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)

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

Turn over ▶

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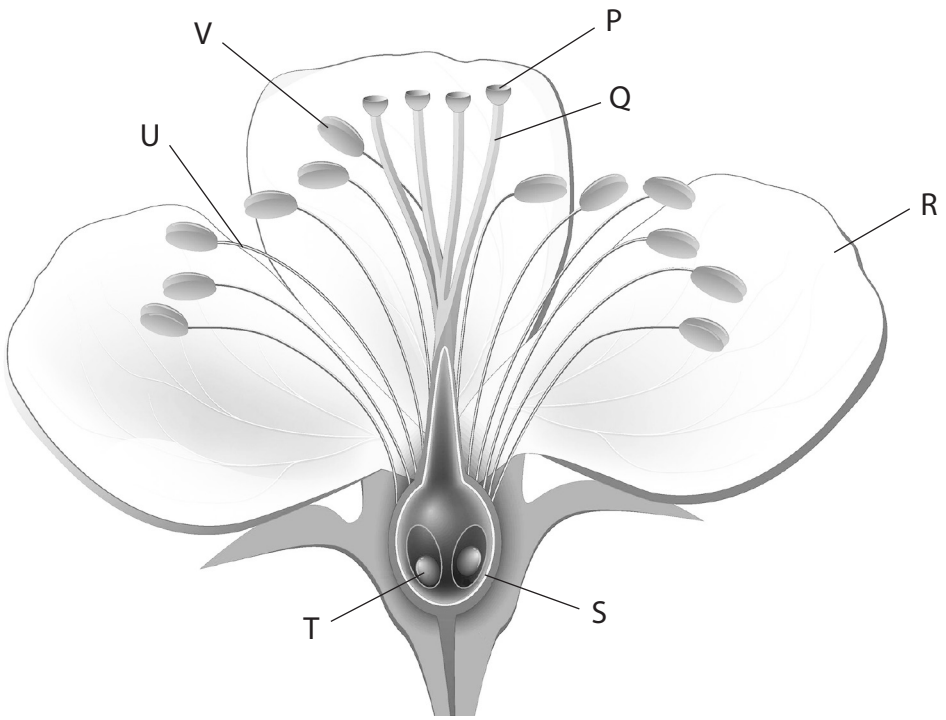
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Answer ALL questions.

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 a flower from an apple tree, with some structures labelled.



(Source: © Designua/Shutterstock)

(a) (i) This apple tree is able to self-pollinate. Which is the correct transfer of pollen during pollination?

(1)

☒ **A** P to Q

☒ **B** P to T

☒ **C** V to P

☒ **D** V to S

(ii) Which structure does the pollen tube grow down?

(1)

☒ **A** Q

☒ **B** U

☒ **C** V

☒ **D** R

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(iii) Which structure develops into the seed?

(1)

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

(b) The flower from an apple tree is insect-pollinated.

Give three differences between the structure of this apple flower and the structure of a wind-pollinated flower such as grass.

(3)

1 .....

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2 .....

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3 .....

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(c) The seeds of many plants are surrounded by sweet-tasting fruit.

Suggest how this enables the plants to spread their seeds.

(2)

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(Total for Question 1 = 8 marks)

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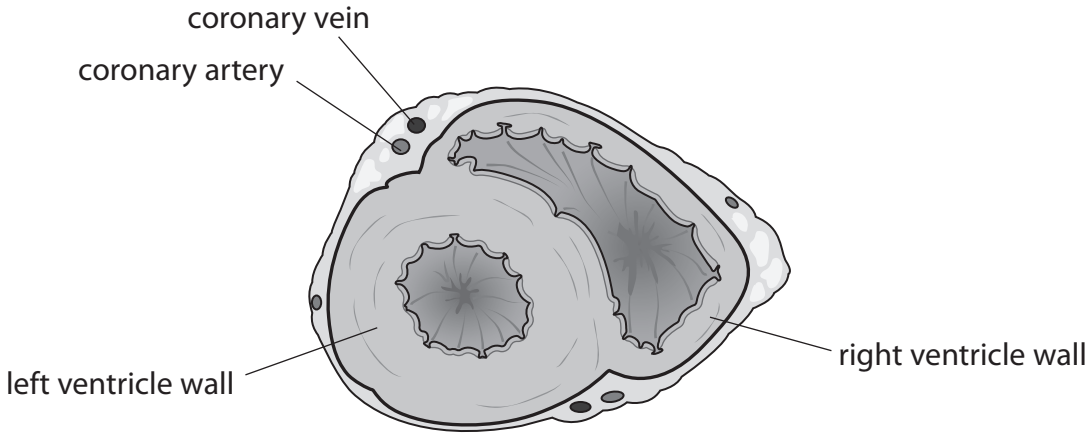
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2 The diagram shows a transverse section through a human heart.



(a) (i) Draw an X on the diagram to show the position of the septum.

(1)

(ii) State two differences between the composition of the blood in the coronary artery and the composition of the blood in the coronary vein.

(2)

1 .....

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2 .....

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(iii) Explain the differences between the left ventricle wall and the right ventricle wall.

(3)

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(b) The development of coronary heart disease is linked to a number of factors.

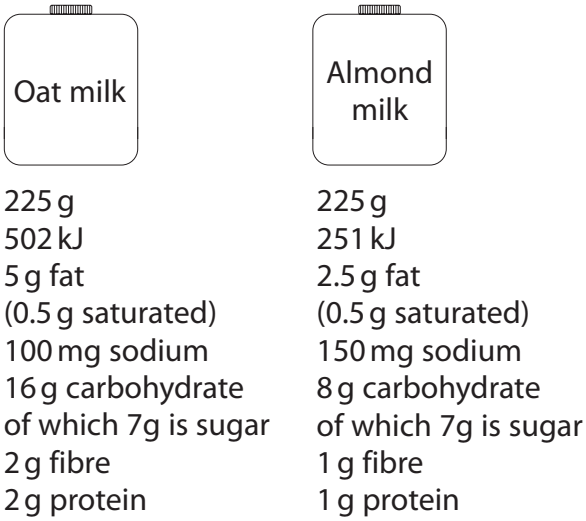
Explain how these factors can increase the risk of developing coronary heart disease.

(4)

(Total for Question 2 = 10 marks)

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3 The diagram shows the nutritional content of two non-dairy milk products, oat milk and almond milk.



(a) (i) A person is told by their doctor that they need to lose weight. Use the information from the milk contents and your own knowledge to discuss which milk would be the most suitable for this person.

(5)

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(ii) Suggest why a person might drink a non-dairy milk such as oat or almond milk rather than cow's milk.

(1)

(b) Describe how a student could test a milk sample for glucose.

(2)

(c) Human breast milk contains special proteins that give immunity to the baby.

Explain how these proteins can help protect the baby from disease.

(3)

(Total for Question 3 = 11 marks)

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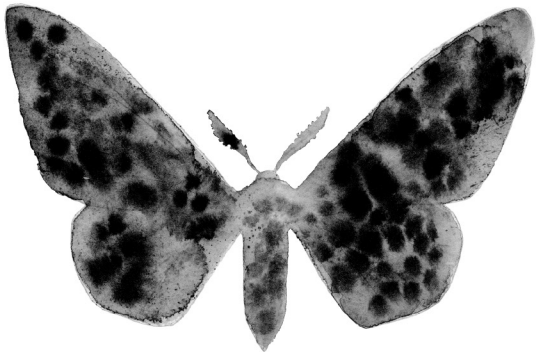
4 The peppered moth is found in many countries.

Two different forms of the peppered moth are a light-coloured moth and a dark-coloured moth.

The dark-coloured moth was first observed in cities when pollution, from burning coal, stained tree trunks black.



Light-coloured moth



Dark-coloured moth

(Source: © KBel/Shutterstock)

Scientists trapped moths in a city location from 1992 to 1998.

The table shows the scientists' results.

Year	Number of light-coloured moths	Number of dark-coloured moths
1992	9	27
1993	11	18
1994	11	7
1995	5	1
1996	1	4
1997	8	1
1998	13	9

(a) Calculate the difference between the percentage of moths that are dark-coloured in 1992 and the percentage of moths that are dark-coloured in 1998.

(3)

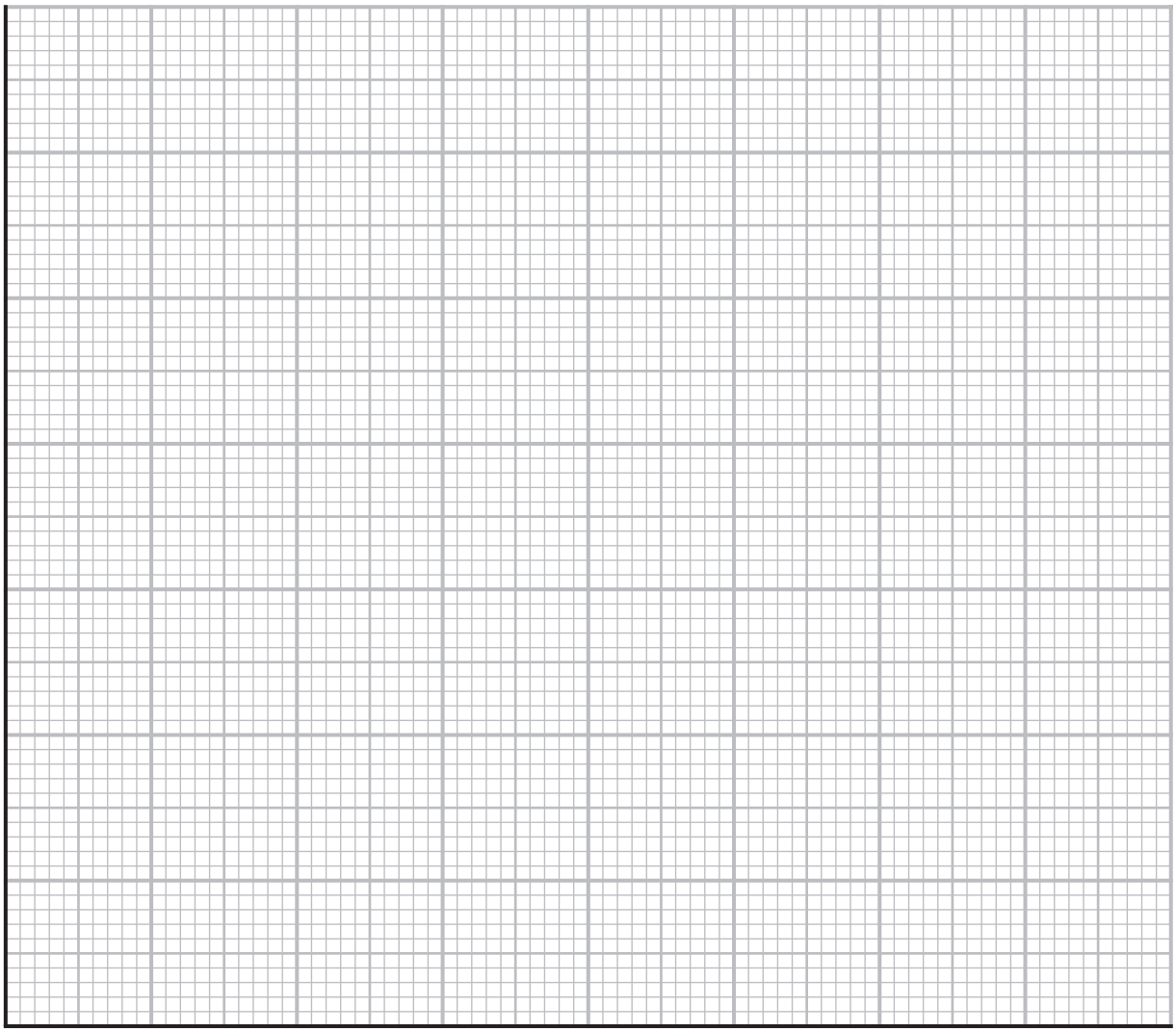
difference = ...%

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(b) (i) Plot a line graph to show the number of light-coloured moths and the number of dark-coloured moths from 1992 to 1998.

Use a ruler to join the points with straight lines.

(5)



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(ii) In the 1990s, many cities introduced laws that prevented the burning of coal.

Comment on the changes in the number of light-coloured moths and the number of dark-coloured moths between 1992 and 1998.

(5)

(Total for Question 4 = 13 marks)

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5 The chromosomes in a human cell can be photographed and then arranged in pairs to show the karyotype.

White blood cells are often used to show the chromosomes in the karyotype.

The chromosomes in white blood cells are larger and easier to see when the white blood cells divide.

Diagram 1 shows a karyotype.

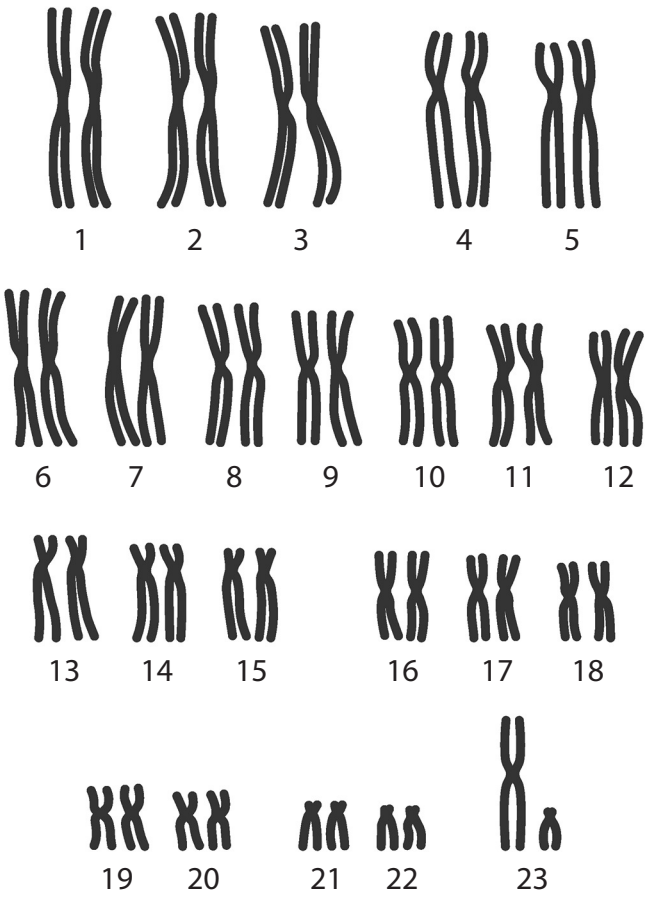


Diagram 1

(Source: © Dee-sign/Shutterstock)

(a) (i) Explain why a red blood cell cannot be used to show a karyotype.

(2)

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.....

(ii) State the type of cell division that occurs in white blood cells.

(1)

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(iii) The karyotype in diagram 1 is from a male.

State how this can be deduced from the diagram.

(1)

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.....

(b) Diagram 2 shows a karyotype from a white blood cell of another person.

The karyotype is from a female, and the person has a condition called Turner syndrome.

This condition affects the development of the ovaries so they may not produce normal quantities of sex hormones.

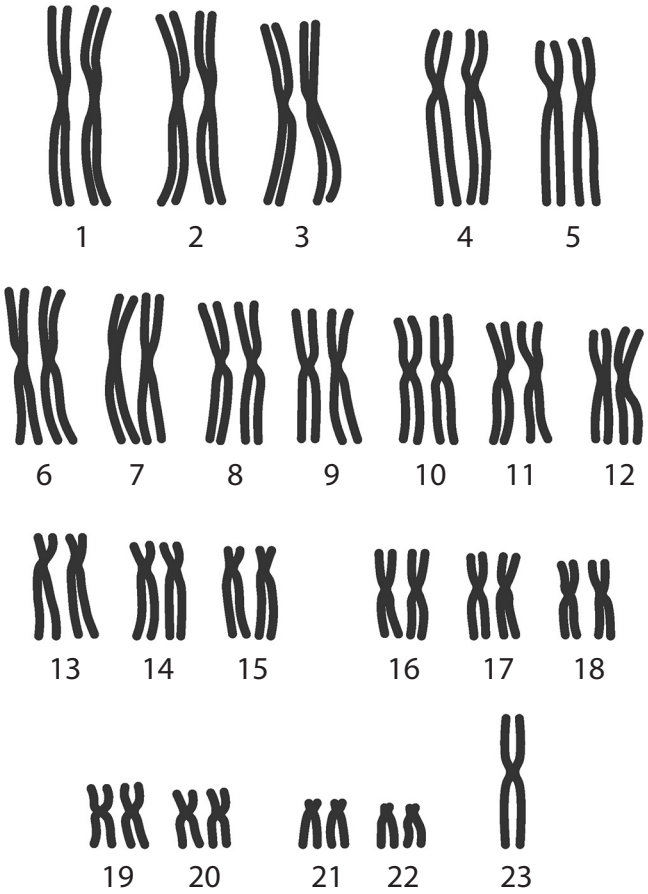


Diagram 2

(Source: © Dee-sign/Shutterstock)

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(i) Comment on the differences between the karyotypes shown in diagram 1 and diagram 2 and the effects Turner syndrome will have on the person.

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

(4)

(ii) Suggest how the difference in the chromosomes of people with Turner syndrome may have been produced.

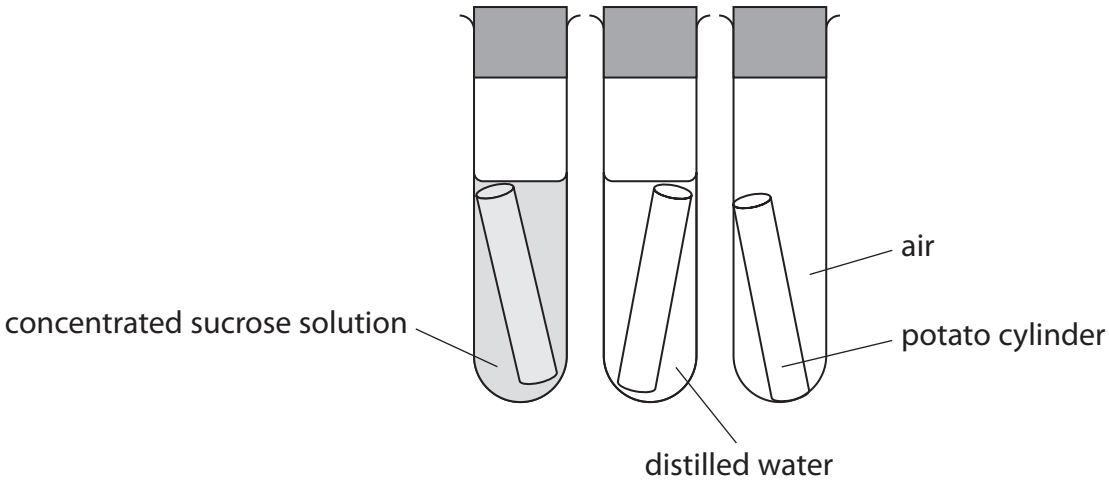
(1)

(Total for Question 5 = 9 marks)

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6 A student uses this method to investigate osmosis in potato tissue.

- cut three 5.0 cm long cylinders from a raw potato
- dry the cut surfaces using filter paper
- measure the mass of each cylinder using a balance
- place one cylinder in a test tube containing 10 cm^3 of concentrated sucrose solution, one cylinder in a test tube containing 10 cm^3 of distilled water and one cylinder in an empty test tube
- put a bung in each test tube and leave them for one hour
- remove the cylinders and dry them with filter paper
- measure the mass of each cylinder again
- measure their lengths using a ruler



(a) (i) Describe what is meant by the term **osmosis**.

(2)

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

(1)

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(b) Osmosis is affected by the surface area and volume of the cylinders, so the student keeps the original surface area and volume of each cylinder the same.

At the start of the experiment each cylinder had a radius of 0.25 cm and a length of 5.0 cm.

(i) Calculate the surface area of each cylinder using this formula.

$$\text{surface area} = 2\pi rl + 2\pi r^2$$

[l = length of cylinder, r = radius of cylinder and $\pi = 3.14$]

(2)

surface area = ... cm^2

(ii) Explain how surface area would affect the rate of osmosis.

(2)

.....

.....

.....

.....

(iii) State another variable the student should control in the investigation.

(1)

.....

(c) The table shows the student's results for the mass of the cylinders.

Tube contents	Original mass in g	Final mass in g	Change in mass in g
concentrated sucrose solution	2.1	1.8	–0.3
distilled water	2.1	2.3	0.2
air	2.2	2.1	–0.1

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(i) Explain the changes in the mass of the potato cylinder in each test tube.

(3)

(ii) The student also measured the change in length of each potato cylinder.

Assuming the length has the same percentage change as the mass, calculate the final length of the cylinder in the concentrated sucrose solution.

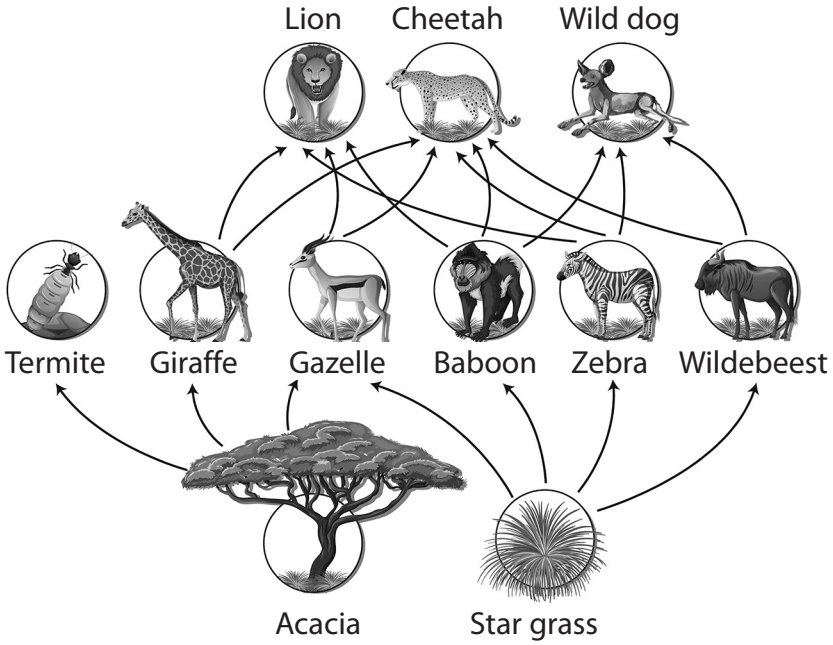
(3)

length = ... cm

(Total for Question 6 = 14 marks)

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7 This food web is from an ecosystem in Africa.



(Source: © BlueRingMedia/Shutterstock)

(a) (i) Which organism is a primary consumer?

(1)

☒ **A** acacia

☒ **B** lion

☒ **C** star grass

☒ **D** zebra

(ii) Which of these has the least efficient energy transfer?

(1)

☒ **A** giraffe to cheetah

☒ **B** star grass to baboon

☒ **C** wildebeest to wild dog

☒ **D** zebra to lion

(iii) Which organism will be least affected by a reduction in the population of star grass?

(1)

☒ **A** baboon

☒ **B** gazelle

☒ **C** wildebeest

☒ **D** zebra

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(b) (i) Explain why only a small proportion of the energy contained within one trophic level is transferred to the next trophic level.

(4)

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(ii) Describe how a scientist could compare the population size of star grass in two areas of the ecosystem.

(4)

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(c) Wild dogs hunt a variety of prey species. They usually eat the weak and sick animals.

Explain how this behaviour may benefit the species the dogs hunt.

(3)

(Total for Question 7 = 14 marks)

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8 Yeast can be used in food production.

(a) (i) Which group of organisms does yeast belong to?

(1)

- ☒ **A** bacteria
- ☒ **B** fungi
- ☒ **C** plants
- ☒ **D** protoctists

(ii) Which substance is the cell wall of a yeast cell made of?

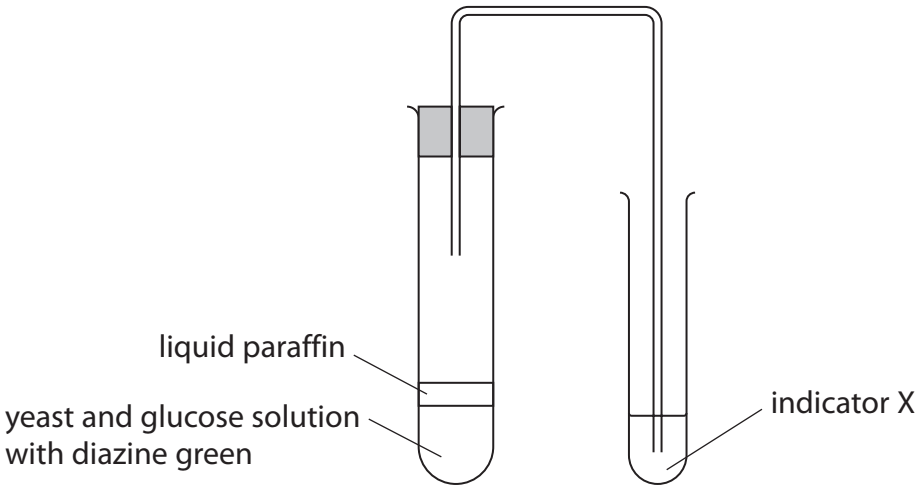
(1)

- ☒ **A** cellulose
- ☒ **B** chitin
- ☒ **C** sucrose
- ☒ **D** starch

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(b) A teacher sets up an experiment to investigate the effect of temperature on the rate of respiration in yeast.

The diagram shows part of the apparatus the teacher uses.



(i) Explain what additional apparatus the teacher will need to investigate the effect of temperature on the rate of respiration in this experiment.

(2)

(ii) State the purpose of the liquid paraffin on the surface of the glucose solution.

(1)

(iii) Give the name of a suitable chemical that could be used as indicator X to show that the yeast is respiring.

(1)

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(iv) Diazine green changes colour from blue to pink as the oxygen levels in the yeast and glucose solution reduce.

Explain how this colour change gives information about the respiration in the yeast.

(2)

(c) Explain why the rate of respiration in the yeast will change as the temperature is increased.

(4)

(Total for Question 8 = 12 marks)

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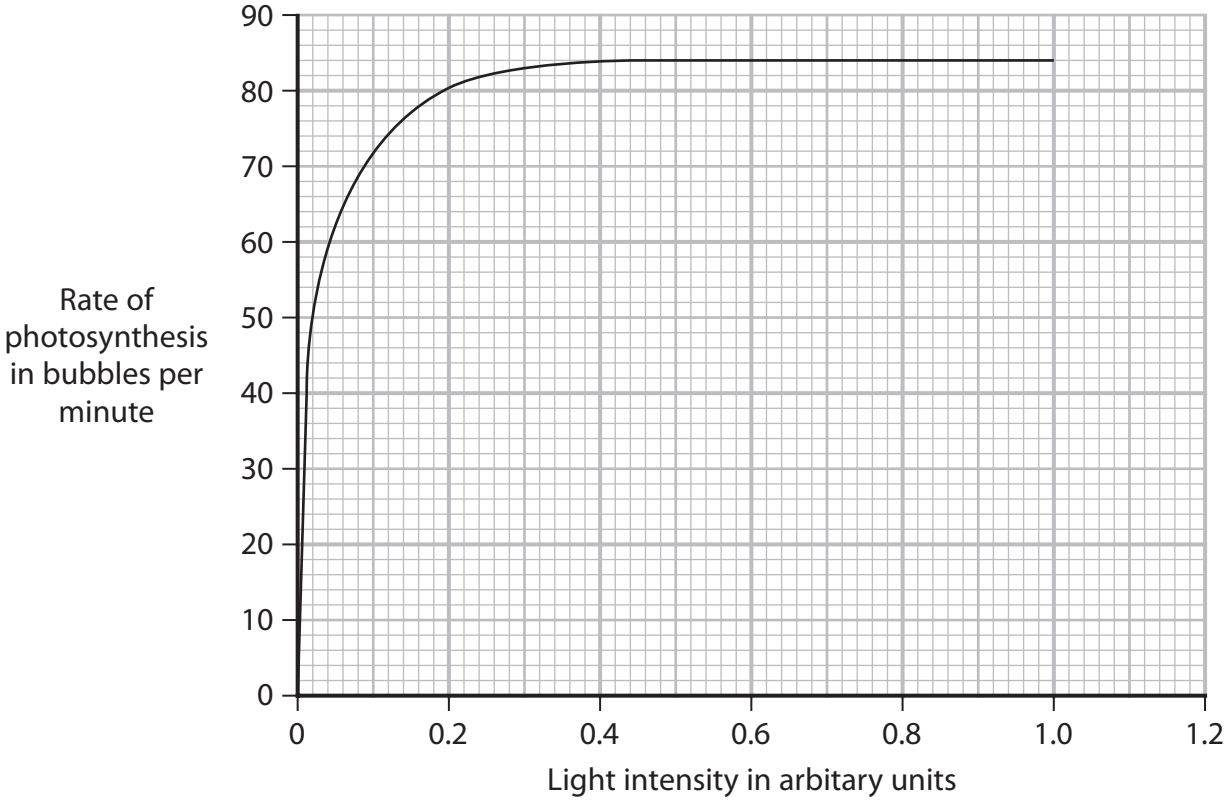
9 Plants need light for photosynthesis.

(a) Give the balanced chemical symbol equation for photosynthesis.

(2)

..... + ... ⟶ ..... + ...

(b) The graph shows the effect of light intensity on the rate of photosynthesis in a water plant.



The rate of photosynthesis is measured by counting the number of bubbles of gas released per minute.

The light intensity is decreased by moving a lamp further away from the water plant.

The light intensity is calculated as

$$= 1 \div (\text{distance in cm of lamp from plant})^2$$

(i) Using information from the graph, calculate the distance of the lamp from the plant when the rate of photosynthesis is 78 bubbles per minute.

(2)

distance = ... cm

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(ii) Describe the relationship between the number of bubbles per minute and light intensity.

(3)

(iii) Explain the rate of photosynthesis between a light intensity of 0.4 arbitrary units and a light intensity of 0.8 arbitrary units.

(2)

(Total for Question 9 = 9 marks)

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10 (a) The table gives some information about enzymes in the human digestive system.

Complete the table by giving the missing information.

(4)

Substrate	Enzyme	Products of digestion
starch		maltose
maltose	maltase	
	protease	amino acids
lipids	lipase	

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(b) Some scientists have investigated the effect of vinegar (a weak acid) on the digestion of starch.

Design an investigation to discover the effect of vinegar on the digestion of starch.

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

(6)

(Total for Question 10 = 10 marks)

TOTAL FOR PAPER = 110 MARKS

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