

Plant Hormones

These practice questions can be used by students and teachers and is suitable for GCSE AQA Biology topic Questions 8641

Level: GCSE AQA Biology 8641

Subject: Biology

Exam board: GCSE AQA

Topic: Plant Hormones

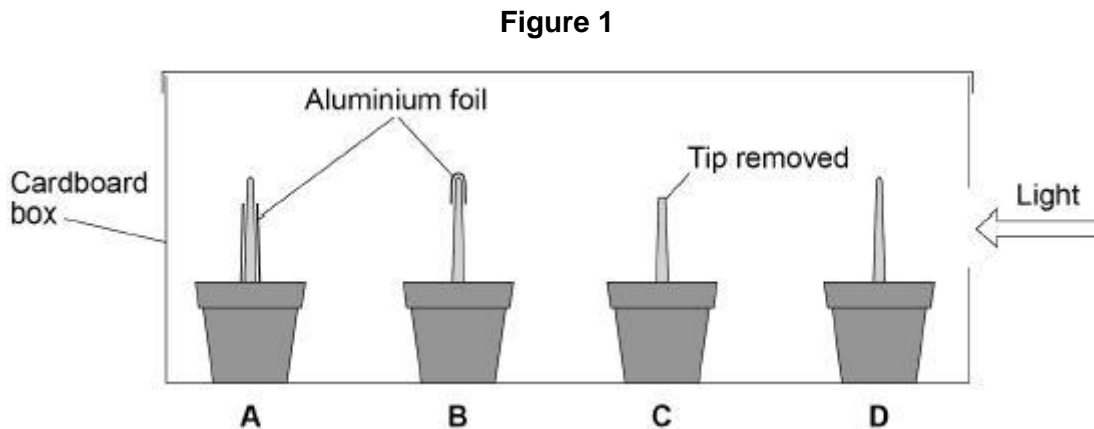
Q1.

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?

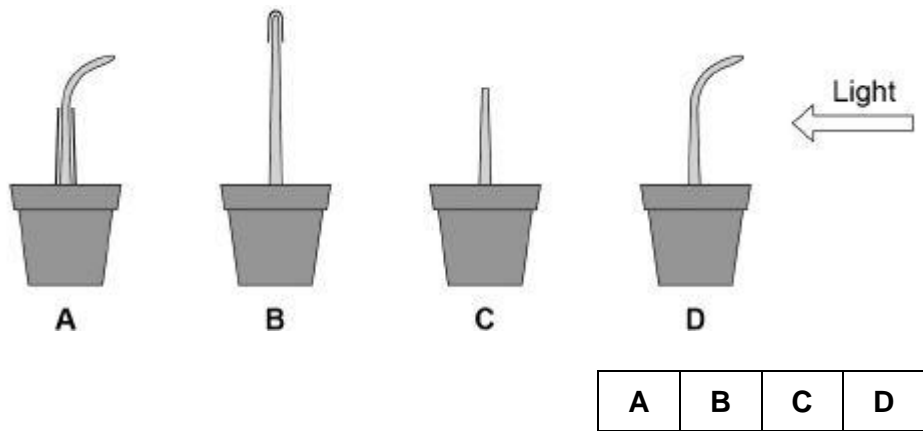
Tick **one** box.

- 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



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.

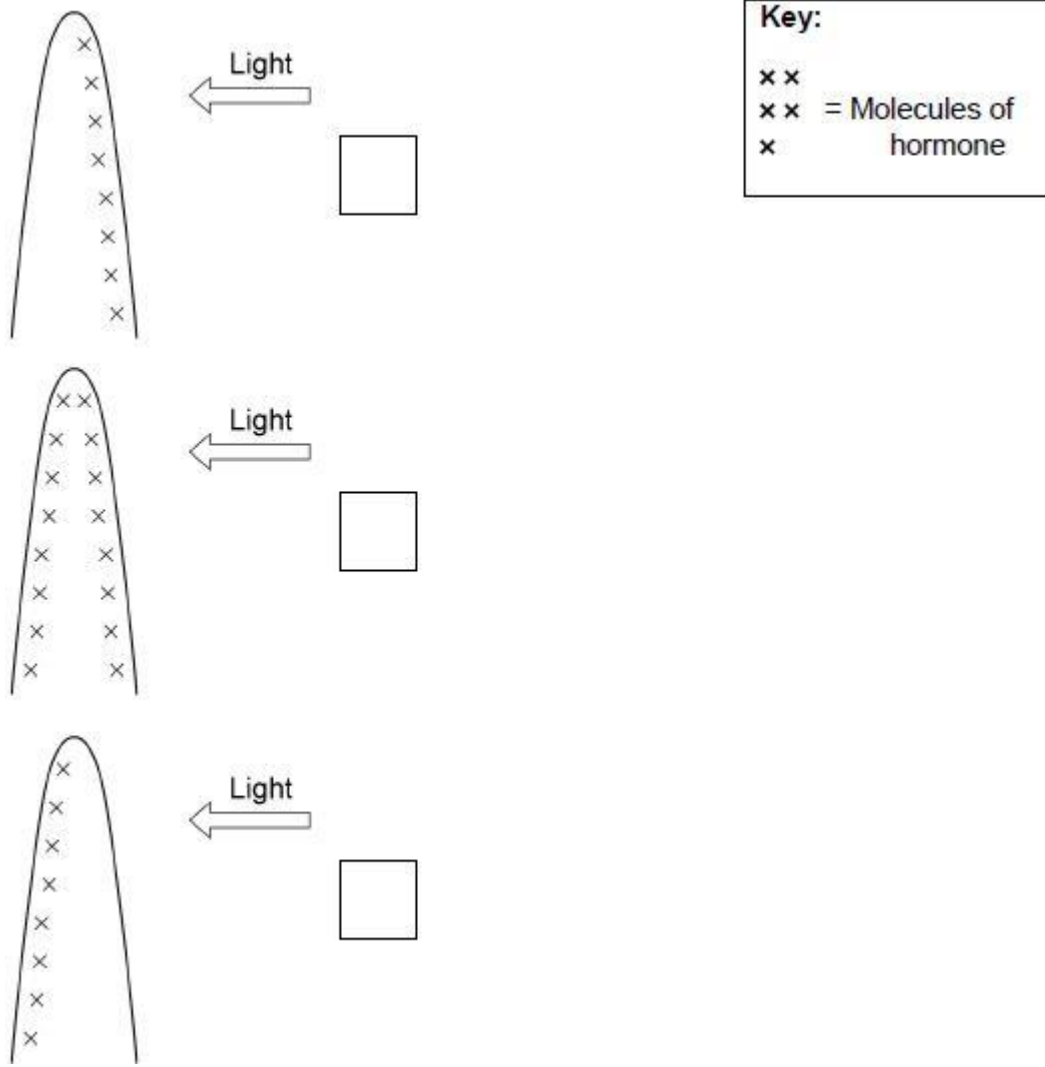
Give evidence for this conclusion from **Figure 2**.

(2)

- (e) A hormone stimulates growth in shoots.

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

Tick **one** box.



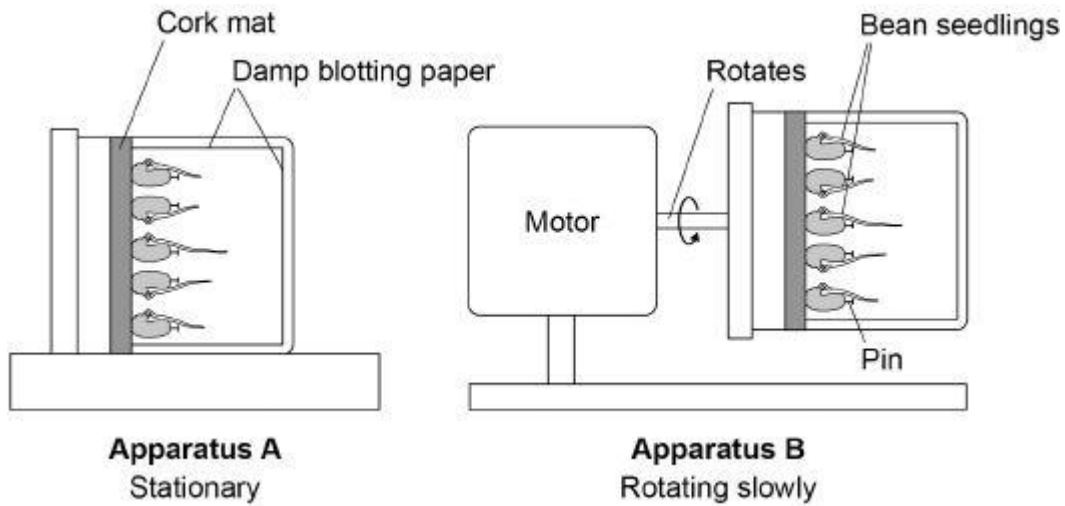
(1)
(Total 8 marks)

Q2.

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 | <input type="checkbox"/> |
| To prevent photosynthesis taking place in the roots | <input type="checkbox"/> |
| To prevent the growth of mould on the roots | <input type="checkbox"/> |
| To prevent water affecting the direction of root growth | <input type="checkbox"/> |

(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.

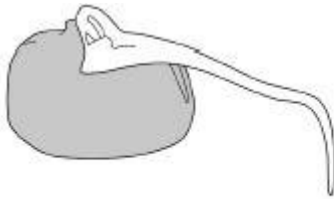
(1)

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

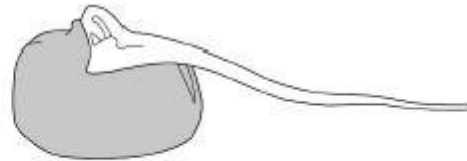
(1)

- (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

Ethene

To slow down the growth of plant stems

Gibberellin

To promote seed germination

To stimulate root growth in plant cuttings

(3)

(Total 10 marks)

Q3.

Hormones called auxins control plant growth.

A student investigated plant growth responses in roots.

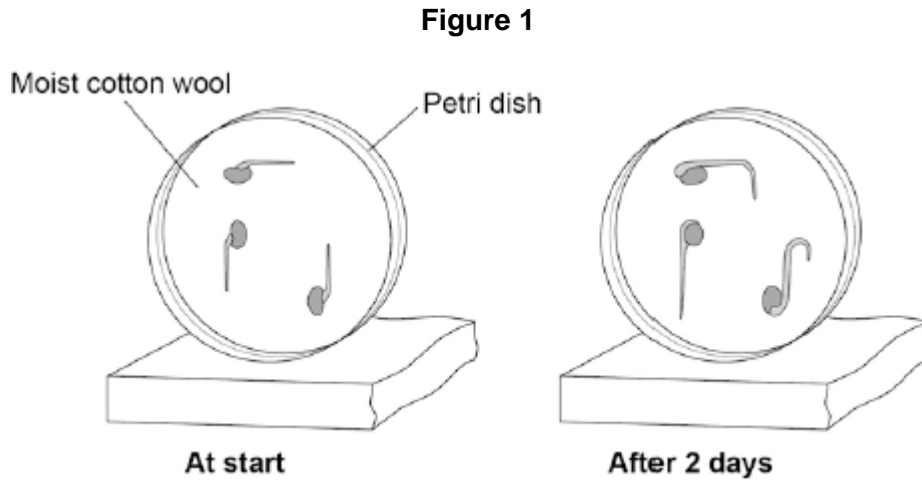
This is the method used.

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)

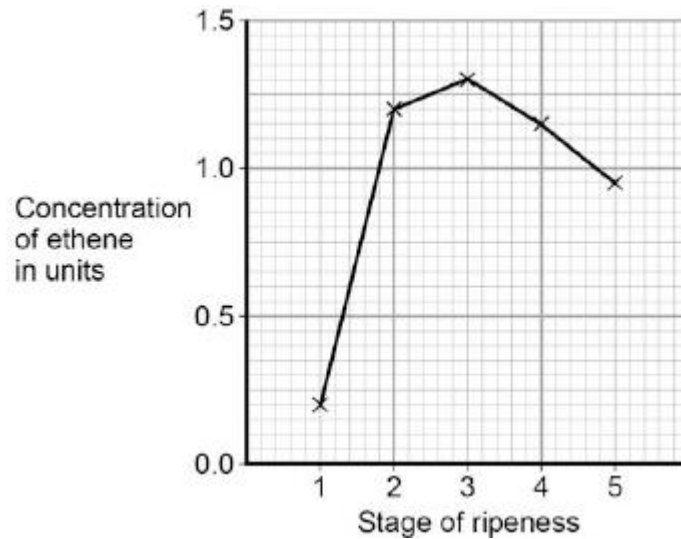
(c) Ethene is a plant hormone.

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

Stage 3

Stage 4

Stage 5



(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)

Q4.

Gardeners sometimes use weed killers to control the growth of plants.

- (a) A gardener wanted to get rid of daisy plants growing in a lawn.

The gardener investigated the use of a weed killer.

The gardener:

- recorded the number of daisy plants growing in different 10 m² areas of the lawn
- made solutions of the weed killer (each solution had a different concentration)
- put 5 dm³ of each solution on different 10 m² areas of the lawn
- recorded the number of daisy plants growing in each area after 2 weeks.

The table shows the results.

Concentration of weed killer in arbitrary units	Number of daisy plants per 10 m ²	
	Before using weed killer	2 weeks after using weed killer
0 (water)	8	8
20	6	8
40	9	6
60	5	2
80	4	0
100	8	0

- (i) To make the investigation fair, the gardener controlled some variables.

Give **one** variable the gardener controlled in the investigation.

(1)

- (ii) The gardener decided that the result for a concentration of 20 arbitrary units of weed killer was anomalous.

Suggest why the gardener decided this result was anomalous.

(1)

- (iii) Why did the gardener put 0 arbitrary units of weed killer on one area of the lawn?



(1)

- (iv) The gardener concluded that the best concentration of weed killer to use all over a lawn is 100 arbitrary units.

Suggest why the gardener cannot be sure about this conclusion.

(1)

- (b) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Plants respond to different environmental factors.

Describe how different environmental factors affect:

- the direction of growth of roots
- the direction of growth of shoots.

In your answer you should refer to the role of plant hormones.

Do **not** refer to the artificial use of plant hormones by gardeners or scientists.

(6)
(Total 10 marks)

Q5.

(a) When a seed starts to grow, the young root grows downwards towards gravity. The young shoot grows upwards, away from gravity.

(i) Name this type of plant response to gravity.

(1)

(ii) Give **two** reasons why it is useful for a young root to grow towards gravity.

1.

2.

(2)

(iii) The root grows towards gravity due to the unequal distribution of a substance in the root.

Draw a ring around the correct answer to complete the sentence.

This substance is

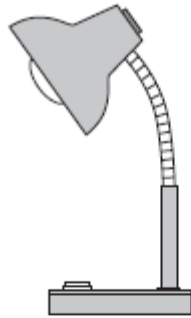
auxin.
chlorophyll.



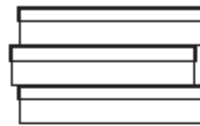
sugar.

(1)

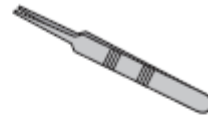
(b) The drawings show some apparatus and materials.



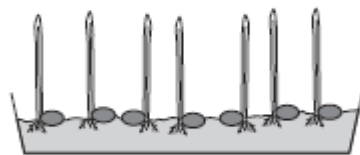
Lamp



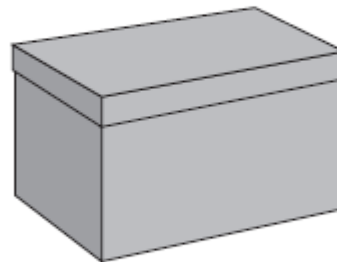
Petri dishes



Forceps



50 maize seedlings
on damp cotton wool



Supply of cardboard boxes with lids



Ruler



Scissors

In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Describe how the students could use some or all of the apparatus and materials shown in the drawings to investigate the growth response of maize seedlings to light shining from one side.

You should include a description of the results you would expect.

(6)
(Total 10 marks)

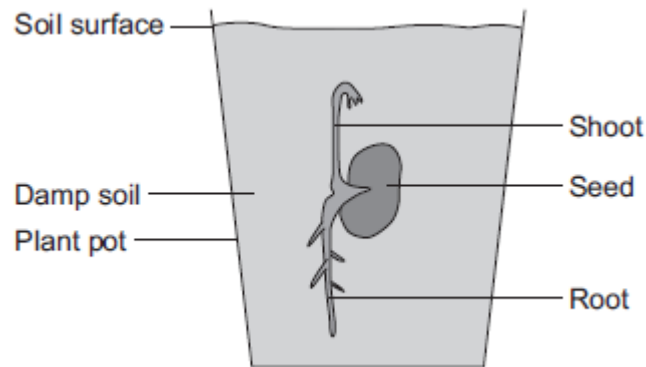
Q6.

A student investigated growth in plants.

The student:

- planted a seed in damp soil in a plant pot
- put the plant pot in a dark cupboard.

The image below shows the result after 5 days.



(a) Draw a ring around the correct answer to complete each sentence.

(i) After the 5 days, the root had grown

- away from water.
in the direction of the force of gravity.
towards light.

(1)

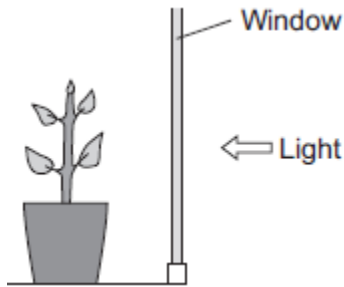
(ii) After the 5 days, the shoot had grown

- against the force of gravity.
away from light.
towards water.

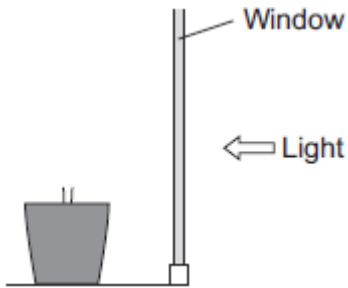
(1)

(b) After the plant had grown, the student put the plant pot by a window with lots of light.

The illustration below shows this.



- (i) Complete the diagram below to show the appearance of the student's plant after 20 days by the window.



(1)

- (ii) Explain the advantage to the plant of growing in the way that you have drawn in part (b)(i).

(2)

(Total 5 marks)

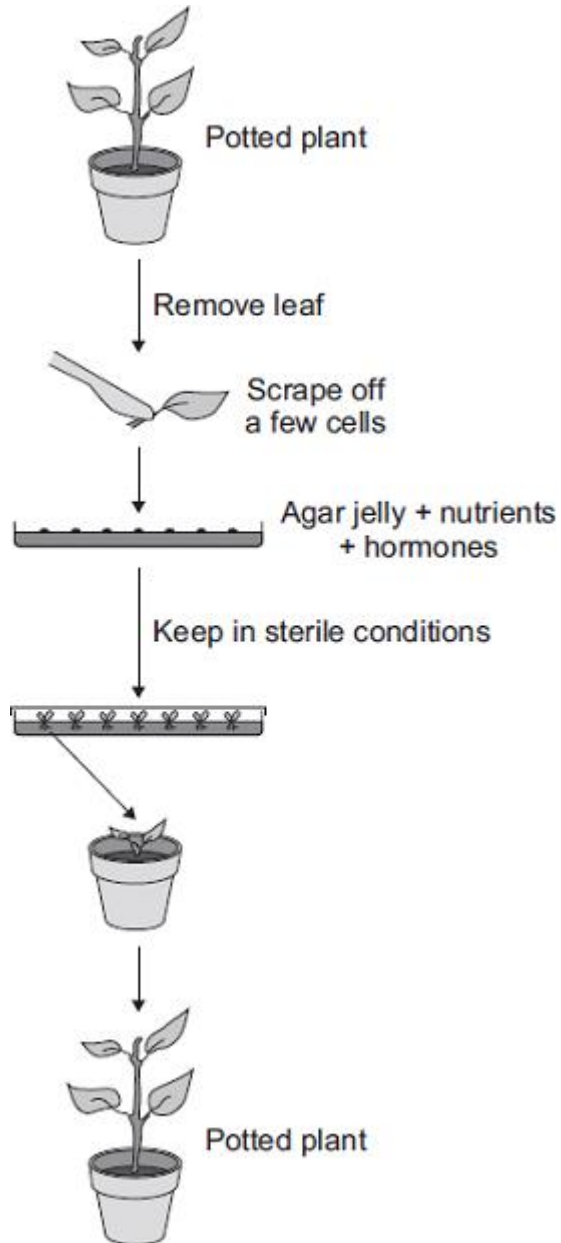
Q7.

Plant hormones are used in horticulture.

- (a) Name **one** plant hormone.

(1)

(b) The diagram shows how new plants are produced using tissue culture.



- (i) Tissue culture is a type of *asexual reproduction* .
Give the main features of *asexual reproduction* .



(3)

(ii) Another method of producing new plants is by taking cuttings.

Suggest **one** advantage of using tissue culture and **not** using cuttings to produce plants.

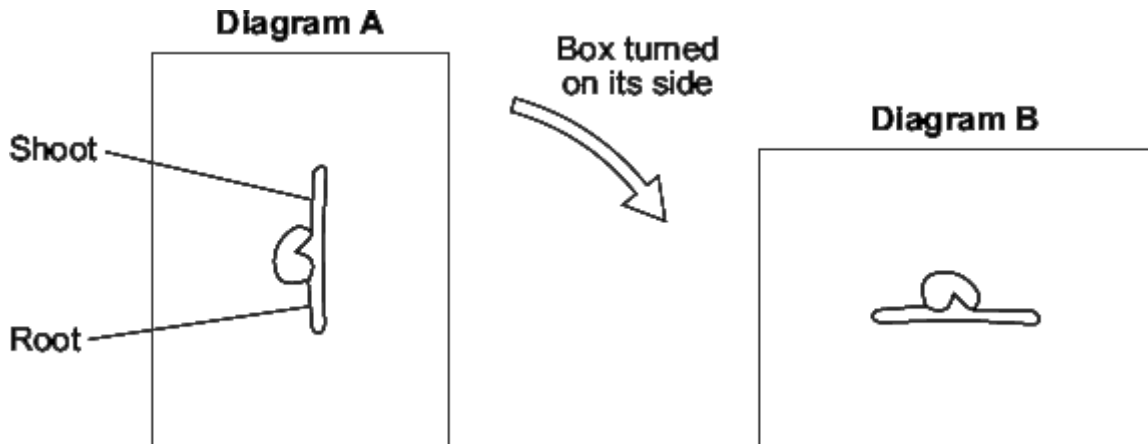
(1)

(Total 5 marks)

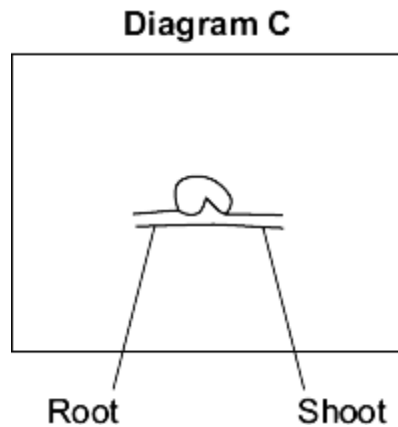
Q8.

A student investigated growth responses in plants.

The student grew a bean seed in a box filled with moist soil, as shown in **Diagram A**. After the seed had started to grow, the box was turned onto its side and placed in a dark room, as shown in **Diagram B**.



- (a) Complete **Diagram C** to show what the root and shoot will look like three days later.



(2)

- (b) Draw a ring around the correct answer to complete the sentence.

The results of the investigation show that the root is sensitive to

light.
moisture.
gravity.

(1)

- (c) A hormone in the plant causes the growth responses.

What is the name of this hormone?

Tick (✓) **one** box.

Auxin	<input type="checkbox"/>
Statin	<input type="checkbox"/>
Steroid	<input type="checkbox"/>

(1)

(d) Gardeners can use some plant hormones as weed killers.

(i) Give **one different** use of plant hormones by gardeners.

(1)

(ii) Selective weed killers only kill some plants in a garden.

Killing weeds in a garden reduces competition between plants.

Give **three** factors that plants compete for.

1.

2.

3.

(3)

(Total 8 marks)

Q9.

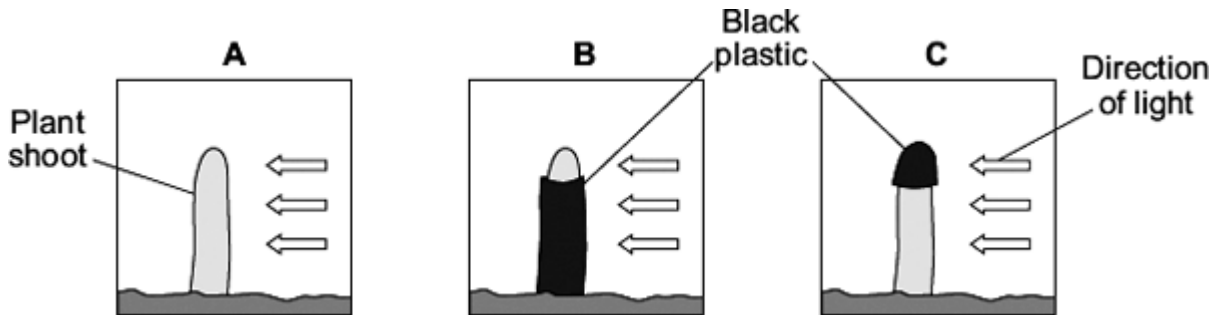
Charles Darwin investigated tropisms in plants.

Some students did an investigation similar to Darwin's investigation.

The students:

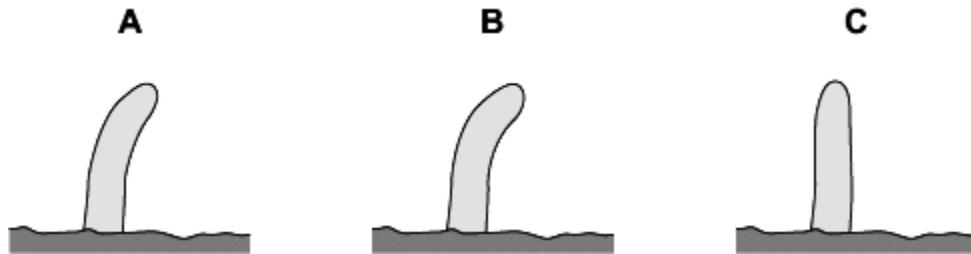
- grew seeds until short shoots had grown
- used black plastic to cover parts of some of the shoots
- put the shoots in light coming from one direction
- put boxes over the shoots to keep out other light.

The diagrams show how the investigation was set up.



Two days later the students took off the black plastic covers and looked at the shoots.

The diagrams show the results.



- (a) Give **two** variables that the students should control in this investigation.

(2)

- (b) Shoot **A** bent towards the light as it grew.

Explain how.

(4)

(c) What conclusions can be drawn from the results about:

(i) the detection of the light stimulus

(1)

(ii) where in the shoot the response to the light takes place.

(1)

(Total 8 marks)



EXAM PAPERS PRACTICE

Mark schemes

Q1.

- (a) the temperature 1
- the volume of water added to the soil 1

- (b) to stop light reaching the shoot 1

- (c) piece of thread (along shoot and mark length)
allow straighten the shoot 1

transfer to ruler / mm-scale
allow use of (flexible) tape measure for 2 marks 1

- (d) tip covered / B / removed / C grows straight up **or** does not bend (towards light)
allow tip covered / B / removed / C does not respond (to light) 1

tip exposed / A / not covered / D bends (towards light)
tip exposed / A / not covered / D does respond (to light)
*allow only the ones with exposed tips or only A **and** D bend towards the light for 2 marks* 1

- (e)  1

[8]

Q2.

- (a) to prevent water affecting the direction of root growth 1

(b) gravity acts evenly on all sides
allow cancel out the effect of gravity
*do **not** accept there is no gravity* 1

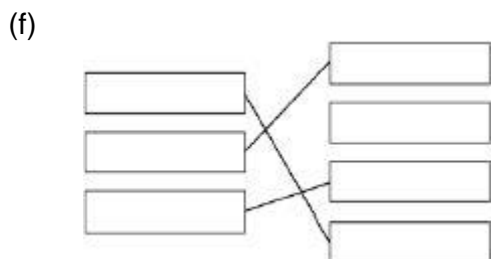
(c) (mean) includes the (anomalous) result for seedling 4
allow (mean) includes the (anomalous) result
which only grew 1 mm 1

(d) calculate (mean) from just seedlings 1, 2, 3 and 5
or
 repeat the investigation **and** recalculate (a new mean)
allow omit seedling 4 from (mean) calculation 1

(e) uneven distribution of hormone in (root / seedling of) A
allow reference to auxin
allow more hormone at bottom
*do **not** accept more hormone at the top* 1

even distribution of hormone in B
allow B does not have an uneven distribution of
hormone 1

(so) top grows fast(er) (than bottom) in (root / seedling of) A (and equal growth in B)
allow (more) cell elongation or cell division on top
of A
allow converse for lower surface 1



extra line for a hormone cancels mark for that hormone

1
1
1

[10]

Q3.

(a) grown down

- allow longer* 1
- towards gravity / gravitropism
allow geotropism 1
- (b) grow up 1
- towards the light
allow phototropism 1
- (c) 3 1
- (d) repeat the experiment 1
- (e) seeds germinate sooner so growing season is longer 1

[7]

Q4.

- (a) (i) any **one** from:
ignore references to same lawn / weather / soil, which are not given in the question.
- (same) (type of) weed killer
 - (same) volume / 5dm³ of solution used (on each area)
allow amount of solution used
*do **not** allow amount / volume / concentration of weed killer*
*do **not** allow number of daisy plants*
 - effect on daisies (not other weeds / plants)
 - (same) area / 10m²
 - (same) time **or** (effect after) two weeks. 1
- (ii) more (daisies) growing after use of weed killer **or** after two weeks
allow it does not fit pattern (of other results) 1
- (iii) any **one** from:
ignore to see if it / water has an effect
- as a control
*do **not** allow as a control variable*
 - to compare (to the other areas)
 - to check other factor(s) are not affecting the results / daisies. 1



- (iv) 80 (arbitrary units of weed killer) also killed all the daisies
allow ref to possible experimental design flaws such as 'only tested once' or 'not repeated' or 'different number of daisies in each area at first'
allow idea that other weed species may not respond in the same way as daisies
allow idea that 100 (units) may also kill wanted species / grass

1

- (b) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking Guidance and apply a 'best-fit' approach to the marking.

0 marks

No relevant content.

Level 1 (1–2 marks)

Reference to at least one environmental factor plants respond to

or

at least one response

or

a named hormone

Level 2 (3–4 marks)

Reference to at least one environmental factor plants respond to

and

at least one associated response

or

reference to a named hormone

and

at least one associated response

Level 3 (5–6 marks)

Reference to at least one environmental factor plants respond to

and

at least one associated response

and

reference to a named hormone

Examples of biology points made in the response:

environmental factors

- light
allow phototropism
- (direction of the force of) gravity
allow gravi / geotropism
- moisture / water.
allow hydrotropism

effects on direction of growth

- shoots grow upwards

For more help, please our website www.exampaperspractice.co.uk



- shoots grow towards light
- shoots grow against (the force of) gravity
- roots grow downwards
- roots grow towards moisture
- roots grow towards (the force of) gravity.
allow reference to 'positive' and 'negative' in terms of tropisms as indicating direction of growth

hormone

- reference to auxin
allow other named hormone(s)
- unequal distribution of hormone causes unequal growth (rates).
allow higher concentration of hormone causes faster growth in shoots
allow higher concentration of hormone causes slower growth in roots

6

[10]

Q5.

- (a) (i) gravitropism / geotropism

not '...trophism'
ignore 'positive' or 'negative'

1

- (ii) any **two** from:

- anchorage
- takes in water
- takes in ions / minerals / salts / correct named example
allow nutrients
do not accept food

2

- (iii) auxin

1

- (b) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a best-fit approach to the marking.

0 marks

No relevant content.

Level 1 (1 – 2 marks)

There is a basic description of a simple method involving seedlings and light.

Level 2 (3 – 4 marks)

There is a description of a method involving seedlings in 1-sided light, and a

control, with a correct observation.

Level 3 (5 – 6 marks)

There is a description of a method involving groups of seedlings in 1-sided light, and in control conditions. It includes some correct measurements or observations.

examples of Biology points made in the response:

- use of scissors to cut tips from some shoots / cut hole in box
- use of forceps for handling seedlings
- use of ruler to measure lengths of shoots at start and at end
- other factors controlled – eg temperature / water
- use of lamp + box re. one-sided lighting
- repetitions – each treatment ≥ 3 times
- control in total darkness / all-round light
- time taken = several hours to a few days
- sample results: tip exposed to 1-sided light \rightarrow bend to light, tip removed \rightarrow vertical, control \rightarrow vertical

6

[10]

Q6.

(a) (i) in the direction of the force of gravity

1

(ii) against the force of gravity

1

(b) (i) diagram completed to show stem bending / leaning towards the window
the bend / lean can be at / from any point above pot level
ignore any leaves

1

(ii) more light (for leaves)
ignore heat

1

more photosynthesis / biomass / glucose
ref to 'more' needed once only, eg 'more light for photosynthesis' = 2 marks
if no other marks given allow 1 mark for 'to get light for photosynthesis'

1

[5]

Q7.

(a) auxin

accept other named plant hormones

1

- (b) (i) any **three** from:
- no (fusion of) gametes / fertilisation
*allow no meiosis **or** new cells only produced by mitosis*
 - only one parent
allow not two parents
 - no mixing of genetic material
 - no genetic variation **or** genetically identical offspring
allow clones
- 3
- (ii) more / many offspring / plants (produced from one parent plant)
allow less damage to parent plant
ignore speed / cost

1

[5]

Q8.

- (a) diagram to show root growing down
*allow single lines **or** not attached **or** open ends for both marks*
all branches must go down
- 1
- diagram to show shoot growing up
all branches must go up
- 1
- (b) gravity
- 1
- (c) Auxin
- 1
- (d) (i) rooting / cuttings
accept other suggestions, eg fruit set / ripening
*do **not** accept weed killers*
- 1
- (ii) any **three** from:
- light
ignore sun / energy
 - water / moisture
 - nutrients / ions / minerals

accept one named mineral
ignore nutrition / food

- space / area
ignore soil / land / territory / volume
ignore reference to gases

3

[8]

Q9.

(a) any **two** control variables for **1** mark each:

- age / size of shoots
- species **or** type of plant / seeds
- light intensity
accept amount of light / colour of light
- (other) named condition eg temperature / water

2

(b) *ignore reference to phototropism*

ref to auxin / hormone

1

unequal (lateral) distribution

1

more hormone on dark side

1

causes growth on dark side

1

(c) (i) (detection) in tip / top / end

1

(ii) (response) behind tip

allow at tip / end / top half

1

[8]