Biology - KS4

Homeostasis and Response

Required Practical
Plant Hormones - Part 2

Miss Ray

OAK NATIONAL ACADEMY

Quick Questions

1. What is a control experiment?
2. What does *repeatable* mean?
3. What does *reproducible* mean?
4. Where in the plant produces auxin?
5. What is the name given to growth against the direction of gravity?

Answers

1. What is a control experiment?

   An experiment where the independent variable that is being tested in the main experiment is removed. This can then be used as a comparison.

1. What does *repeatable* mean?

   That similar results would be obtained if the experiment were repeated by the same person.

Answers

3. What does *reproducible* mean?

   That similar results would be obtained if the experiment were repeated by a different person.

4. Where in the plant produces auxin?

   Root and shoot tips.

5. What is the name given to growth against the direction of gravity?

   Negative geotropism.

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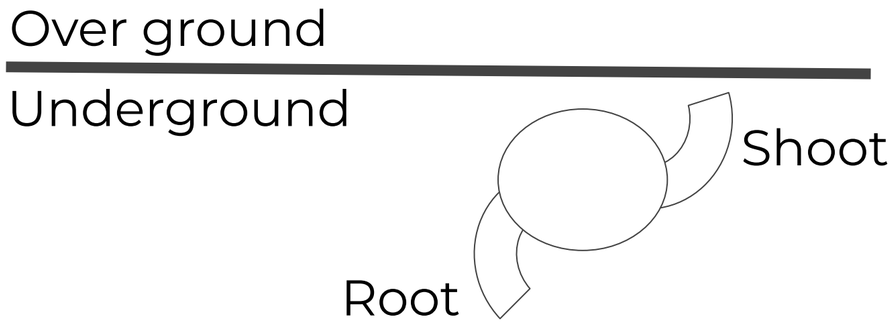
National Academy

Exam style question



Use the diagram to complete the paragraph.

The shoot will _____ away from the direction of _____. This is known as negative _____. Once the shoot is exposed to _____, it will grow _____ it. This is an example of _____ phototropism.

The root will grow in the direction of gravity. This is known as _____ _____. The root will grow away from light if they are exposed to it. This is an example of negative _____.

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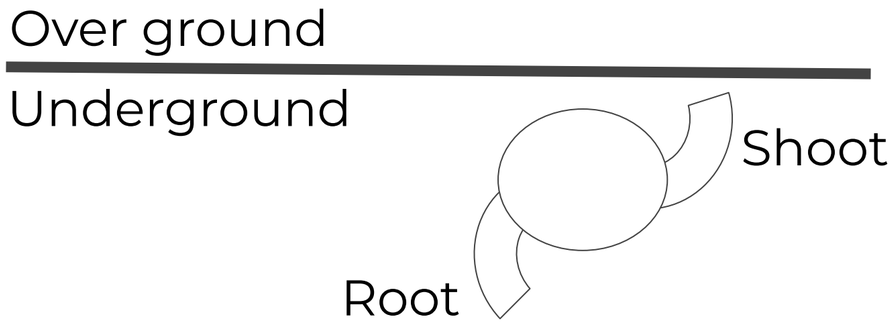
National Academy

Answers



Use the diagram to complete the paragraph.

The shoot will **grow/move** away from the direction of **gravity**. This is known as negative **geotropism**. Once the shoot is exposed to **light**, it will grow **towards** it. This is an example of **positive** phototropism.

The root will grow in the direction of gravity. This is known as **positive geotropism**. The root will grow away from light if they are exposed to it. This is an example of negative **phototropism**.

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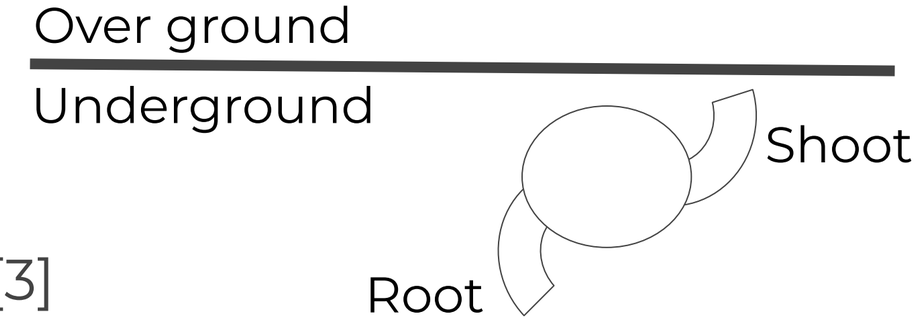
National Academy

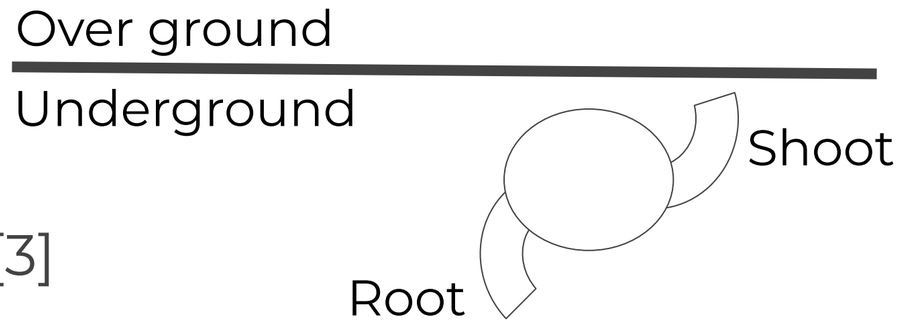
Exam style questions



1. Explain how the roots exhibit positive geotropism. [3]

1. If the tip of the shoot were removed, what impact would that have on the direction of its growth? [2]

Answers



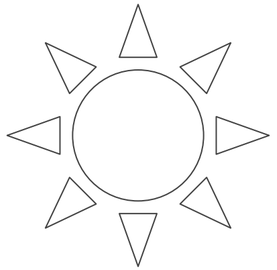
1. Explain how the roots exhibit positive geotropism. [3]

Auxins are highly concentrated on the underside of the root. This slows the cell growth. The upper-side of the root grows faster than the underside of the root and the roots grow in the direction of gravity.

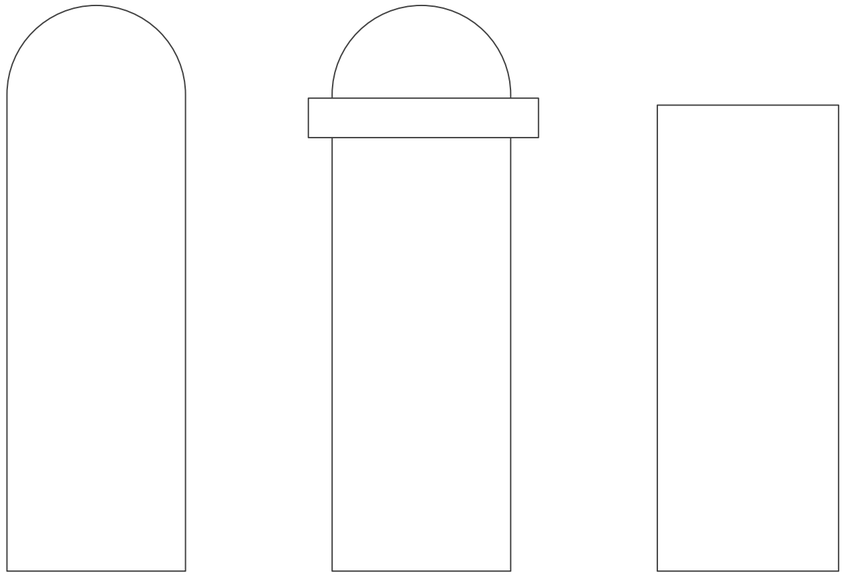
1. If the tip of the shoot were removed, what impact would that have on the direction of its growth? [2]

The tip of the shoot is where light receptors are found and auxins are produced. When this is removed, the shoot is unable to detect the direction of light and produce auxin. Therefore it cannot grow towards the light.

Exam style question



Some students completed an experiment similar to Darwin's on phototropism.
Shoot A was left untouched.
Shoot B had a plastic sheet separating the tip from the main body of the shoot.
Shoot C had the tip removed.
This is represented in the diagram to the right. The shoots were left for 48 hours, only shoot A responded by bending towards the light.



a) Where in the shoot are auxins produced. [1]
b) Why was shoot B unable to respond to the light? [3]
c) Explain why shoot C did not respond to the light. [2]

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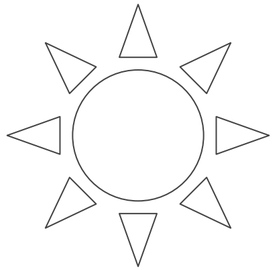
Answers



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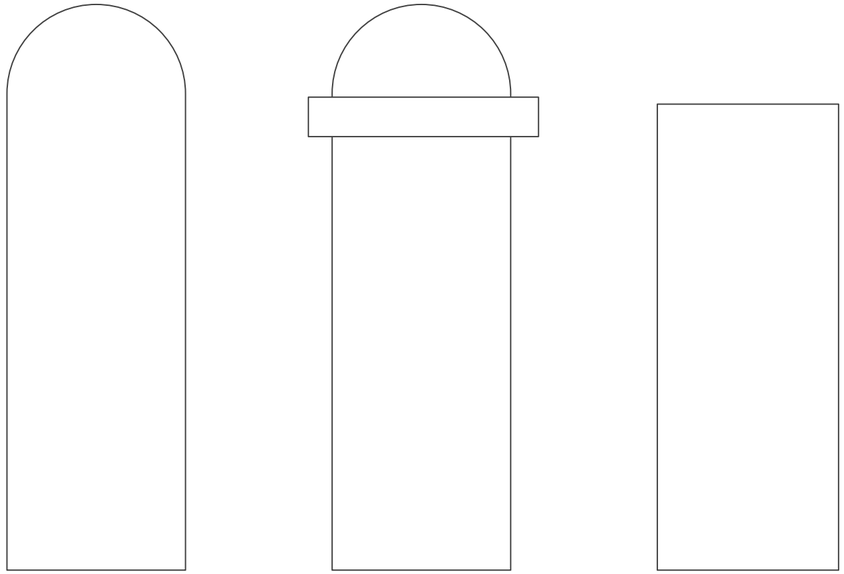

a) Where in the shoot are auxins produced. [1]

The tip

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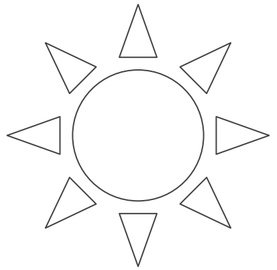
Answers



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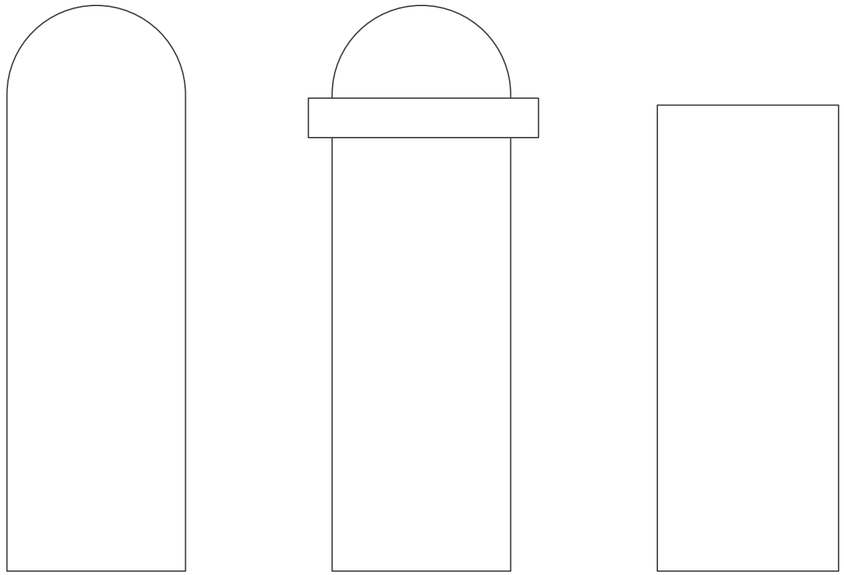

a) Why was shoot B unable to respond to the light? [3]

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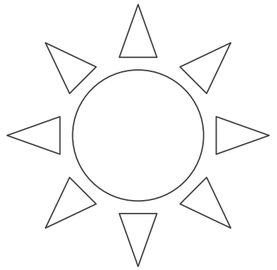
The tip has been separated from the rest of the shoot. This means that the auxins are unable to diffuse into the shoot and concentrate on the shaded side. Therefore there is no response.

Answers



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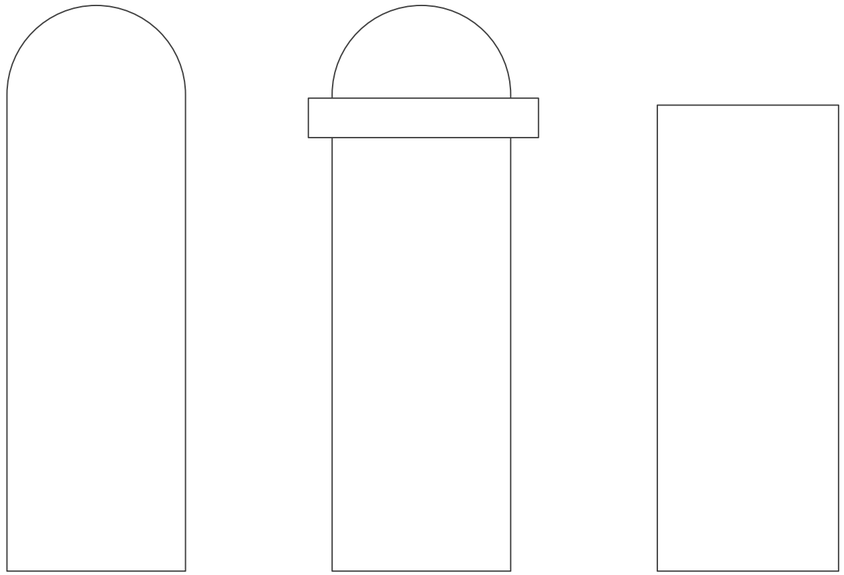

c) Explain why shoot C did not respond to the light. [2]

The tip has been removed and this where light receptors are found and auxins are produced. Therefore there is no response.

State 3 ways that this experiment could be improved to make it more reproducible.

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Large sample size

Repeat the experiment x 3

Calculate a mean

Use a lux meter to measure light intensity

Have a greater range of different light intensities

Exam style question

A student places a beaker containing a germinated seed on its side. The roots were horizontal, in line with the beaker. She left the beaker for 5 days. When she returned the roots had changed their direction of growth and were now pointing downwards.

a) What hormone has caused this change? [1]

a) What is the name given to the direction of this growth in relation to gravity? [1]

a) Explain how this hormone has caused this change. [3]

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a) What hormone has caused this change?[1] **Auxins**

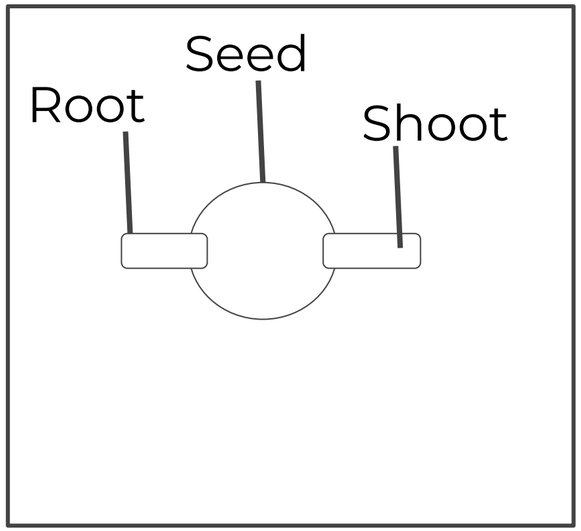
a) What is the name given to the direction of this growth in relation to gravity? [1]

Positive geotropism

a) Explain how this hormone has caused this change. [3]

Auxins are highly concentrated on the underside of the root. This slows the cell growth. The upper-side of the root grows faster than the underside of the root and the roots grow in the direction of gravity.

Exam style question



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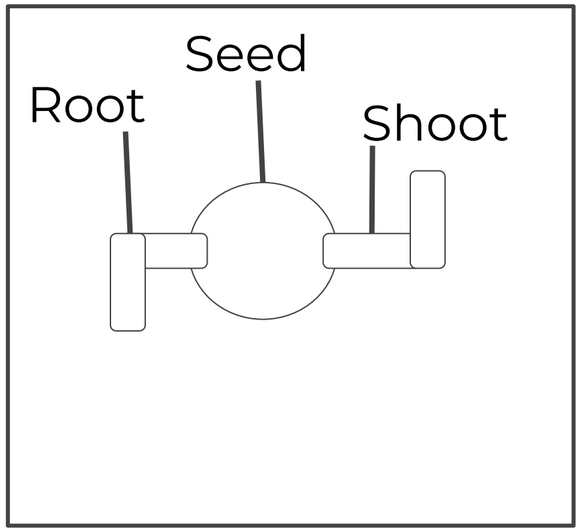
A newly germinated seed is placed into a box and then tipped onto its side.

a) Draw a diagram to show the direction of growth of the shoots and the roots. [2]
b) The roots and shoots both exhibit positive tropisms. The roots positively respond to _____ and the shoots positively respond to _____. [2]
c) What hormone controls these responses?
d) Explain how this hormone controls the response in the shoot. [3]
e) Explain how this hormone controls the response in the roots. [3]

Answers



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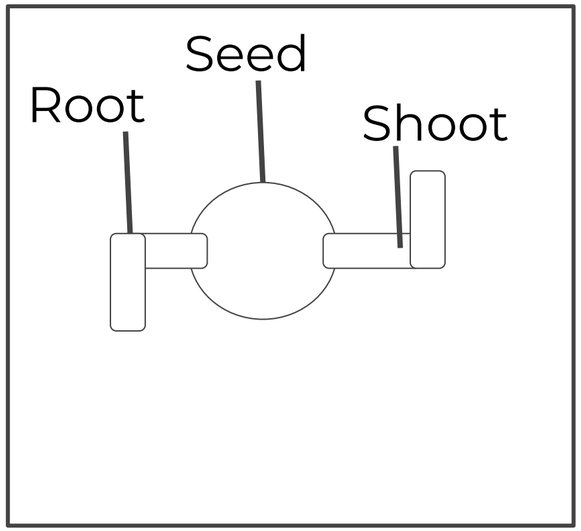
a) What hormone controls these responses?

Auxins

Answers



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d) Explain how this hormone controls the response in the shoot. [3]

Auxins are highly concentrated on the shaded side of the shoot. This increases growth. The shaded-side of the shoot grows faster than the unshaded side of the shoot and the shoots grow in the direction of the light.

e) Explain how this hormone controls the response in the roots. [3]

Auxins are highly concentrated on the underside of the root. This slows the cell growth. The upper-side of the root grows faster than the underside of the root and the roots grow in the direction of gravity.

Exam style question

Miss Ray investigated the effect of light intensity on the growth of cress shoots. She placed 10 seeds in full sunlight, partial sunlight and darkness and left them for 5 days. She measured the length of each shoot before and after the experiment and calculated a mean.

a) What was the independent variable? [1]
b) What was the dependent variable? [1]
c) State two other factors that must be controlled. [2]
d) Describe the results in the table. Use a calculation in your answer. [2]
e) Explain the results in the table. [3]

Light intensity	Mean change in shoot length (mm)
Full sunlight	21
Partial sunlight	14
Darkness	6

Answers

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Light intensity	Mean change in shoot length (mm)
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a) What was the independent variable? [1]

Light intensity

a) What was the dependent variable? [1]

Length of the shoot (mm)

a) State two other factors that must be controlled. [2]

Species, age, temperature, water availability, carbon dioxide concentration.

Answers

d) Describe the results in the table. Use a calculation in your answer. [2]

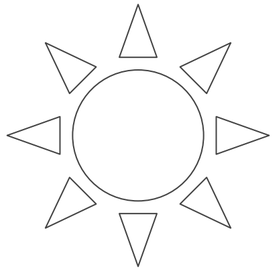
As the light intensity increases, the mean change in shoot length increases. The mean change in shoot length in full sunlight is 3.5 times greater than the mean shoot length change in darkness.

Light intensity	Mean change in shoot length (mm)
Full sunlight	21
Partial sunlight	14
Darkness	6

e) Explain the results in the table. [3]

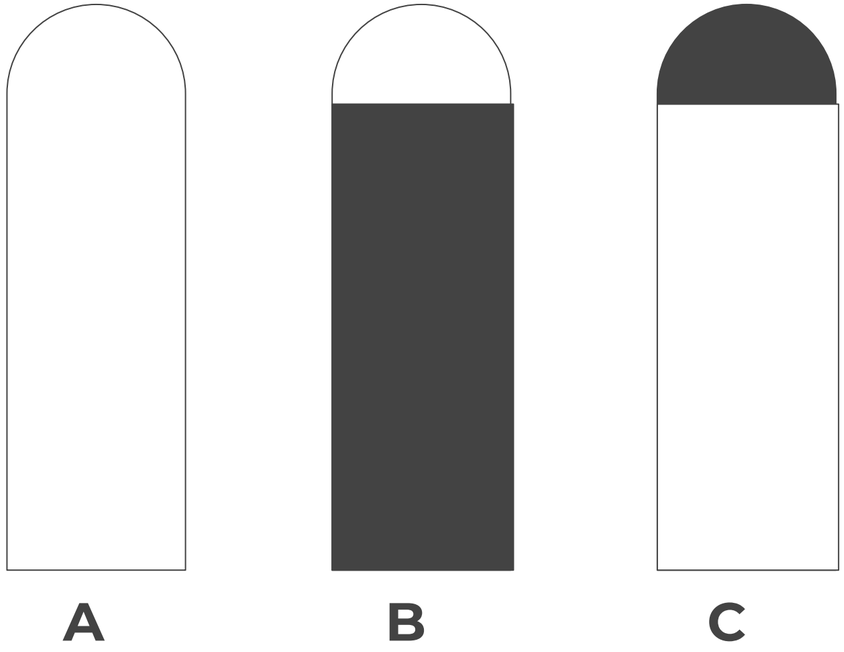
The shoots placed in full sunlight grew the most as they were able to photosynthesise the most. This means more glucose was produced which is used in respiration to release energy. This energy is used for growth.

Exam style question



Some students did an investigation similar to Darwin's investigation. Shoot A was left untouched, B was wrapped in foil with the shoot tip exposed and the tip of C was covered in foil. This is represented in the diagram to the right. The shoots were left for 48 hours.

a) State two things that must be controlled in this experiment. [2]
b) Explain the response of shoot A in this experiment. [3]
c) Explain why shoot B was able to respond by bending towards the light. [2]
d) Explain why shoot C did not respond to the light. [2]



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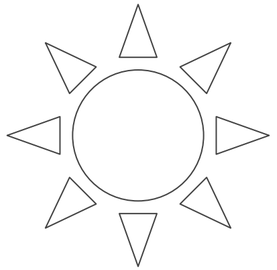
Answers



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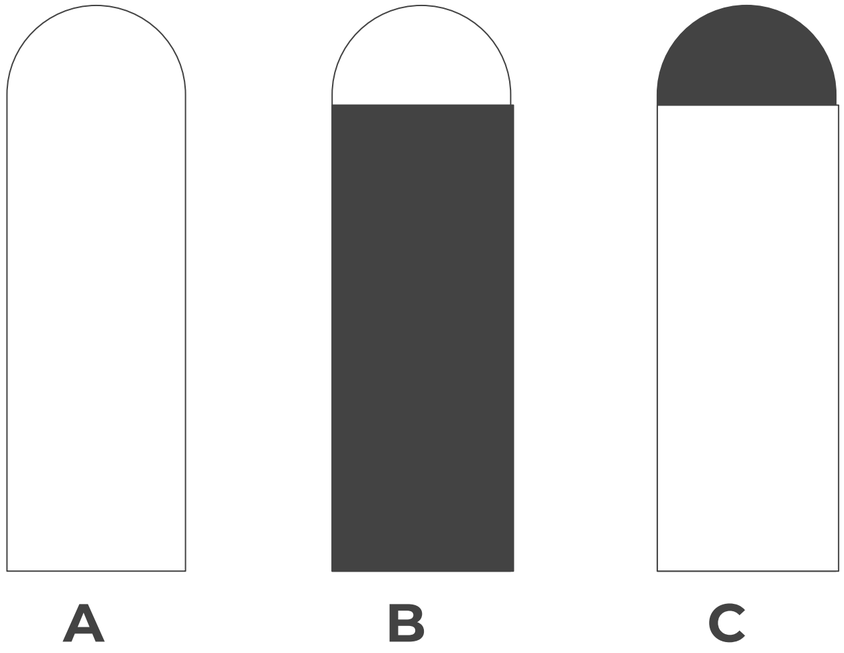

a) State two things that must be controlled in this experiment. [2]

Age of shoots, species, light intensity, temperature, water availability, carbon dioxide concentration

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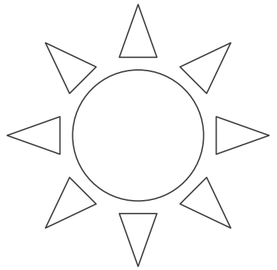
Answers



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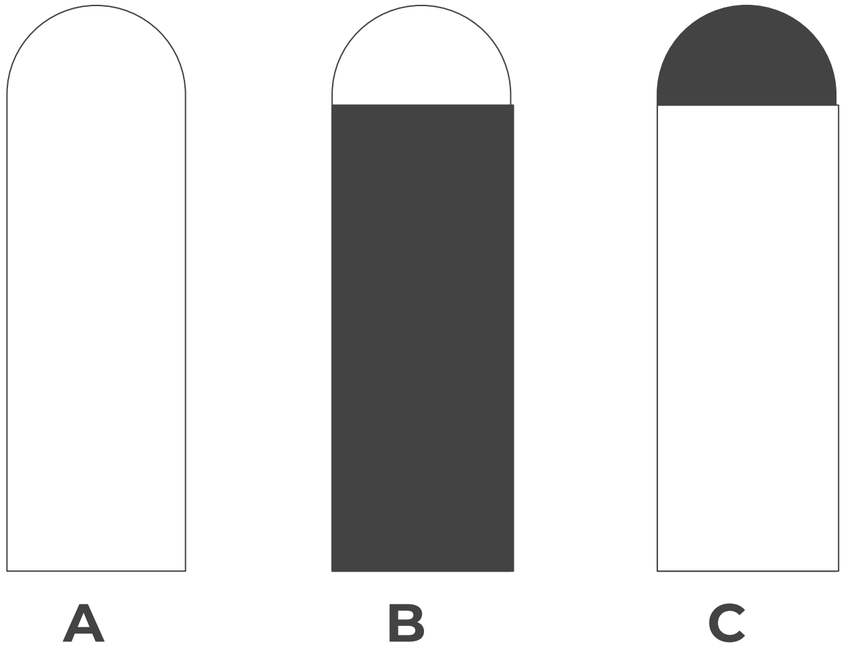

b) Explain the response of shoot A in this experiment. [3]

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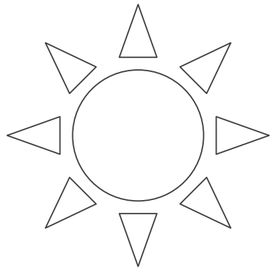

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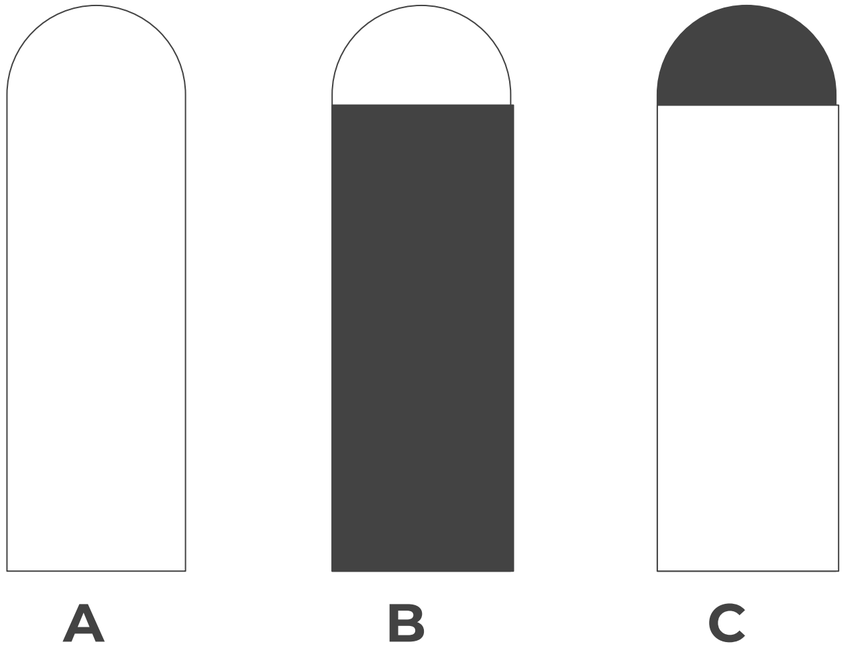

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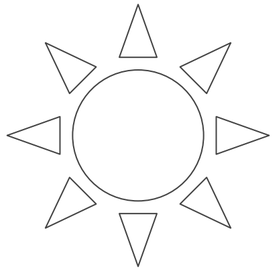
c) Explain why shoot B was able to respond by bending towards the light. [2]

Light receptors are found on the tip of the shoots.
Auxins are produced in the tip of the shoots.

Answers



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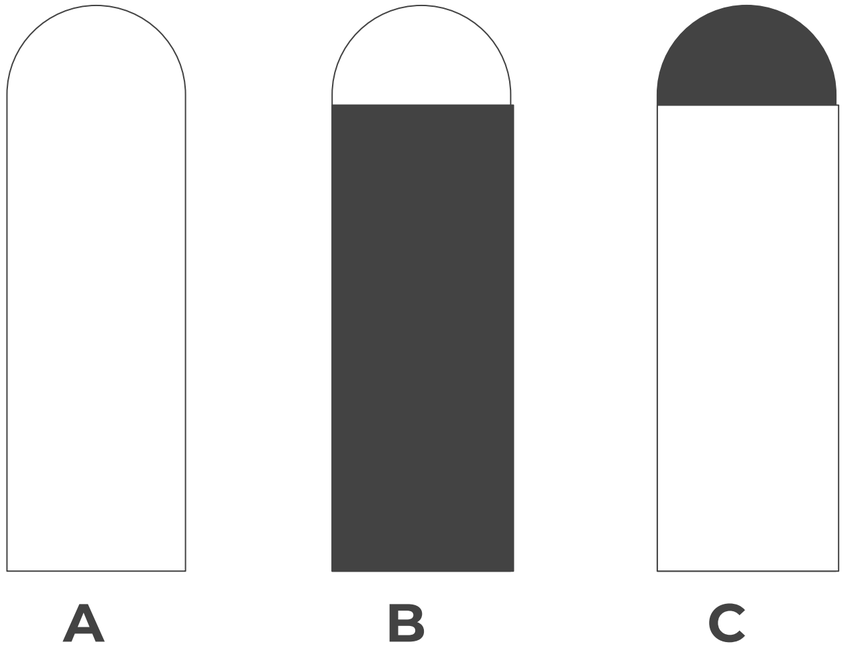

d) Explain why shoot C did not respond to the light. [2]

Light receptors are found on the tip of the shoots and will not detect the light as they are covered by the foil.
Auxins will not be produced and the shoot will not respond by growing towards the light.

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