

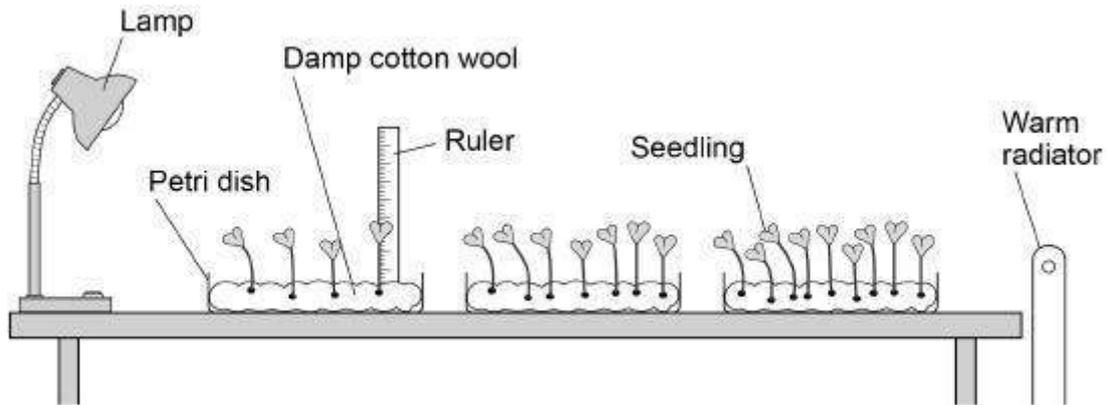


**Q1.**

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

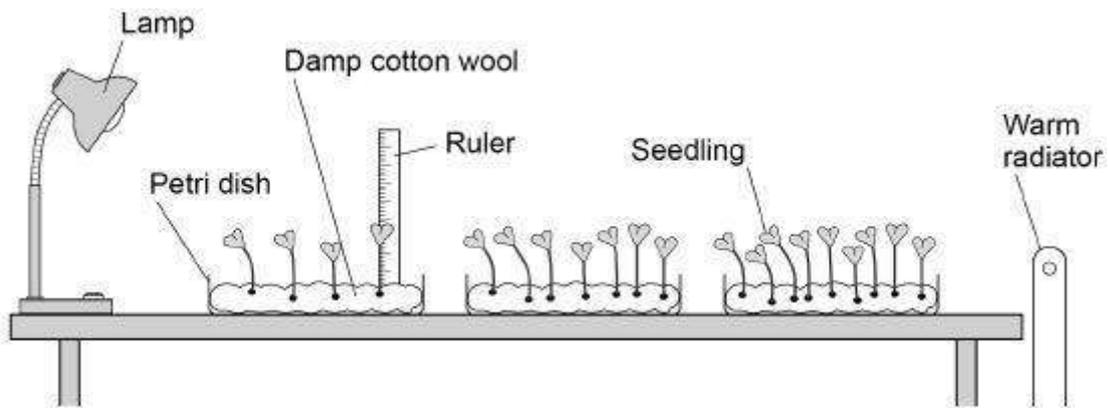
(2)

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**.

- \_\_\_\_\_



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(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?

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(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

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Stimulus

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(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**






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(3)  
(Total 11 marks)

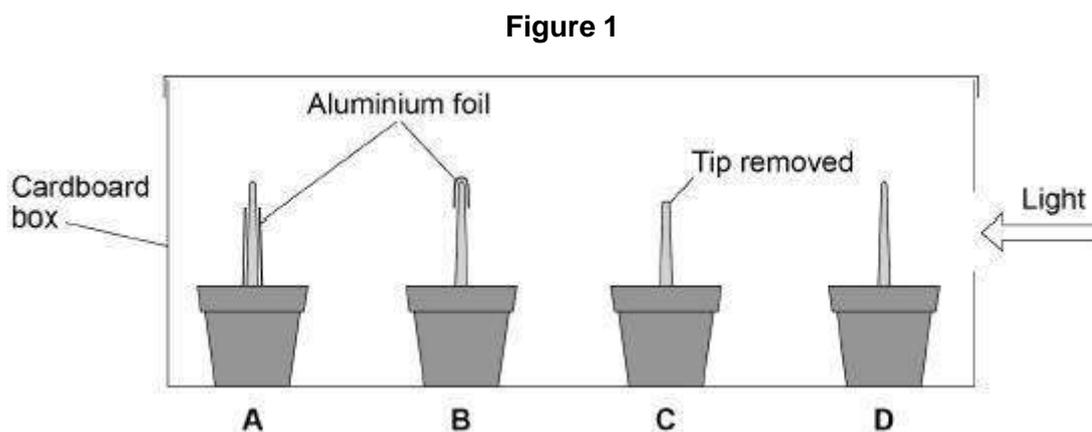
**Q4.**

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.



- (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
- The temperature
- The thickness of the aluminium foil
- The volume of water added to the soil

(2)

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

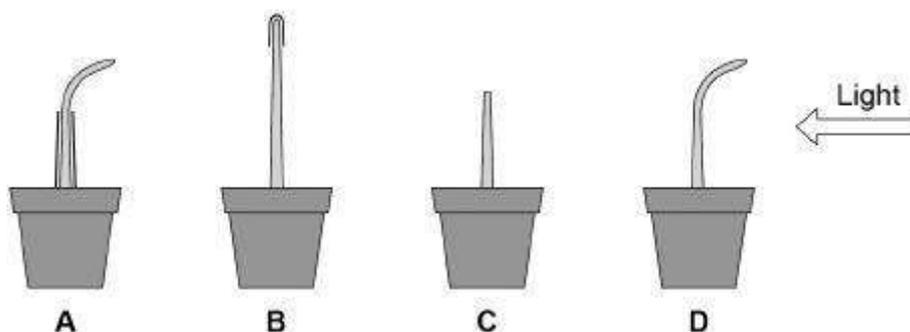
Tick **one** box.

- To hold the shoot straight
- To keep the shoot warm
- To remove the effect of gravity
- To stop light reaching the shoot

(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.

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(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**.

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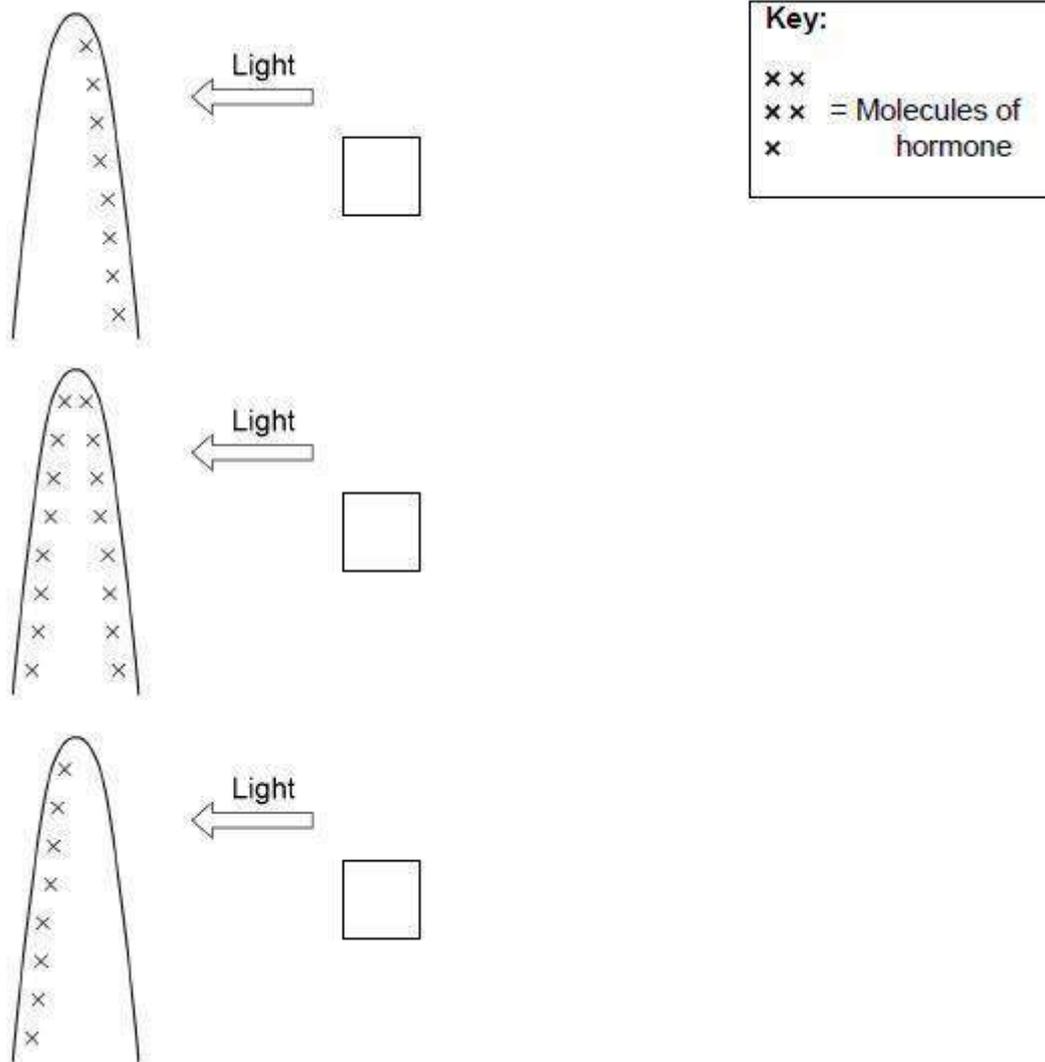
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(2)

- (e) A hormone stimulates growth in shoots.

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

Tick **one** box.



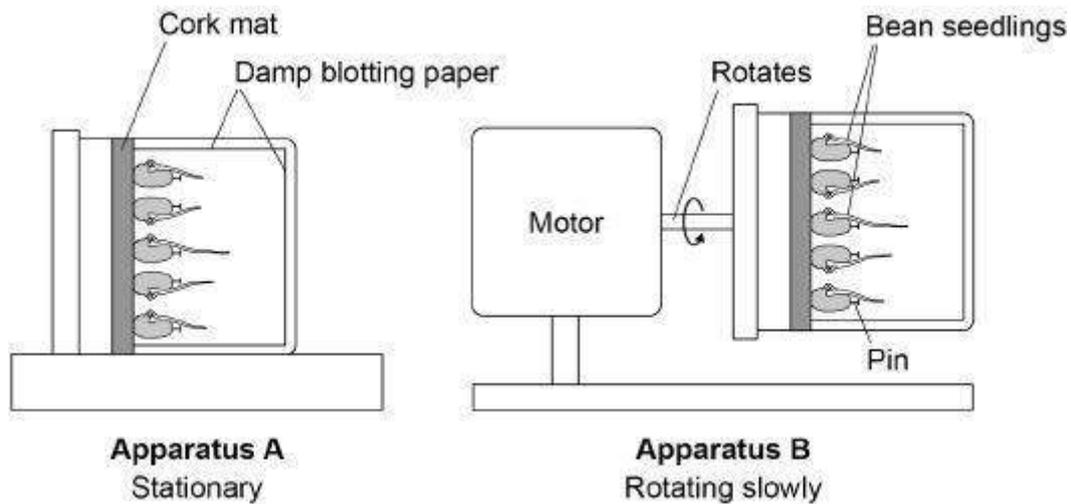
(1)  
(Total 8 marks)

**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**





Ethene

To promote seed germination

Gibberellin

To stimulate root growth in plant cuttings

(3)

(Total 10 marks)

**Q6.**

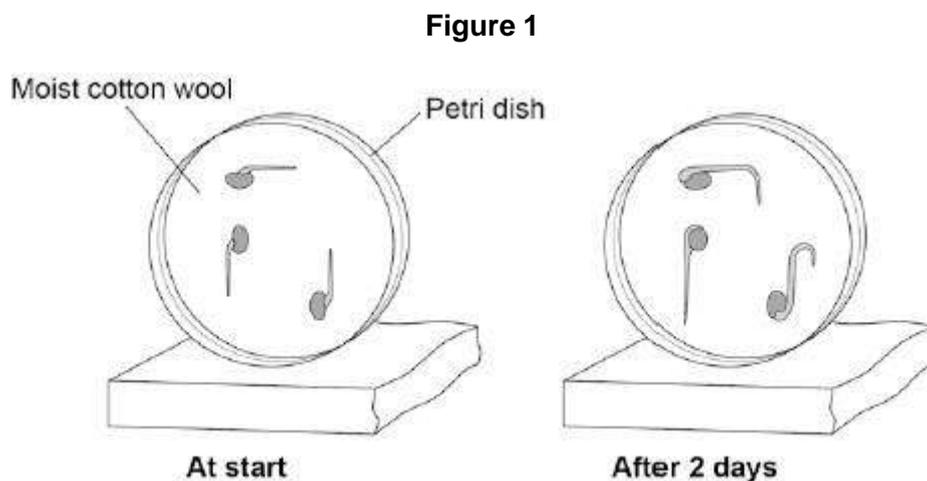
Hormones called auxins control plant growth.

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.



(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)

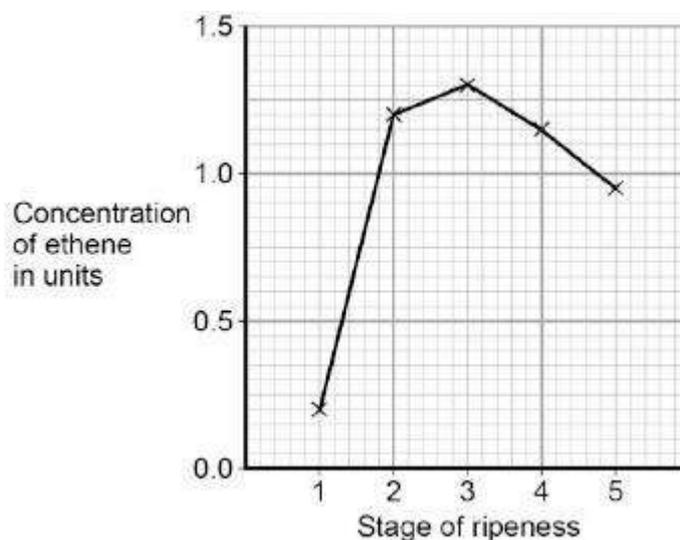
(c) Ethene is a plant hormone.

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="checkbox"/>
Stage 3	<input type="checkbox"/>
Stage 4	<input type="checkbox"/>
Stage 5	<input type="checkbox"/>

(1)

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

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(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.

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(1)

(Total 7 marks)