Questions are for separate science science students only

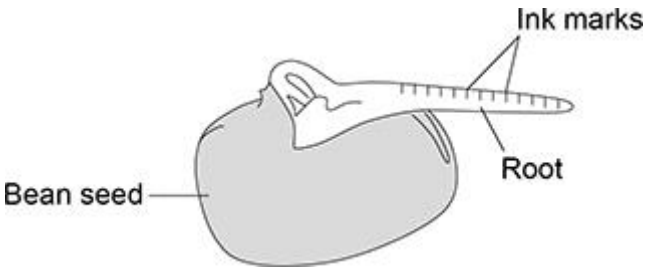
Q1.

A student investigated the effect of gravity on the growth of bean seedlings.

The student put ink marks on the root of each bean seedling.

Figure 1 shows a bean seedling with ink marks.

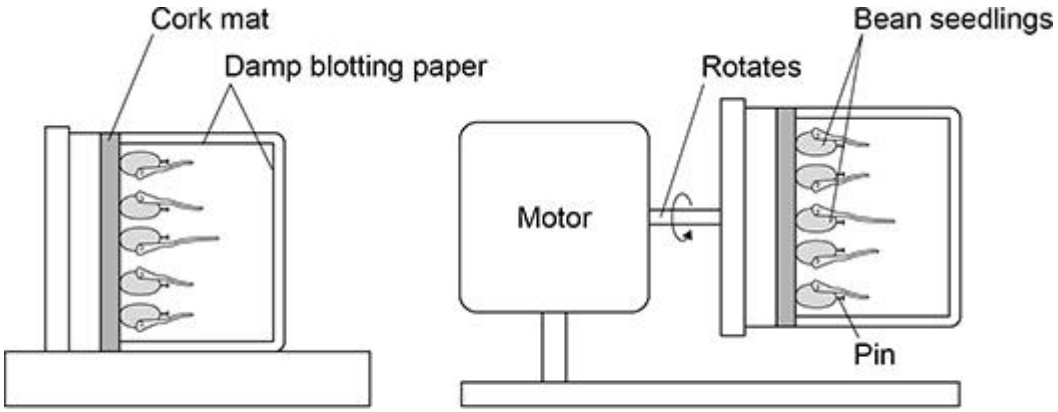
Figure 1



The student set up apparatus **A** and apparatus **B**.

Figure 2 shows both sets of apparatus.

Figure 2



The student left both sets of apparatus in a dark cupboard for 24 hours.

(a) Give the reason why the student placed both sets of apparatus in the dark.
(biology only)

_____

_____

(1)

(b) What are **two** reasons for surrounding the seedlings with damp blotting paper? **(biology only)**

Tick (✓) **two** boxes.

To prevent photosynthesis in the roots	☐
To prevent the growth of mould on the roots	☐
To prevent water affecting the direction of root growth	☐
To provide enough water for root growth	☐
To provide the roots with mineral ions	☐

(2)

(c) Apparatus **B** is a control.

Explain why apparatus **B** is needed. **(biology only)**

_____

_____

_____

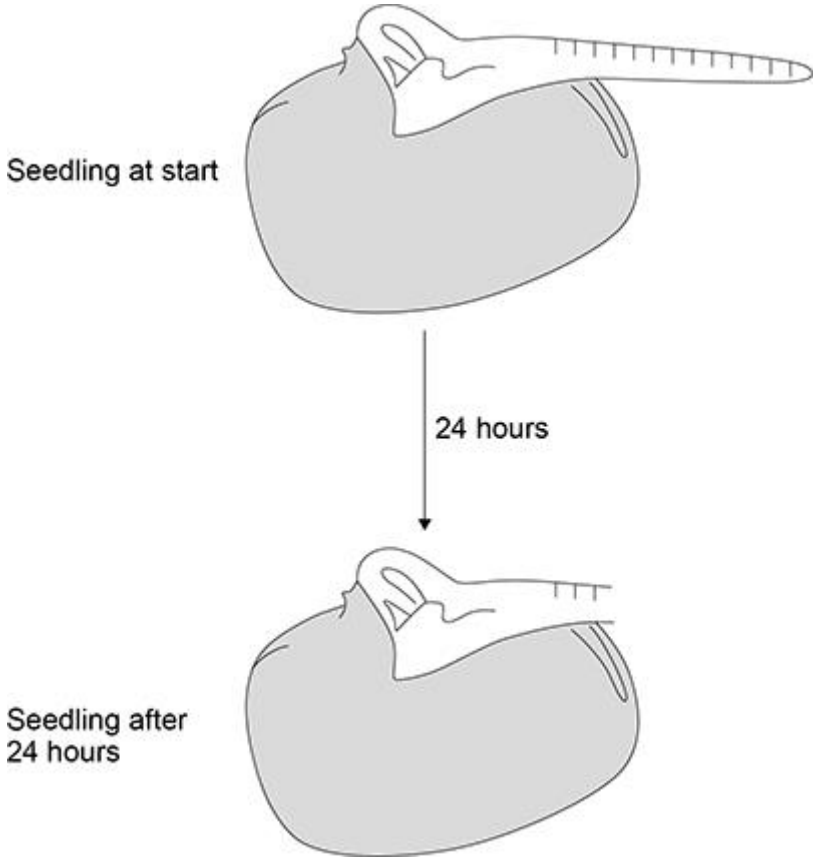
_____

(2)

(d) **Figure 3** shows one seedling from apparatus **A** at the start of the investigation and after 24 hours.

The drawing of the seedling after 24 hours is **not** complete.

Figure 3



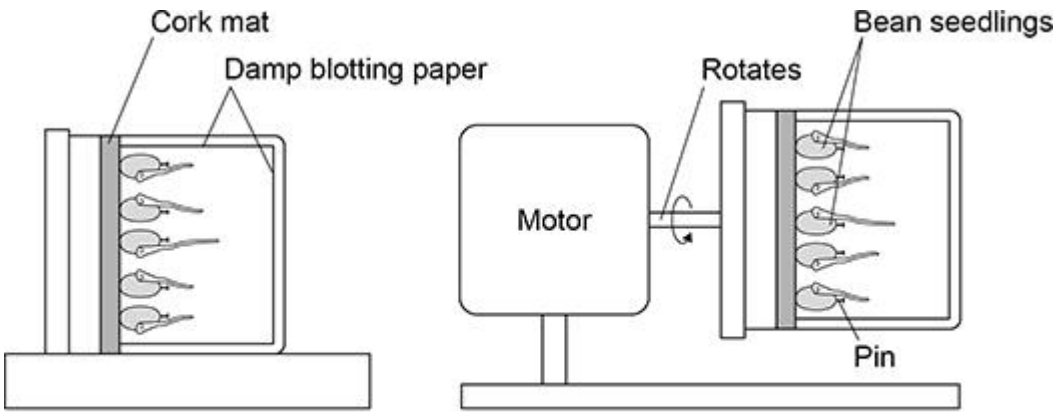
Complete **Figure 3** to show: **(biology only)**

- the appearance of the root after 24 hours
- the ink marks on the root after 24 hours.

(3)

Figure 2 is repeated below.

Figure 2



The student left both sets of apparatus in a dark cupboard for 24 hours.

(e) Describe how a root from apparatus **B** would look different from the root you drew in part (d). **(biology only)**

_____

_____

(1)

(f) Auxin is a plant hormone.

Explain how auxin causes the results in apparatus **A**. **(biology only)**

_____

_____

_____

_____

(2)

Farmers can use plant hormones to control the growth of plants.

(g) Give **two** uses of auxin. **(biology only) (HT only)**

1 _____

_____

2 _____

_____

(2)

(h) A farmer sprayed an apple tree with gibberellin.

Suggest **two** reasons why the farmer sprayed the apple tree with gibberellin. **(biology only) (HT only)**

1 _____

_____

2 _____

_____

(2)

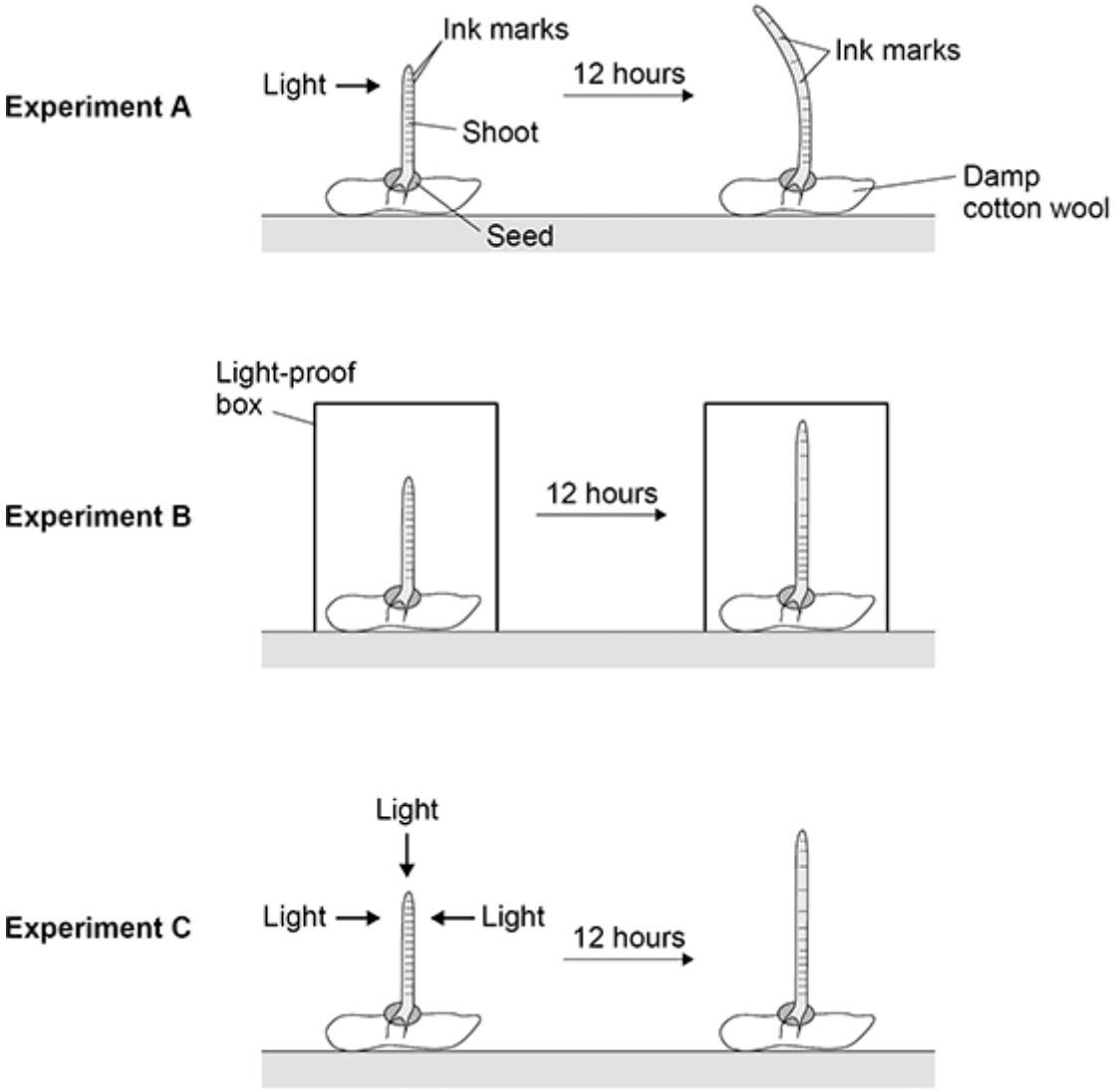
(Total 15 marks)

Q2.

Students investigated the response of plant shoots to one-sided light.

Figure 1 shows how the students set up three experiments.

Figure 1



(a) Suggest **two** control variables the students should have used in their investigation. **(biology only)**

1 _____

_____

2 _____

_____

(2)

(b) Describe how experiment **B** and experiment **C** acted as controls for the investigation. **(biology only)**

Experiment **B** _____

_____

Experiment **C** _____

_____

(2)

(c) Give **two** conclusions that the students could make from the **ink marks** on the shoot in experiment **A**. **(biology only)**

1 _____

_____

2 _____

_____

(2)

(d) Name the type of response shown by the seedling in experiment **A**. **(biology only)**

_____

(1)

Auxin is a plant hormone. Auxin is made in the shoot tip.

Scientists investigated the role of auxin in the response of shoot tips to light.

This is the method used.

1. Grow four seedlings in the dark for a few days.

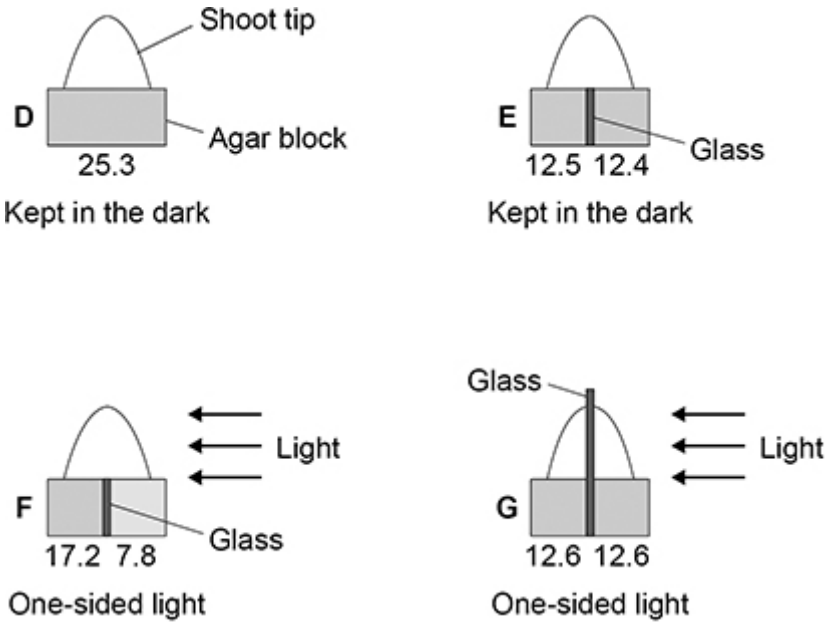
2. Cut the tip off the shoot of each seedling.

3. Place each shoot tip on a small block of agar jelly.

4. Place the shoot tips and agar in different conditions as shown in **Figure 2**.

5. After 24 hours, measure the mass of auxin in the agar blocks.

Figure 2



The numbers under each block show the mass of auxin that diffused into the blocks from the shoot tips.

The mass of auxin is given in arbitrary units.

(e) A scientist made a hypothesis:

> 'Light causes auxin to move from the side of the shoot nearest to the light to the side furthest from the light.'

Describe the evidence from **Figure 2** which supports the hypothesis.
(biology only)

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_____

_____

_____

_____

_____

_____

(3)

(f) Another scientist made a different hypothesis:

'Light causes the breakdown of auxin.'

Give the evidence from **Figure 2** that shows that auxin is **not** broken down by light. **(biology only)**

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_____

(1)

(Total 11 marks)