

Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCE

Biology

Advanced Subsidiary

Unit 2: Development, Plants and the Environment

Monday 21 May 2012 – Afternoon

Time: 1 hour 30 minutes

Paper Reference

6BI02/01

You do not need any other materials.

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 80.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
– *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*
- Candidates may use a calculator.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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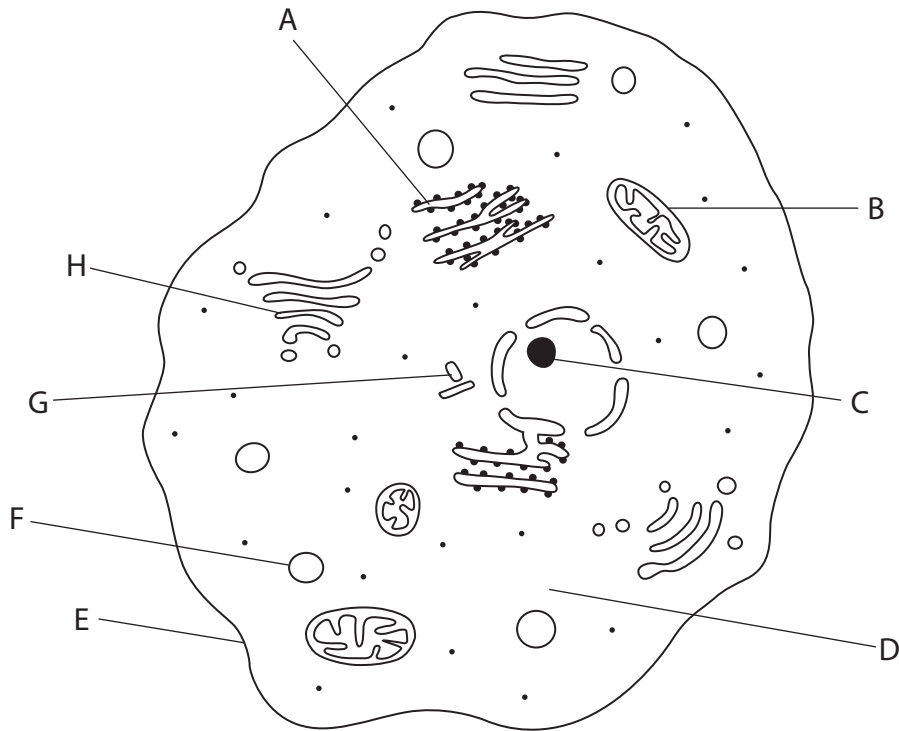


PEARSON

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 below shows a typical animal cell as seen using an electron microscope.



- (a) Name the organelles labelled A, B and C shown on the diagram.

(3)

A

B

C

- (b) Give the letter of the organelle that doubles just before mitosis and then separates to opposite poles of the cell during mitosis.

(1)

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(c) Give the letter of the organelle that would **not** be present when this cell is undergoing mitosis.

(1)

(d) Place a cross (☒) in the correct box next to the following statements.

(2)

Statement	Yes	No
The structure labelled D is present in both animal and plant cells.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
The structure labelled E is the outermost layer in both animal and plant cells.	<input type="checkbox"/>	<input checked="" type="checkbox"/>

(Total for Question 1 = 7 marks)



- 2 Read through the following passage about plant cell walls and transport. Write on the dotted lines the most appropriate word or words to complete the passage.

(5)

Many β (beta) molecules join together to

form, the polysaccharide found in plant cell walls.

When these polysaccharides are next to each other, bonds

form and a microfibril is made.

To aid transport of materials from one plant cell to the next cell, there are areas

with reduced cell walls called and areas with no cell

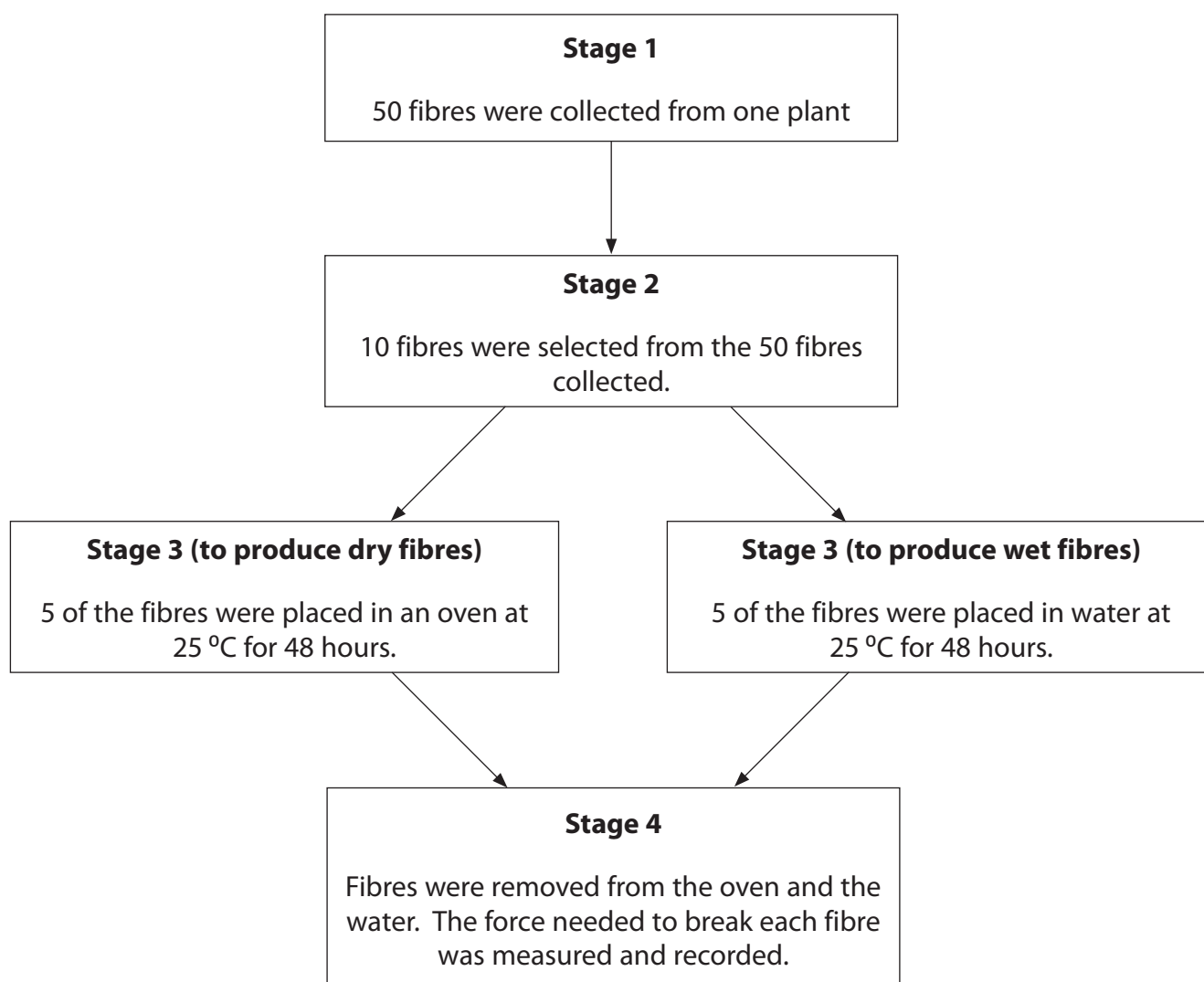
walls called

(Total for Question 2 = 5 marks)



- 3 An investigation was carried out to measure the force needed to break wet and dry plant fibres.

The diagram below shows some of the stages involved in this investigation.



- (a) (i) Explain why the fibres were collected from only one plant in stage 1.

(1)



(ii) Suggest **two** factors that should be kept constant when selecting the 10 fibres from the 50 in stage 2.

(2)

1

2

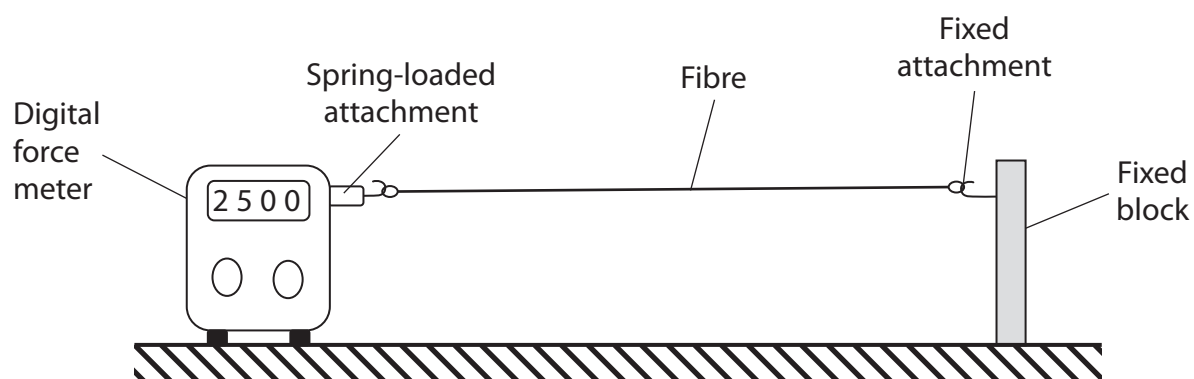
(iii) Suggest why all fibres were kept at the same temperature in stage 3.

(1)

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(b) The diagram below shows the equipment used in stage 4 to find the force needed to break each fibre.



Suggest why safety glasses should be worn when using the apparatus shown in the diagram.

(1)

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(c) The table below shows the results of this investigation.

Sample	Force needed to break each fibre / arbitrary units	
	Wet	Dry
1	4200	2800
2	3800	2900
3	4100	2600
4	4100	2700
5	3100	2800
Mean	3860	2760

- (i) Compare the mean force needed to break the wet fibres with the mean force needed to break the dry fibres.

(2)

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- (ii) State which of these two sets of data is less reliable. Give reasons for your answer.

(3)

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(d) A student observed that dry fibres 3, 4 and 5 each had a knot in the middle of their length and that they broke at the knot. She used this observation to state that the recorded force needed to break these three dry fibres was an underestimate.

(i) Suggest **one** piece of evidence from the table that supports her statement. (1)

(ii) Suggest **one** piece of evidence from the table that does **not** support her statement. (1)

(Total for Question 3 = 12 marks)



4 Meiosis is involved in the production of gametes such as human egg cells and sperm cells.

(a) An investigation was carried out to study the effect of changing the temperature on spindle fibre formation in human egg cells during meiosis.

Five human egg cells undergoing meiosis at 37 °C were incubated at 25 °C for 10 minutes and then returned to 37 °C. After 20 minutes, the number of egg cells showing spindle fibre formation was recorded.

The investigation was repeated at three different incubation temperatures.

The results are shown in the table below.

Incubation temperature / °C	Number of human egg cells used	Number of human egg cells showing spindle fibre formation
25	5	0
28	5	2
33	5	5
37	5	5

(i) Suggest why some of the human egg cells were incubated at 37 °C throughout this investigation.

(1)

(ii) Using the information in the table, describe the effect of temperature on spindle fibre formation in human egg cells.

(2)



(b) A student made the statement that all 5 cells would have shown spindle fibre formation if the incubation temperature had been either 35 °C or 31 °C.

(i) Using the information in the table, give evidence to support part of this statement.

(2)

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(ii) Using the information in the table, give evidence that may **not** support part of this statement.

(2)

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*(c) Describe and explain **three** ways in which a human sperm cell is specialised for its function.

(6)

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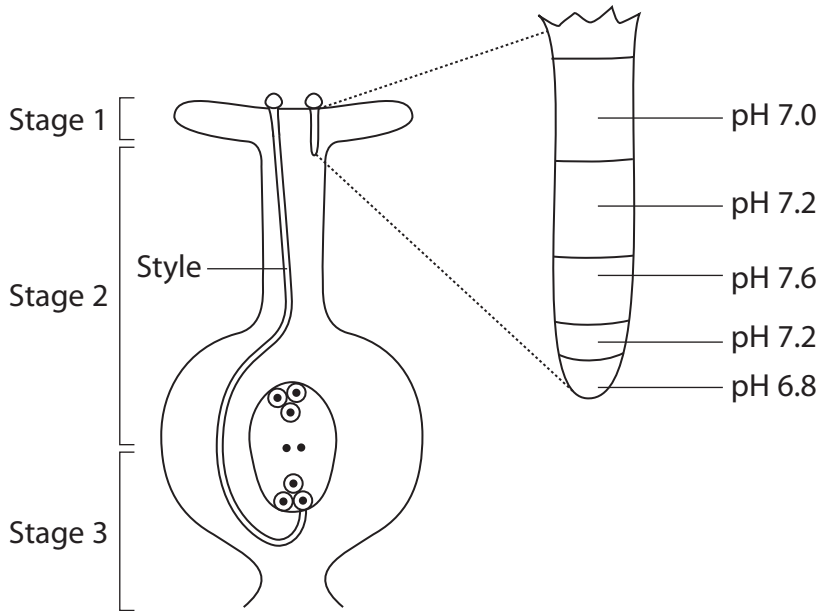
(Total for Question 4 = 13 marks)



5 Sexual reproduction in plants includes the transfer and fusion of gametes.

The diagram below shows part of a flower with two pollen grains and their pollen tubes.

The diagram also shows an enlargement of one of the pollen tubes and the pH of the cytoplasm in each region of this tube.



(a) At stage 1, the pollen grain contains the haploid generative nucleus.
Explain what is meant by the term **haploid nucleus**.

(2)

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(b) Describe the changes in the pH of the pollen tube shown in the diagram.

(2)

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*(c) At stage 2, amino acids are absorbed into the cytoplasm of the pollen tube. These amino acids are used to synthesise proteins such as enzymes. These enzymes are transported through the cytoplasm and then secreted into the style.

Suggest what happens to the amino acids from when they are absorbed into the cytoplasm until they are secreted as enzymes into the style.

(5)

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(d) During stage 3, the generative nucleus divides to form two male nuclei and the pollen tube fuses with the embryo sac.

Describe what happens to each of these two male nuclei.

(2)

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(Total for Question 5 = 11 marks)



6 Before a new drug can become available for use it has to pass a contemporary drug testing protocol. This includes three-phased testing.

(a) A drug may fail at any of the three phases.

Place a cross (☒) in the box next to the phase at which the drug would have failed.

(2)

(i) The drug did **not** improve the condition it was designed to treat in humans.

A Phase 1

B Phase 2

C Phase 3

(ii) The effect of the drug was different in humans from its effect in animals.

A Phase 1

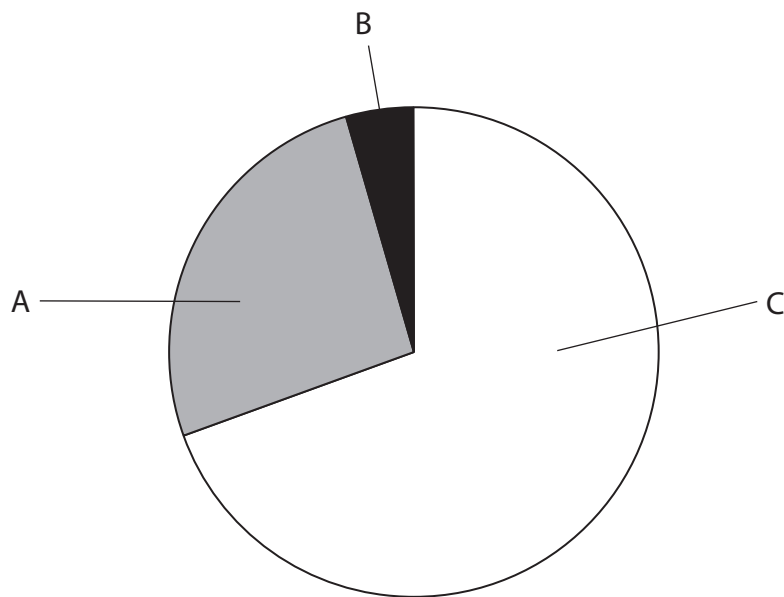
B Phase 2

C Phase 3



(b) The number of people tested is different in each phase.

The pie chart below shows the number of people tested in each phase of a drug trial.



Suggest which of the letters A, B or C, represents phase 3.
Give a reason for your answer.

(2)

Letter

Reason

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(c) The table below shows the mean percentage improvement of a condition in humans, when given one of three different treatments.

Treatment	Percentage improvement of a condition (%)	
	Range	Mean
Placebo	18 – 22	20
Drug P	45 – 51	49
Drug Q	41 – 51	46

Both drugs P and Q passed the three-phased testing protocol. However, only drug P was made available for use.

Using the information in the table, suggest reasons why **only** drug P was made available.

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(d) The table below gives three statements about William Withering's use of digitalis and contemporary drug testing protocols.

If the statement is correct for **both** of these place a tick (✓) in the box, and if it is not correct for **both**, place a cross (✗) in the box.

(3)

Statement	Tick (✓) or cross (✗)
Correct dosage investigated	
Tested on animals	
A double blind trial undertaken	

(Total for Question 6 = 11 marks)



7 Plants are complex organisms that contain different tissues and organs.

(a) Explain what is meant by the term **tissue**.

(2)

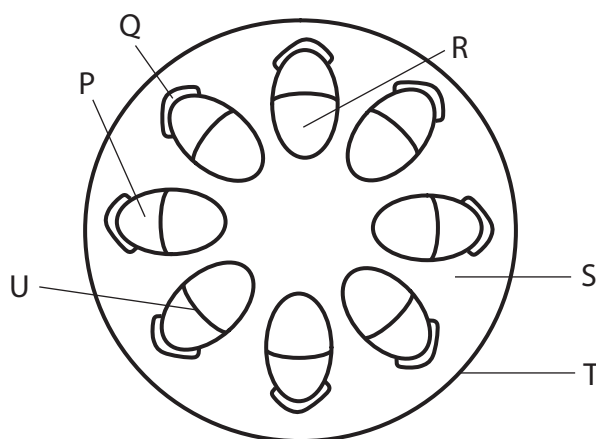
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(b) The diagram below shows a section through one organ of a plant and some of its tissues labelled P to U.



For each of the following statements place a cross (☒) in the box next to the correct answer.

(2)

(i) The organ shown in the diagram is a

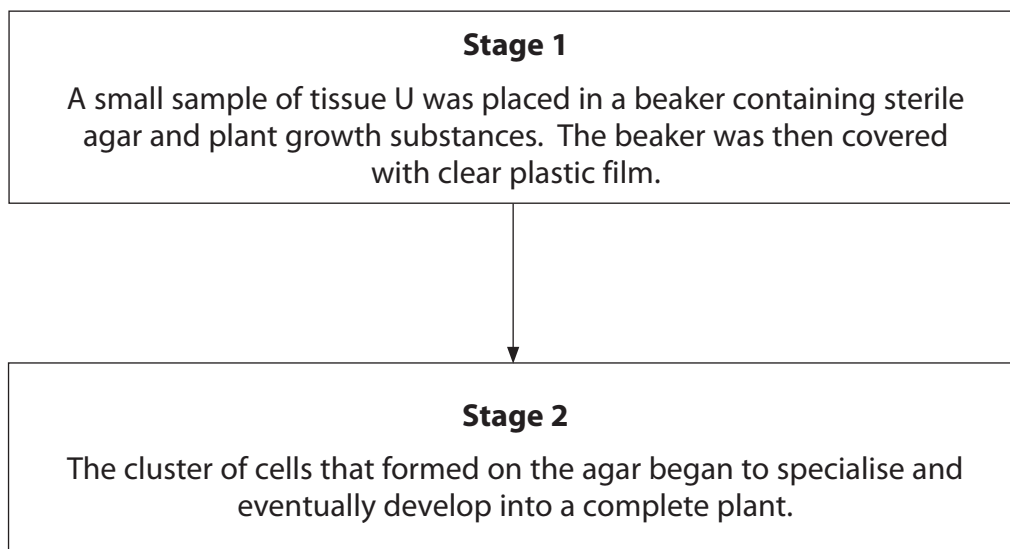
- A leaf
- B root
- C stem
- D vascular bundle

(ii) **Two** tissues that contain lignin are labelled

- A P and Q
- B Q and R
- C R and S
- D S and T



- (c) The diagram below shows two of the stages in a plant tissue culture technique, used to demonstrate totipotency in the plant tissue labelled U on the diagram on page 19.



- (i) Suggest **one** safety reason for covering the beaker with clear plastic film in stage 1.

(2)

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- (ii) Suggest **one** reason, other than for safety, for covering the beaker with clear plastic film.

(1)

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(iii) No plant would develop if the plant tissue labelled R, on page 19, was used instead of plant tissue U.

Suggest reasons why no plant would develop if tissue R was used.

(3)

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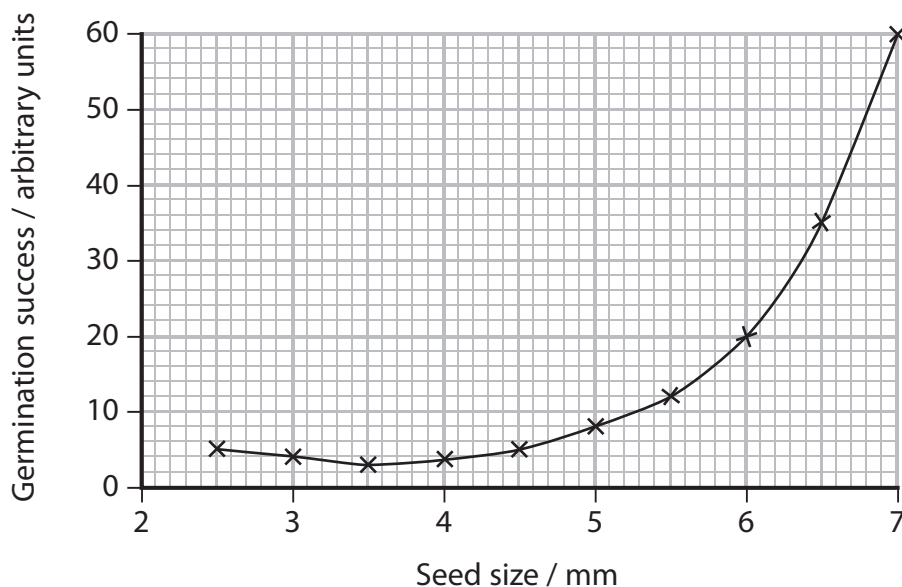
(Total for Question 7 = 10 marks)



8 Seedbanks help in the long-term conservation of rare plant species by conserving the seeds of these species.

- (a) Seedbanks carry out a variety of tests to select the best individual seeds to conserve. The germination success of the seeds is one of the tests that is carried out.

The graph below shows the effect of seed size on germination success for one species of plant.



- (i) Using the information in the graph, suggest which seed size would be considered the best for the seedbank to conserve, giving a reason for your answer.

(1)

- (ii) Using the information in the graph, calculate the percentage change in germination success when seed size increases from 3 mm to 6 mm. Show your working.

(3)

Answer %



(iii) Seed size may be determined by the genotype of the seeds.
Suggest advantages of selecting seeds of different sizes for long-term storage. (3)

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(b) The best seeds will be selected for the seedbank.
Describe what the seedbank will do with these seeds to ensure the long-term conservation of the species. (4)

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(Total for Question 8 = 11 marks)

TOTAL FOR PAPER = 80 MARKS



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