

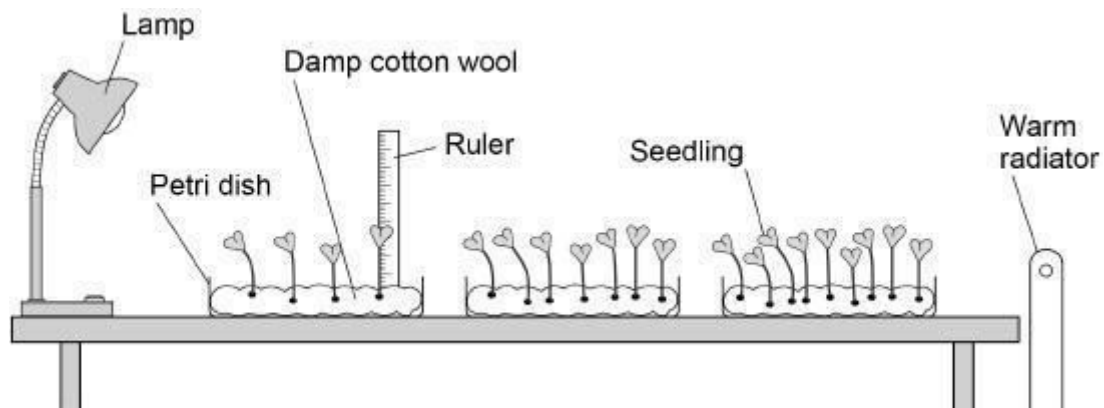
All questions are for separate science students only

Q1.

A student investigated the effect of light intensity on the growth of seedlings.

Figure 1 shows the equipment.

Figure 1



(a) Which two improvements should the student make to the investigation? Tick

(✓) two boxes.

Give more water to the seedlings nearest the lamp

☐

Leave some of the seedlings for a few more days

☐

Open a window to let more air in

☐

Put all the dishes the same distance from the radiator

☐

Use equal numbers of seedlings in each dish

☐

(2)

(b) What is the dependent variable in the investigation? Tick

(✓) one box.

The height of the seedlings

☐

The mass of cotton wool

☐

The temperature of the room

☐

(1)

- (c) In each dish the seedlings compete with each other.

Give two factors the seedlings compete for.

1 _____

2 _____

(2)

Figure 2 shows a seedling growing towards a lamp.

Figure 2



- (d) What happened to the growth of the seedling on side P compared with the growth on side Q?

Tick (✓) one box.

Side P has grown less than side Q

☐

Side P has grown more than side Q

☐

Side P has grown the same as side Q

☐

(1)

- (e) Plant responses are called tropisms.

Which tropism causes the seedling to grow towards light?

Tick (✓) one box.

Geotropism

☐

Gravitropism ☐

Phototropism ☐

(1)

(f) Which hormone causes the seedling to grow towards the light?

Tick (✓) one box. Auxin

☐

Insulin ☐

Testosterone ☐

(1)

(Total 8 marks)

Q2.

This question is about plant hormones.

(a) Farmers can spray seeds with gibberellins to start germination. What are two other uses of gibberellins?

Tick (✓) two boxes.

To help in tissue culture ☐

To help roots form ☐

To increase fruit size ☐

To kill weeds ☐

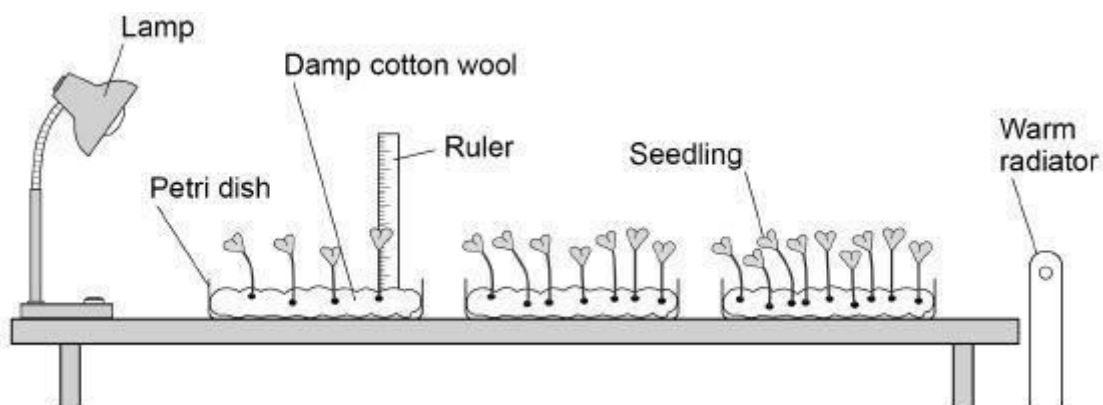
To promote flower production ☐

(2)

Students investigated the effect of light intensity on the height of seedlings.

Figure 1 shows the equipment.

Figure 1



- (b) Describe two improvements the students should make to their investigation.

1 _____

2 _____

(2)

Figure 2 shows a seedling growing towards a lamp.

Figure 2



- (c) Suggest how the students measured the length of the curved seedling in Figure 2.

(1)

- (d) Explain what happened to the growth of the seedling on side Q compared with the growth on side P.

(3)

- (e) Bananas are often stored separately from other fruits because bananas release a plant hormone.

Why does storing bananas with other fruits cause the other fruits to ripen faster?

(1)

(Total 9 marks)

Q3.

Phototropism is a growth response by part of a plant to light.

- (a) Name one other tropism.

Give the stimulus the plant responds to in the tropism you have named.

Tropism

Stimulus

(2)

- (b) Plan an investigation to show the effect of light from one direction on the growth of plant seedlings.

Include details of any controls needed.

You may use some of the equipment shown in Figure 1 and any other laboratory apparatus.

Figure 1

(3)
(Total 11 marks)

Q4.

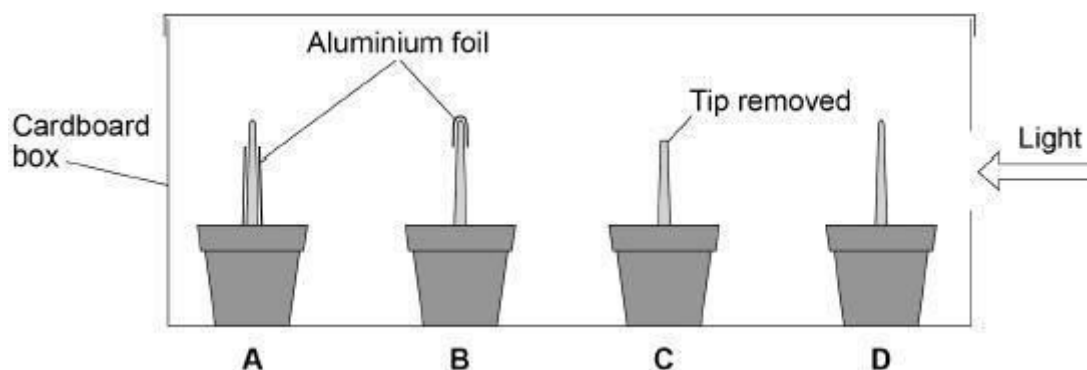
Some students investigated phototropism in plant seedlings.

This is the method used.

1. Measure the lengths of the shoots of 20 seedlings.
2. Set up four groups of seedlings as follows:
 - A – bottom of shoot covered in aluminium foil
 - B – tip covered in aluminium foil
 - C – tip removed
 - D – no changes.
3. Put the seedlings in a cardboard box.
4. Use a lamp to shine a light into the box through a hole in one side.
5. After one day, re-measure the lengths of the shoots.
6. Make a drawing of the appearance of one seedling from each group.

Figure 1 shows the appearance of one seedling in each group at the start of the investigation.

Figure 1



- (a) Which two conditions should the students have kept constant for each group of seedlings?

Tick two boxes.

The length of the roots

☐

| | |
|---------------------------------------|----------------------|
| The number of seedlings in each group | <input type="text"/> |
| The temperature | <input type="text"/> |
| The thickness of the aluminium foil | <input type="text"/> |
| The volume of water added to the soil | <input type="text"/> |

(2)

(b) What is the purpose of the aluminium foil?

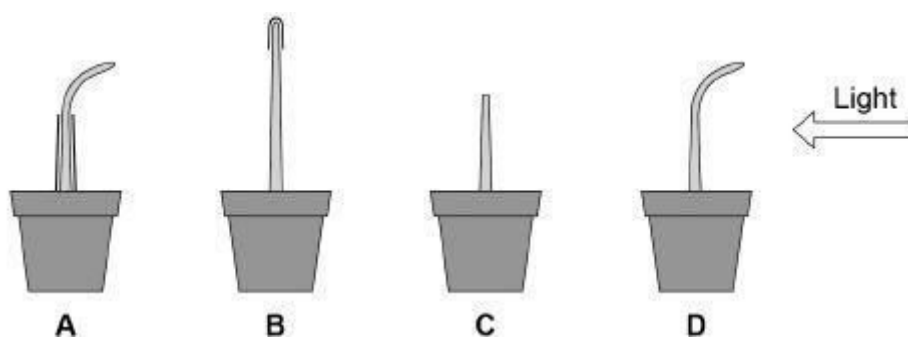
Tick one box.

| | |
|----------------------------------|--------------------------|
| To hold the shoot straight | <input type="checkbox"/> |
| To keep the shoot warm | <input type="checkbox"/> |
| To remove the effect of gravity | <input type="checkbox"/> |
| To stop light reaching the shoot | <input type="checkbox"/> |

(1)

Figure 2 shows the students' results.

Figure 2



| | A | B | C | D |
|--|----|----|----|----|
| Mean length of shoot at start in mm | 23 | 24 | 21 | 25 |
| Mean length of shoot after 1 day in mm | 28 | 30 | 23 | 30 |
| Mean change in length of shoot in mm | 5 | 6 | 2 | 5 |

- (c) Suggest how the students measured the lengths of the curved shoots of seedlings A and D at the end of the investigation.

(2)

- (d) The students concluded that the tip of the shoot is needed for the plant to respond to light.

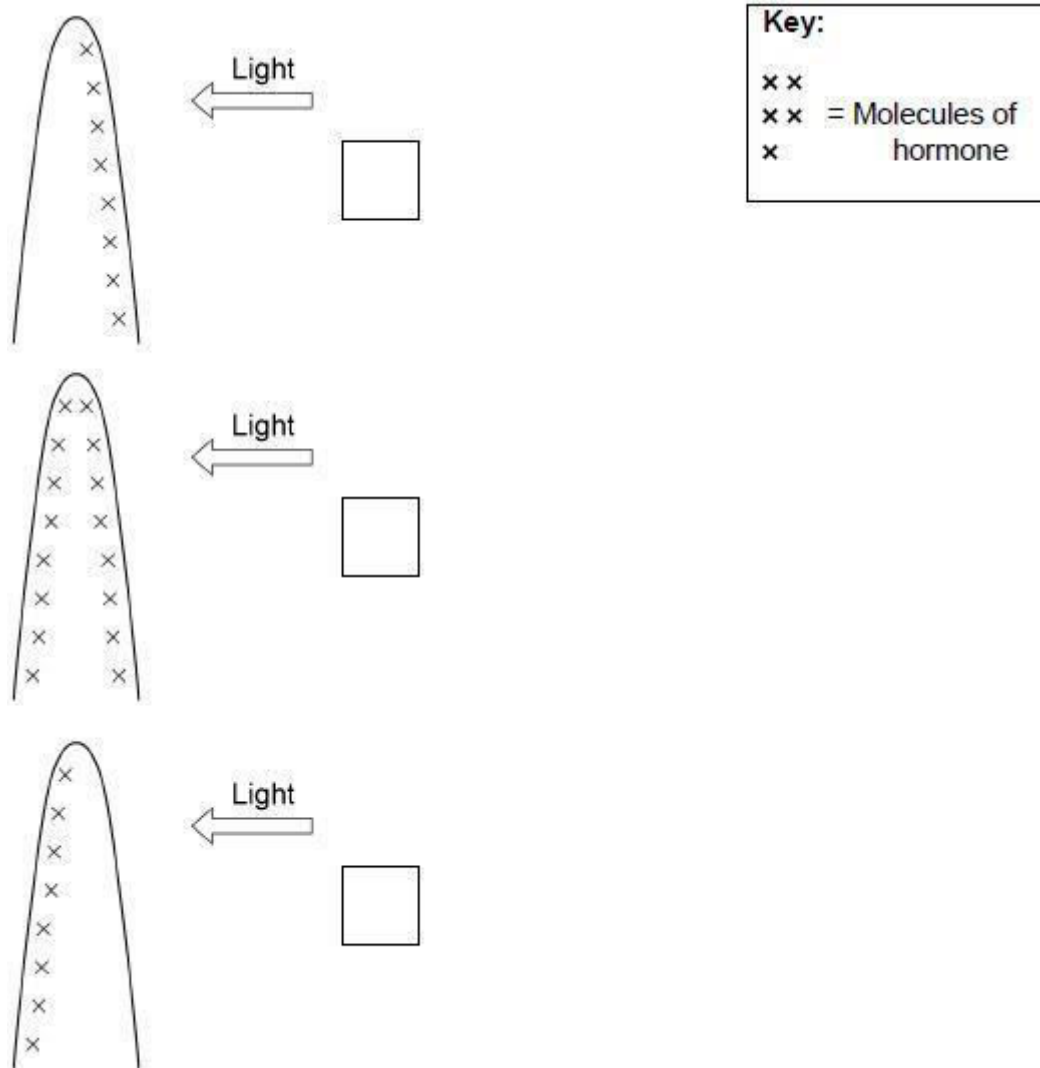
Give evidence for this conclusion from Figure 2.

(2)

- (e) A hormone stimulates growth in shoots.

Which distribution of the hormone would cause the results seen in shoot D?

Tick one box.



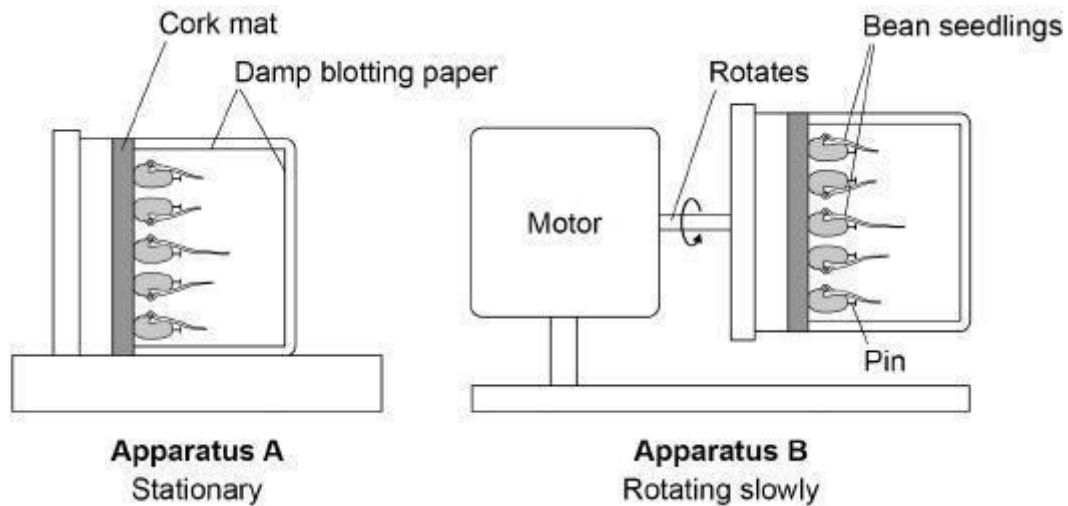
(1)
(Total 8 marks)

Q5.

Some students investigated geotropism in the roots of bean seedlings.

Figure 1 shows the apparatus used.

Figure 1



This is the method used.

1. Measure the length of the root of each of 10 bean seedlings.
 2. Pin 5 seedlings to the cork mat in apparatus A.
 3. Pin 5 seedlings to the cork mat in apparatus B.
 4. Leave A and B in a dark cupboard for 2 days.
 5. After the 2 days:
 - make a drawing to show the appearance of each seedling
 - measure the length of the root of each seedling.
- (a) Why did the students surround the seedlings with damp blotting paper? Tick one box.

To prevent light affecting the direction of root growth

☐

To prevent photosynthesis taking place in the roots

☐

To prevent the growth of mould on the roots

☐

To prevent water affecting the direction of root growth

☐

(1)

Apparatus B is a control.

Apparatus B rotates slowly.

- (b) How does apparatus B act as a control?

(1)

The table below shows the students' results.

| | Apparatus A | | | | | Apparatus B | | | | |
|---------------------------|-------------|----|----|----|----|-------------|----|----|----|----|
| Seedling number | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| Length at start in mm | 35 | 41 | 32 | 33 | 39 | 30 | 33 | 29 | 28 | 31 |
| Length after 2 days in mm | 49 | 57 | 43 | 45 | 54 | 45 | 45 | 44 | 29 | 44 |
| Length change in mm | 14 | 16 | 11 | 12 | 15 | 15 | 12 | 15 | 1 | 13 |
| Mean length change in mm | 14 | | | | | 11 | | | | |

(c) One student stated:

'The mean length change for the seedlings in apparatus B is not valid.'

Suggest the reason for the student's statement.

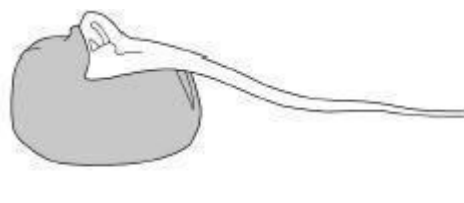
(1)

(d) Suggest one improvement the students could make to obtain a more valid mean length change for the seedlings in apparatus B.

(1)

(e) Figure 2 shows the students' drawings of two seedlings at the end of the 2 days.

Figure 2


Seedling from Apparatus A

Seedling from Apparatus B

A plant hormone is made in the root tip.

The hormone diffuses from the tip into the tissues of the root.

Explain how the hormone causes the appearance of the seedlings in Figure 2 to be different.

You should refer to both seedlings in your answer.

(3)

- (f) In horticulture plant hormones are used for controlling plant growth.

Draw one line from each plant hormone to the correct use of that hormone.

Plant hormone

Use of hormone

Auxin

To reduce the time
taken
for tomatoes to ripen

To slow down the
growth
of plant stems

Ethene

Gibberellin

To promote seed germination

To stimulate root growth in plant cuttings

(3)

(Total 10 marks)

Q6.

Hormones called auxins control plant growth.

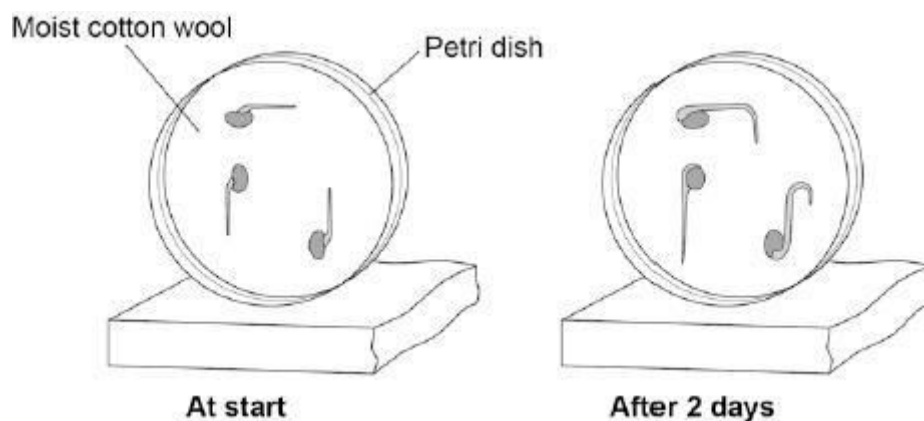
A student investigated plant growth responses in roots.

This is the method used.

1. Grow three bean seeds until their roots are 1 cm long.
2. Attach the three bean seeds to moist cotton wool in a Petri dish. Each bean seed root should point in a different direction.
3. Fix the Petri dish vertically for 2 days in the dark.

Figure 1 shows the results.

Figure 1



- (a) Describe the direction of growth of the bean roots after 2 days. Give one reason for this growth response.

Direction of root growth _____

Reason _____

(2)

- (b) The student then noticed the shoots growing from the seeds. He then:

1. put a light above the Petri dish but did not move the seeds
2. allowed the seeds to grow for 2 more days.

Predict the direction of growth of the bean shoots after 2 days.

Give one reason for your prediction.

Direction of root growth _____

Reason _____

(2)

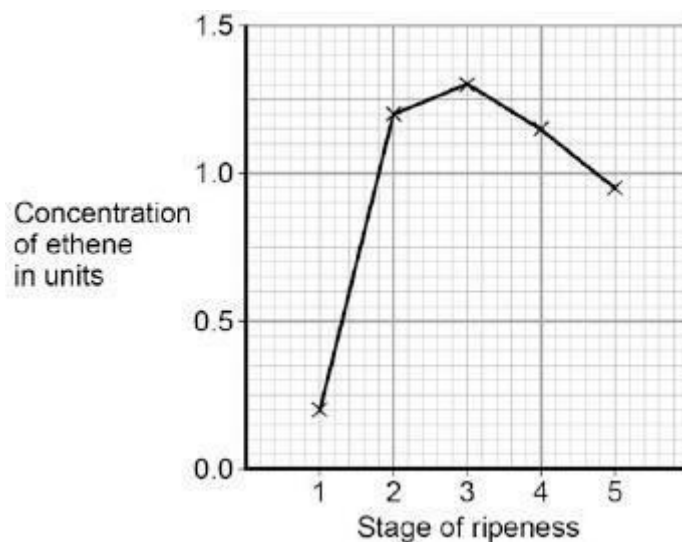
- (c) Ethene is a plant hormone.

Ethene causes fruit to ripen.

Scientists measured the concentration of ethene found in fruit at different stages of ripeness.

Figure 2 shows the results.

Figure 2



At which stage of ripeness is there most ethene?

Tick one box.

Stage 1

☐

| | |
|---------|----------------------|
| Stage 2 | <input type="text"/> |
| Stage 3 | <input type="text"/> |
| Stage 4 | <input type="text"/> |
| Stage 5 | <input type="text"/> |

(1)

- (d) Suggest how the scientists can find out if the result for Stage 1 was an anomaly.

(1)

- (e) Gibberellins are a different type of plant hormone.

Farmers growing cotton plants in cold climates sometimes soak their seeds in a solution of gibberellins before planting the seeds.

Suggest an advantage of soaking seeds in a gibberellin solution in cold climates.

(1)

(Total 7 marks)