

1)

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.

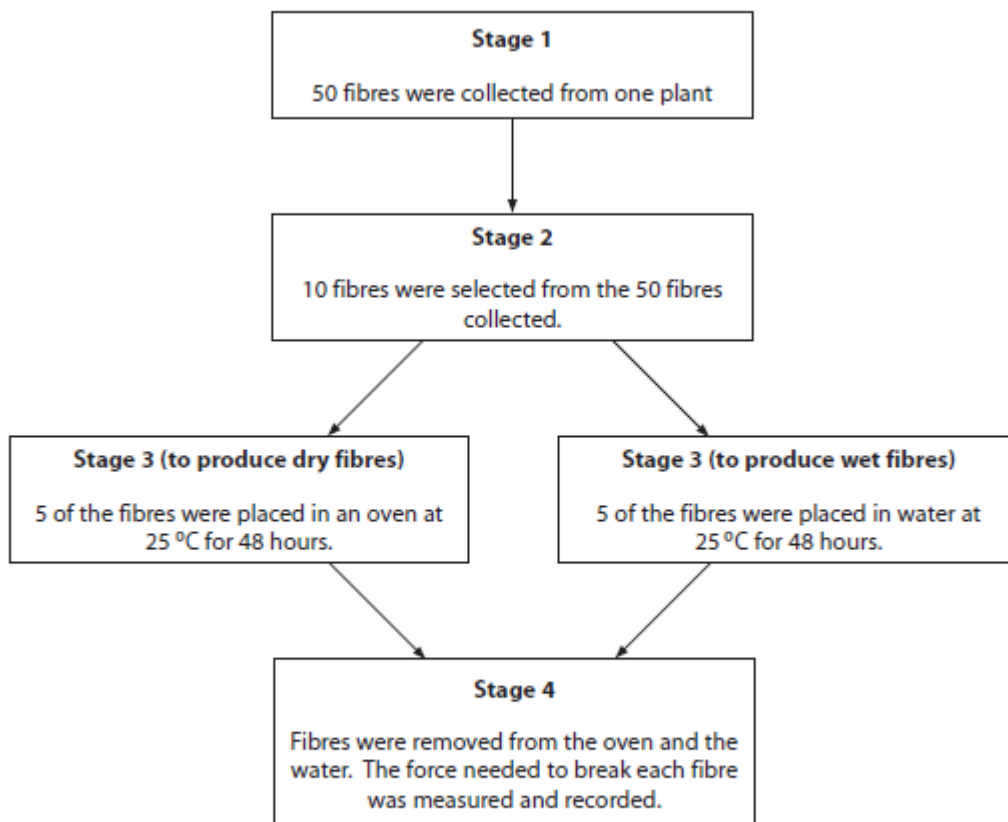
(5)

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

2)

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

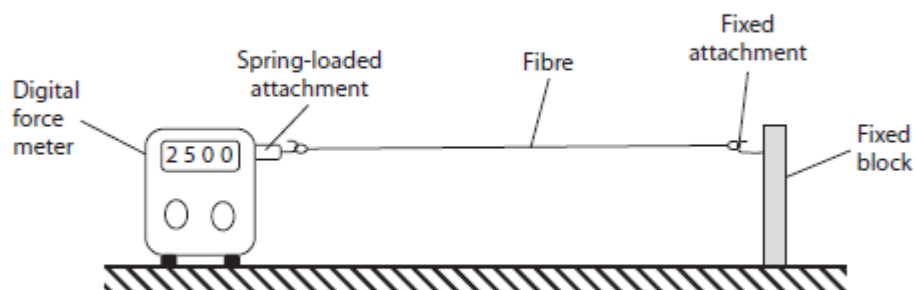
The diagram below shows some of the stages involved in this investigation.



(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)
- (iii) Suggest why all fibres were kept at the same temperature in stage 3. (1)
- (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)

(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)
- (ii) State which of these two sets of data is less reliable. Give reasons for your answer. (3)
- (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)

3)

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.

(i) The drug did **not** improve the condition it was designed to treat in humans. (2)

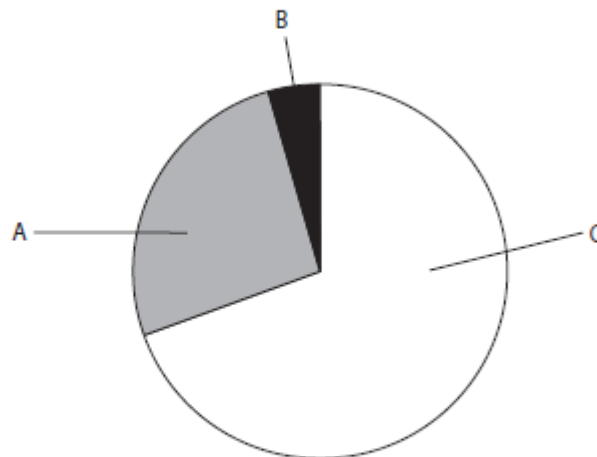
- A Phase 1
- B Phase 2
- C Phase 3

(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

- (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.

(4)

- (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	

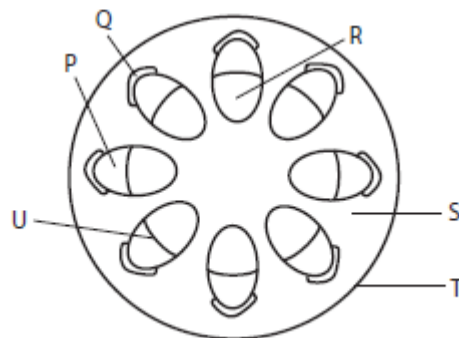
4)

Plants are complex organisms that contain different tissues and organs.

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

(2)

- (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)

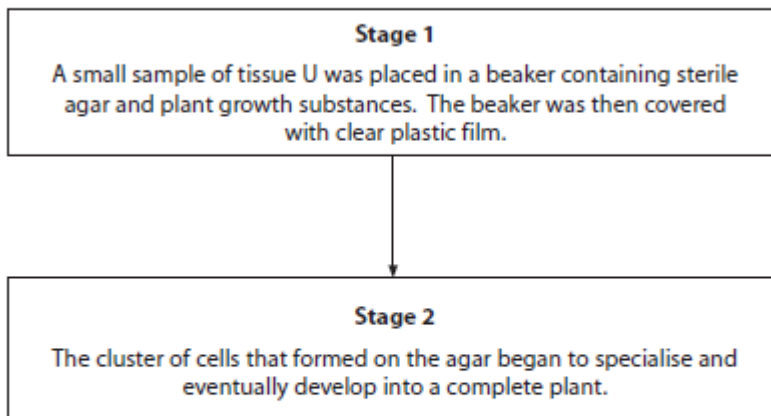
(i) The organ shown in the diagram is a

- 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)

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

(1)

(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.

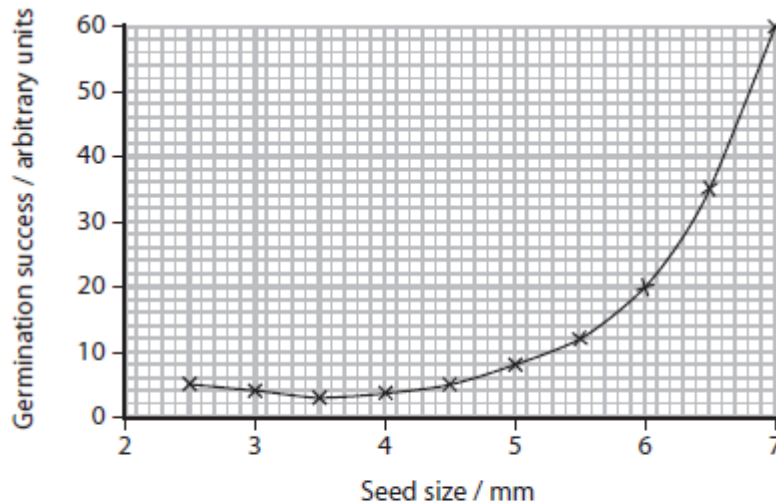
(3)

5)

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)

- (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)

6)

- (a) William Withering tested the use of digitalis to treat a heart condition. The table below describes some of the stages he could have used.

Place a tick (✓) in the box if he used this stage in his test and place a cross (✗) in the box if he did not.

(3)

Description of stage	Tick / cross
He tried to isolate digitalis from foxglove plants.	
He tested digitalis on healthy humans.	
He used a placebo to make sure digitalis worked.	

- (b) (i) Explain why placebos are used to test the efficiency of new drug treatments.

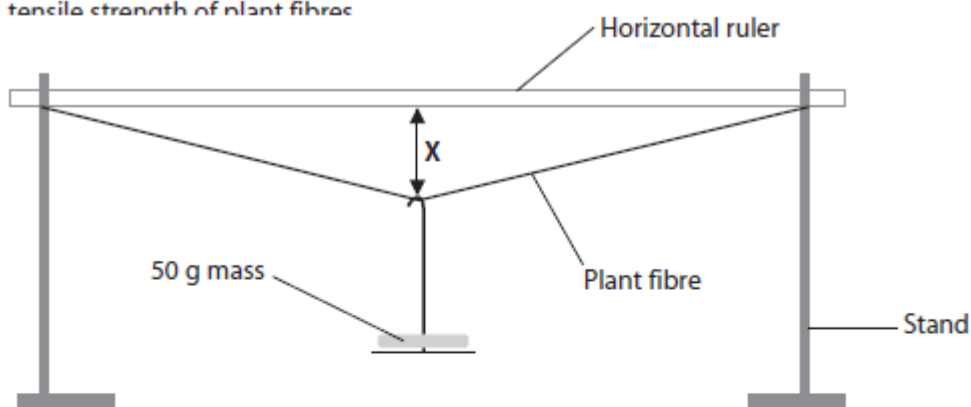
(2)

- (ii) Explain what is meant by a **double blind trial**.

(2)

7)

- (a) A student used the apparatus shown in the diagram below to investigate the tensile strength of plant fibres.



She added a 50 g mass to the middle of the fibre and measured distance X. She repeated this by adding additional 50 g masses.

The results are shown in the table below.

Mass / g	Distance X / cm
0	0
50	2
100	4
150	5
200	5
250	Fibre broke

- (i) Describe the effect on distance X of increasing the mass.

(2)

- (ii) Another student thought that the data did not show the mass needed to break the fibre. He suggested that it could be anywhere between 200 g and 250 g.

Suggest how a more accurate result could be determined.

(2)

- (b) Suggest how you would use this apparatus to enable a valid comparison of the tensile strength of fibres from two different plants.

(5)

8)

The black-footed ferret, shown in the photograph below, is one of North America's most endangered species. In 1986, only 18 individuals were living in the wild. These were used to start a captive breeding programme. Six zoos are now involved in this programme.



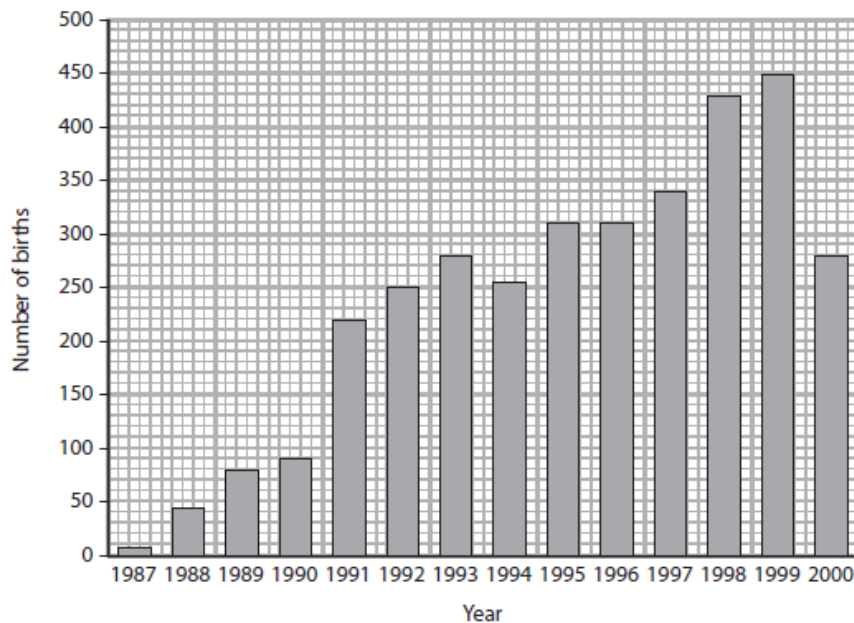
Black-footed ferret

Magnification $\times 0.1$

- *(a) Suggest how this captive breeding programme in the six zoos ensures that genetic diversity is maintained in this species.

(5)

- (b) The graph below shows the number of black-footed ferrets in captivity born each year from 1987 to 2000.



(i) Each year since 1991, 200 black-footed ferrets have been released into the wild.

Suggest why no black-footed ferrets were released into the wild before 1991.

(2)

(ii) Using the information in the graph, suggest how effective the captive breeding programme was between 1991 and 2000.

(2)

(c) The map of the USA below shows the original range of the black-footed ferrets and the sites where they have been reintroduced. Their natural habitat is prairie, which is a type of grassland.

Only 1% of the prairie remains undisturbed by human activity.

Black-footed ferrets mainly prey on prairie dogs. Prairie dogs are treated as pests by farmers who may use poison to kill them.



Suggest **three** factors that could affect the survival chances of black-footed ferrets when they are reintroduced to the sites shown on the map.

(3)