs in one breath.

The graph shows the relationship between vital capacity and age for a large number of people.



The vital capacity plotted is the median value for each age.

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

(1)

.....

.....

.....

(ii) Give a reason why the median is used rather than the mean.

(1)

.....

.....

.....

(iii) Describe the relationship between vital capacity and age shown by the graph.

(2)

(iv) Explain why vital capacity changes with age.

(2)

(v) Age is not the only variable that can change vital capacity.

Give two other variables that can affect a person's vital capacity.

(2)

1 .....

2 .....

(b) Describe a method you could use to demonstrate the effect of exercise on breathing rate in students.

(3)

(Total for Question 3 = 11 marks)

BLANK PAGE

4 Scientists collect data from a grassland ecosystem.

For each trophic level they determine

- the mean number of organisms in a square metre
- the mean dry mass of these organisms in a square metre

The table shows the scientists' data.

Trophic level	Mean number of organisms	Mean dry mass in g
producer	592	821.0
primary consumer	68	37.0
secondary consumer	35	10.60
tertiary consumer	3	2.40

(a) (i) Draw a labelled pyramid of numbers for this data.

(2)

(ii) Describe how you could collect data to find the mean number of producers per square metre in the ecosystem.

(3)

.....

.....

.....

.....

.....

.....

(b) The mass of organisms at each trophic level is called the biomass.

The percentage of biomass in the producers that is transferred to the primary consumers is 4.5%.

(i) Calculate the percentage of biomass in the secondary consumers that is transferred to the tertiary consumers.

(1)

percentage = ... %

(ii) Comment on the energy transfers in this ecosystem.

In your answer, refer to data from the table and the percentages of biomass transferred.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

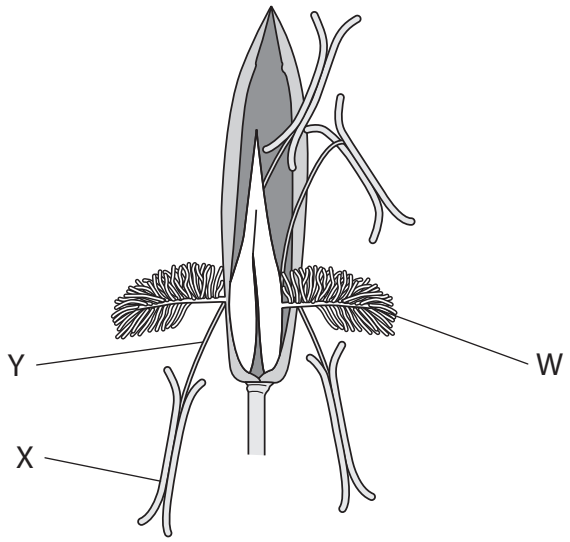
.....

.....

(Total for Question 4 = 10 marks)

BLANK PAGE

5 The diagram shows a wind-pollinated flower with some structures labelled W, X and Y.



(a) (i) Describe how structures W, X and Y are adapted for wind pollination.

(3)

(ii) Structures W, X and Y are adapted for wind pollination.

Give two other differences between wind-pollinated flowers and insect-pollinated flowers.

(2)

1 .....

.....

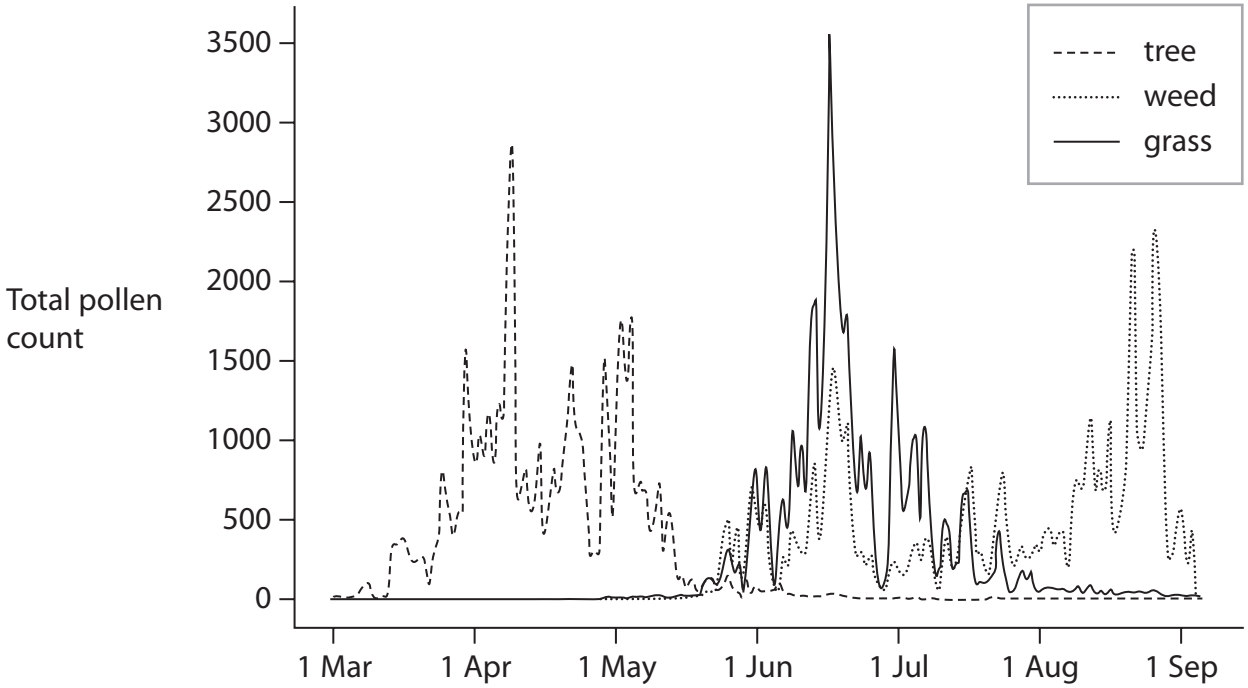
2 .....

.....

(b) Wind-pollinated flowers often cause an allergic response in people. This is known as hay fever.

Most people in the United Kingdom who get hay fever have the symptoms from April to September.

The graph shows the changes in total pollen count for three different plant types from March to September during one year in the United Kingdom.



As part of an investigation into pollen allergy, five people keep a diary of their hay fever symptoms. They do this for the same year as the pollen count.

The table gives their results.

Person	Months with severe symptoms	Months with mild symptoms	Months with no symptoms
A	April and May	March and June	July to September
B	June and July	March to May August	none
C	April to September	March	none
D	none	none	all
E	June to September	March to May	none

Using the data in the table and the information from the graph, discuss the likely causes of the allergic responses in each person.

(5)

(c) The allergic response to pollen is part of the body's immune response.

Explain what is meant by the term **immune response**.

(2)

(Total for Question 5 = 12 marks)

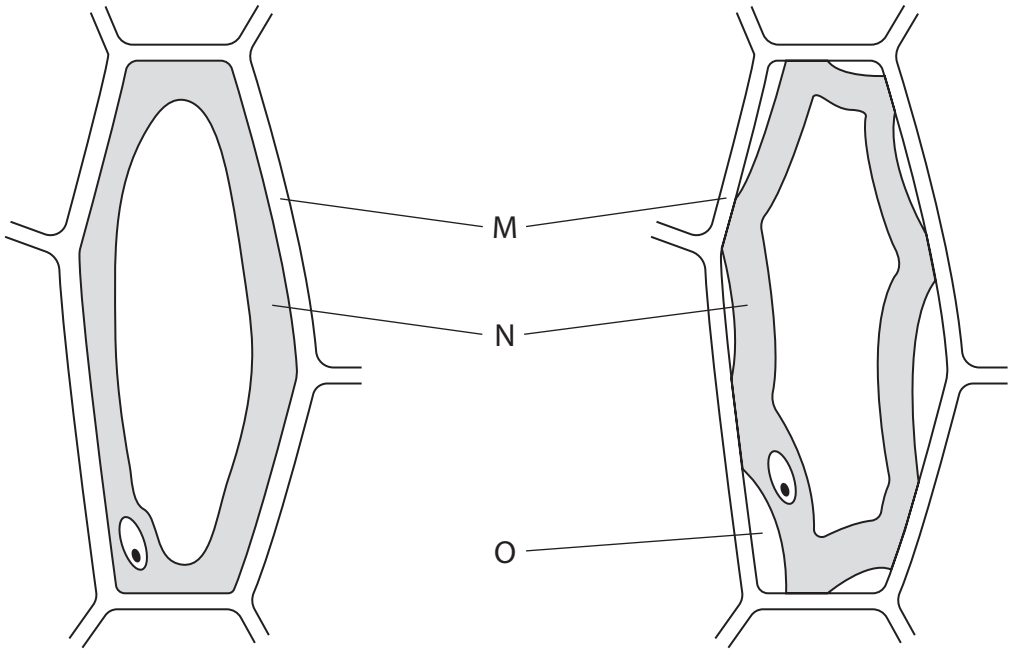
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

BLANK PAGE

6 The diagram shows a plant cell in distilled water and a plant cell in a concentrated solution of sodium chloride.



Cell in distilled water

Cell in concentrated solution of sodium chloride

(a) (i) Which structure is labelled M?

(1)

- ☒ **A** cell membrane
- ☒ **B** cell wall
- ☒ **C** nucleus
- ☒ **D** vacuole

(ii) Which structure is labelled N?

(1)

- ☒ **A** cell membrane
- ☒ **B** cell wall
- ☒ **C** cytoplasm
- ☒ **D** vacuole

(b) (i) Give the name of the liquid found in the gap labelled O in the cell in the concentrated solution of sodium chloride.

(1)

(ii) Explain the differences in the appearance of the cell in distilled water and the cell in the concentrated solution of sodium chloride.

(4)

(c) Describe an experiment you could do to show how different concentrations of sodium chloride solution affect the appearance of plant cells.

(4)

(Total for Question 6 = 11 marks)

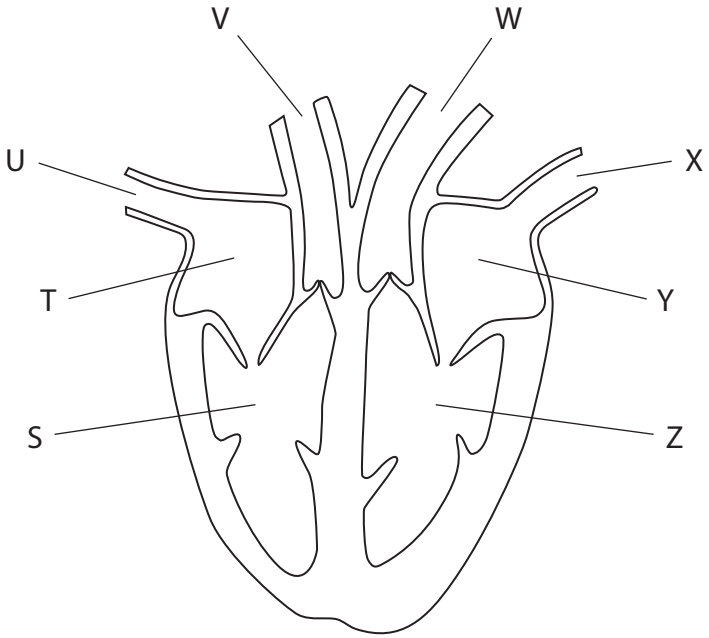
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

BLANK PAGE

7 (a) The diagram shows the human heart with four chambers and four blood vessels labelled.



(i) Which blood vessel brings deoxygenated blood to the heart?

(1)

- ☒ **A** U
- ☒ **B** V
- ☒ **C** W
- ☒ **D** X

(ii) Which chamber pumps oxygenated blood away from the heart?

(1)

- ☒ **A** S
- ☒ **B** T
- ☒ **C** Y
- ☒ **D** Z

(iii) Explain the difference in the wall of chamber S and the wall of chamber Z.

(3)

(b) Humans need a balanced diet for healthy growth and development.

Give the function of three different components of a balanced diet.

(3)

1

2

3

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(c) Scientists investigated the link between body mass and coronary heart disease in a population in Australia.

The scientists recorded the number of heart attacks in a population of 850 people for a period of 20 years.

They classified the people as normal mass, overweight or obese.

They calculated rates of heart attacks that allowed a valid comparison to be made between the groups.

Age in years	Calculated rate of heart attacks in arbitrary units		
	normal mass	overweight	obese
under 40	3.7	6.4	12.1
40 to 60	18.6	21.4	27.0
over 60	36.1	36.4	17.3
all ages	11.3	16.3	20.2

Evaluate what the data shows about the relationship between classification of body mass, age and heart attacks.

(5)

(Total for Question 7 = 13 marks)

8 Fur colour in rats is controlled by a gene with two alleles.

One allele codes for black fur colour. The other allele codes for agouti fur colour.

Several female rats with agouti coloured fur are mated with several male rats with black coloured fur.

All of the offspring have agouti coloured fur.

(a) (i) Explain which allele is dominant.

(2)

.....

.....

.....

.....

(ii) A male and female rat from these offspring are then mated together in a second cross.

Some of the offspring of this second cross have agouti coloured fur and some have black coloured fur.

Draw a genetic diagram to show this second cross. Include the genotypes of the parents, the gametes they produce, and the genotypes and the phenotypes of the offspring.

(4)

(iii) Calculate the probability of any one offspring from this second cross being male with agouti coloured fur.

(2)

probability = ...

(b) Scientists observed that genes that control fur colour in rats can affect rat behaviour, such as how tame they are.

Other genes that control the size of the adrenal glands and the production of neurotransmitters also affect rat behaviour.

Scientists also noticed that coat colour is associated with differences in anatomy and physiology, such as the size of the adrenal glands and the production of neurotransmitters.

(i) State the name of the type of genetic control where many genes control one phenotype.

(1)

.....

(ii) Explain why the size of the adrenal glands and the production of neurotransmitters would affect rat behaviour.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(c) Some rats with white fur also have pink eyes.

These rats have pink eyes because they do not have pigment in their irises.

This means that their irises let light pass through, unlike the coloured irises found in other rats.

Explain how this difference in the iris affects vision in the rats with pink eyes.

(3)

(Total for Question 8 = 15 marks)

9 Selective breeding has been used to develop modern varieties of wheat.

(a) Describe how scientists could use selective breeding to increase wheat yield.

(3)

(b) During a long-term study of selective breeding, scientists collected data for the mean yield of wheat in tonnes per hectare.

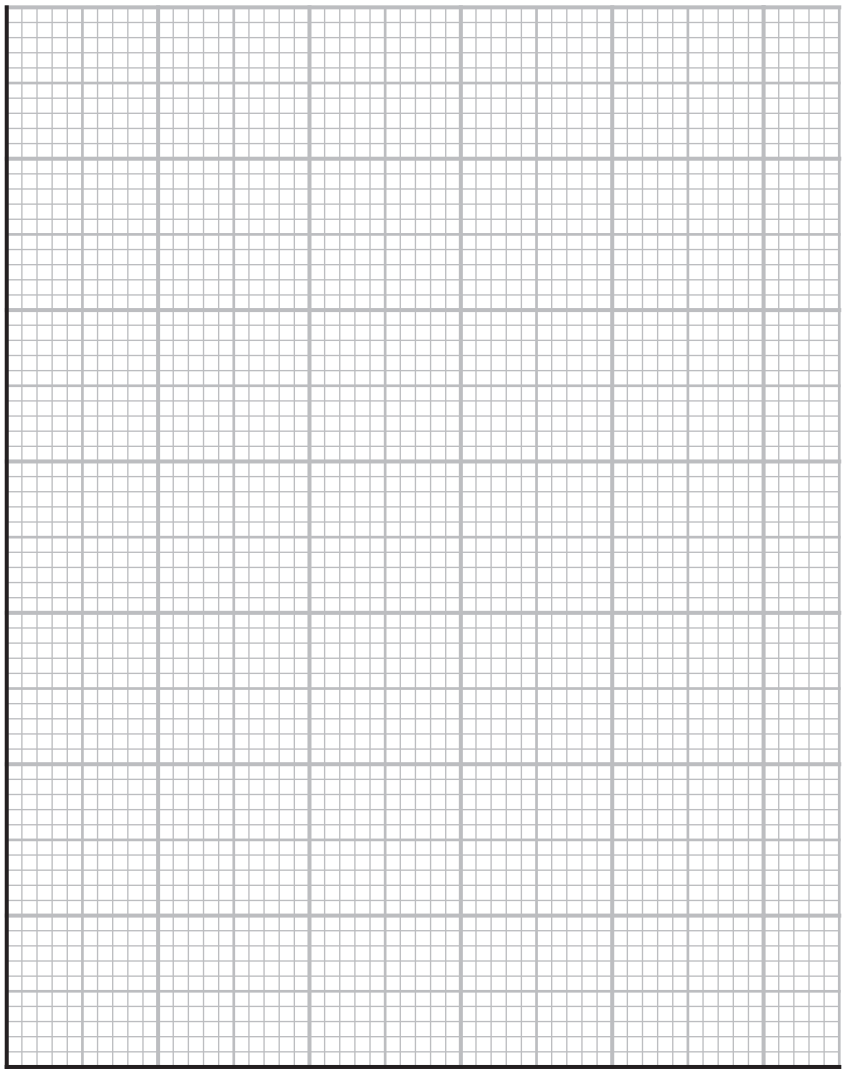
The table shows the scientists' data.

Year	Mean yield in tonnes per hectare
1840	2.6
1860	2.5
1880	2.4
1900	2.4
1920	2.5
1940	2.6
1960	2.8
1980	4.2
2000	5.3
2020	6.7

(i) Plot a line graph to show how the mean yield changes from 1840 to 2020.

Use a ruler to join the points with straight lines.

(5)



(ii) In 1960, a dwarf variety of wheat replaced the old variety.

Scientists compared the percentage change in yield for the two varieties.

The percentage change in yield per year from 1840 to 1960 was 0.06% per year.

Calculate the percentage change in yield per year from 1960 to 2020.

(3)

percentage change = ...%

(iii) Dwarf wheat has a shorter, thicker stem than the old variety.

Suggest why growing dwarf wheat is an advantage for farmers.

(3)

(Total for Question 9 = 14 marks)

10 There is a relationship between the colour of a flower and pollination by insects.

Design an investigation to find out if the colour of a flower affects how attractive it is to pollinators.

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

(6)

(Total for Question 10 = 6 marks)

TOTAL FOR PAPER = 110 MARKS

BLANK PAGE