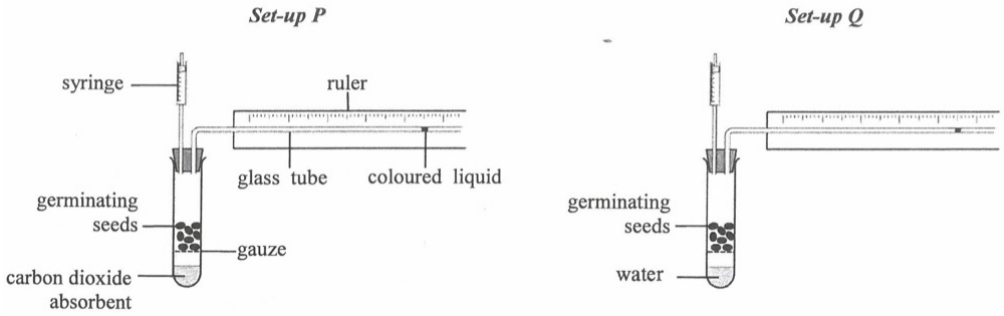
Directions: Questions 11 and 12 refer to the diagram below, which shows two set-ups used for the investigation of the gas exchange in germinating seeds:

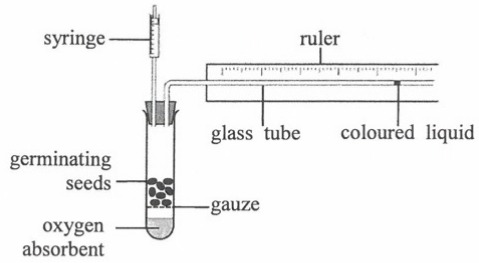


11. Assuming that the environmental conditions are the same, what will happen to the coloured liquid in each set-up?

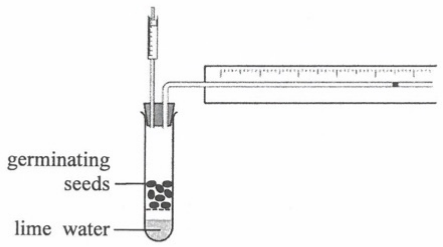
	Set-up P	*Set-up Q*
A.	moves to the right	moves to the left
B.	moves to the left	stays still
C.	stays still	moves to the left
D.	stays still	moves to the right

12. Which of the following modified set-ups can be used to show the identity of the gas produced in the investigation?

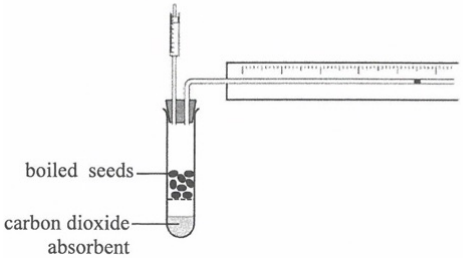
A.



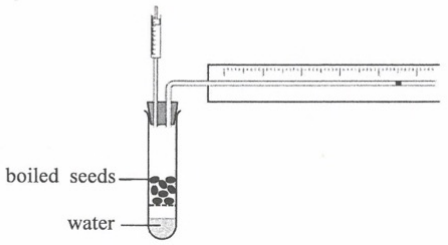
B.



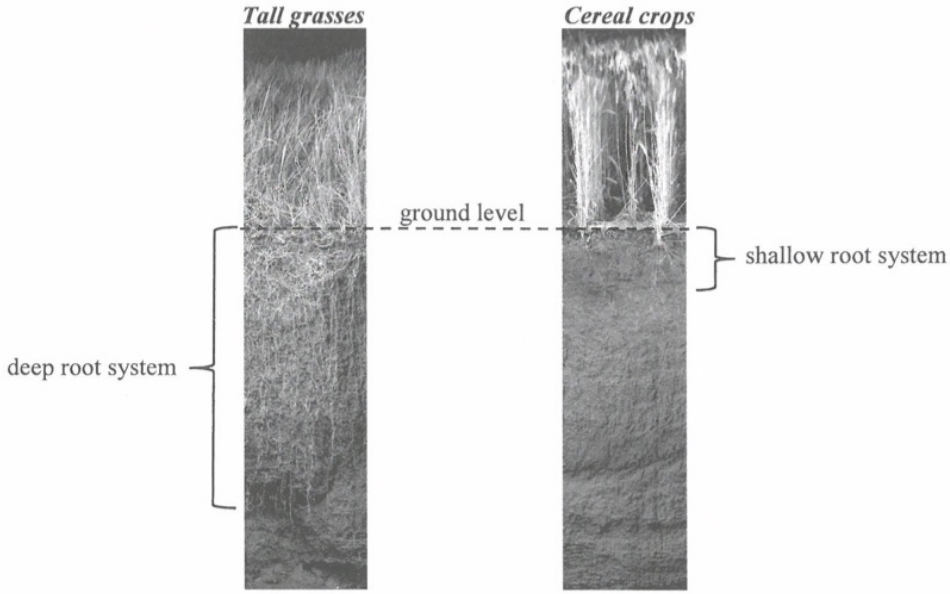
C.



D.



8. Tall grasses and cereal crops belong to the same family and share a common ancestor. Cereal crops have been artificially selected for agriculture and their seeds harvested as food. The roots of the tall grasses in grasslands range in depth from 1.5 m to 4.5 m while those of cereal crops rarely exceed 1 m. The photographs below show the root depths of tall grasses and cereal crops under the same magnification:



(a) (i) Grassland is a region of treeless plain which is mainly occupied by tall grasses. It is usually found in regions with moderate rainfall. The tall grasses have evolved with a deep root system. What is the selection pressure involved in this evolutionary process? What is the advantage of the greater root depth in tall grasses? (2 marks)

(ii) In terms of energy usage of the plant, explain why having a shallow root system for cereal crops is considered an advantage to farmers. (2 marks)

DSE M.C. Questions - Detecting the environment (plant)
(sort by difficulty)

Challenging

2012 Q.30 (35%)
Which of the following correctly describe the importance of phototropism to plants?

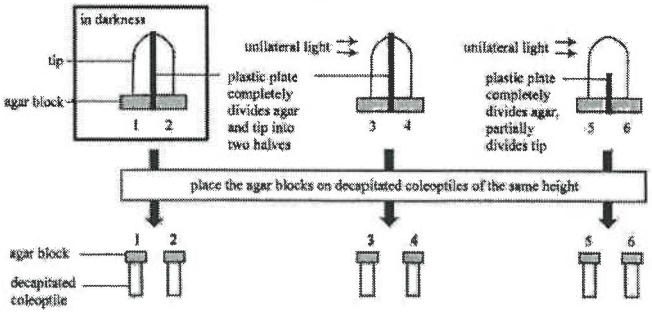
(1) It ensures that the root can get water from the soil.
(2) It ensures that the root can anchor to the soil for support.
(3) It allows the shoot reach a position where there is sunlight.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

Average

Directions:

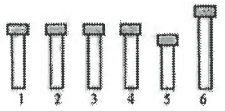
Questions 35 and 36 refer to the diagram below, which shows an experiment that collects auxins from the tip of coleoptiles under different conditions. After that, the agar blocks are placed on decapitated coleoptiles of the same height:



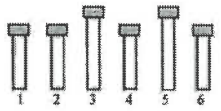
2016 Q.35 (42%)

Which of the following correctly shows the growth response of the decapitated coleoptiles?

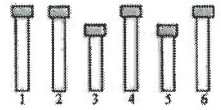
A.



B.



C.



D.

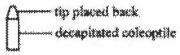
2016 Q.36 (64%)

Which of the following can be used as a control set-up for the above experiment?

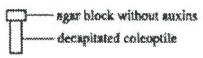
A.

B.

C.



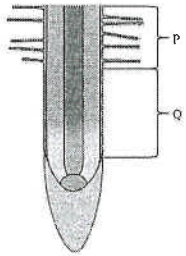
D.



Average

2017 Q.31 (65%)

The diagram below shows a low power drawing of the cut section of a root:

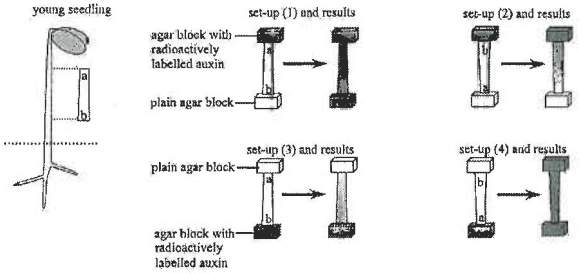


Which of the following correctly describes the relationship of auxin and different regions of the root?

A. It affects cell division at P.
B. It affects cell division at Q.
C. It affects cell elongation at P.
D. It affects cell elongation at Q.

2019 Q.28 (45%)

To investigate the transport of auxins in the stem of a young seedling, a plain agar block and an agar block soaked in radioactively labelled auxins were prepared and placed at different ends of a cut stem, as shown in the diagram below. The relative amounts of radioactivity in different parts are shown as different intensities of shaded area.



Which of the following conclusions can be drawn from the above results?

(1) Transport of auxins in the stem is not affected by gravity.
(2) Transport of auxins in the stem involves an active process.
(3) Transport of auxins in the stem mainly takes place from a to b.

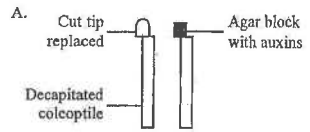
A. (1) and (2) only B. (1) and (3) only C. (2) and (3) only D. (1), (2) and (3)

Easy

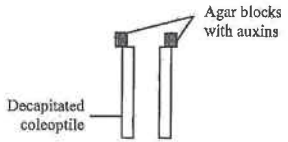
2014 Q.36 (77%)

Which of the followings pairs of set-ups can be used to test the hypothesis that auxins are growth-promoting substance in oat coleoptiles:

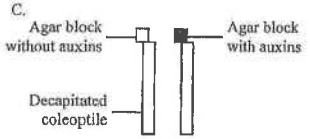
A.



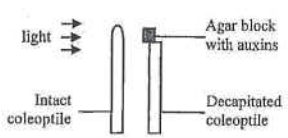
B.



C.



D.



2020

27. Which of the following serve(s) as the control set-up(s) in this investigation?

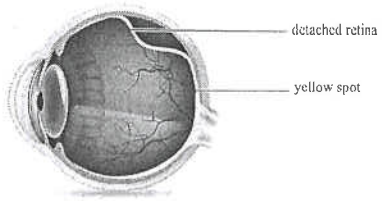
A. P only
B. R only
C. P and Q only
D. Q and R only

28. Which of the following conclusions can be drawn based on the results of the investigation?

A. The tip of the coleoptile produces auxins.
B. Auxins stimulate the growth of coleoptiles.
C. The coleoptile shows positive phototropism.
D. Coleoptiles stop growing when the tip is removed.

2021

18. The diagram below shows an early stage of an eye defect:

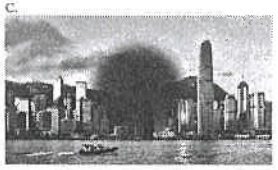


If a person suffers from this eye defect, which of the following diagrams is the most likely vision perceived by this person?

A.

B.

C.



D.

Answers

Challenging

2012
30 [D]

Average

2016	2017	2019
35 [A] 36 [D]	31 [D]	28 [B]

Easy

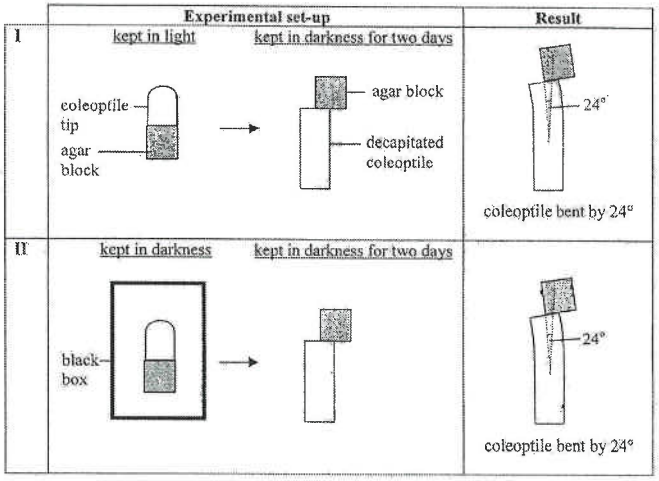
2014
36 [C]

CE - 2009

10. (b) Scientists have proposed two hypotheses to explain why a greater amount of auxins is found in the shaded side than the lighted side when a coleoptile is illuminated with unilateral light.

Hypothesis A: Light destroys auxins in the lighted side of the plant.
Hypothesis B: Auxins move from the lighted side to the shaded of the plant

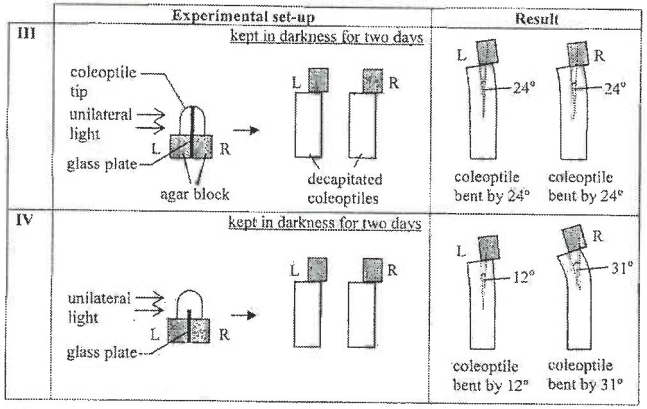
(i) A scientist performed an experiment to test Hypothesis A. He used agar blocks to collect auxins from coleoptile tips under different conditions. Then he placed each agar block on one side of a decapitated coleoptile. The set-up was kept in darkness for two days. He then measured the degree of bending of the coleoptile. The diagrams below show his experiment set-ups and the results:



(1) State the dependent variable in the above experiment. (1 mark)

(2) Do the results of the above experiment support Hypothesis A? Explain your answer. (3 marks)

(ii) The scientist performed another experiment to test Hypothesis B. The diagram below shows his experiment set-ups and the results:

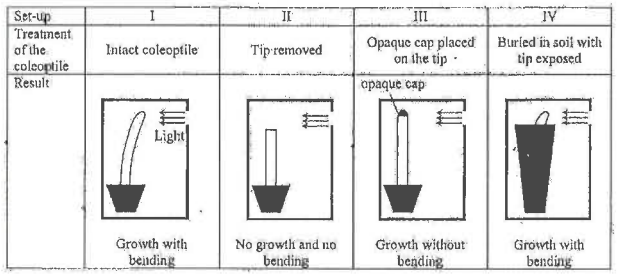


(1) What is the purpose of inserting a glass plate into the coleoptile and agar block in the way shown in Experiment set-up III? (1 mark)

(2) If Hypothesis B is correct, explain the results obtained from Experimental set-up IV. (4 marks)

HKDSE - 2013 1B

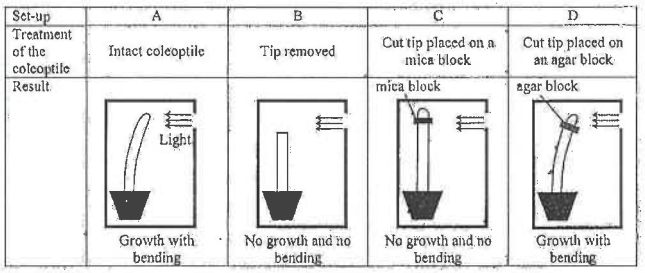
7. In 1880, Darwin conducted an experiment to investigate the phototropism of plants. He placed some coleoptiles in dark boxes, each with a hole at one side to allow light to pass through. The results after various treatments of coleoptiles are shown in the diagrams below:



(a) From the results of the experiment, which part of the coleoptiles is responsible for detecting unilateral light? Support your answer with reasons. (3 marks)

(b) Explain why it is necessary to have set-up III in the experiment. (1 mark)

(c) In 1913, Boysen-Jensen performed some other experiments to study the nature of the signal transmission involved in phototropism. The diagram below shows his experimental set-ups:



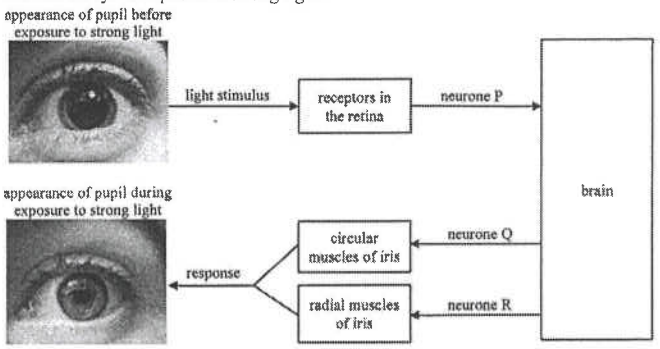
What conclusion can be drawn from Boysen-Jensen's experiment? (3 marks)

(d) Which of the following statements about the nature of science are demonstrated in the above historical events? Put a '✓' in the space next to the statement and provide an explanation. The first one is an example for your reference. (4 marks)

Statement		*Evidence from the historical events*
Doing science requires creativity and imagination.	✓	Both Darwin and Boysen-Jensen used innovation and imagination to design their experiments.
Science is socially and culturally embedded.		
Science is based on evidence.		
Science knowledge is tentative and dynamic.		

HKDSE - 2020 1B

3. The diagram below shows a neural pathway involved in the coordination of pupil size when a human eye is exposed to strong light:



(a) With reference to the above neural pathway,
(i)state the ***two*** types of receptors located in the retina. (1 mark)
(ii)state the type of neurone represented by Q and R. (1 mark)

(b) Describe how the two sets of iris muscles work together to bring about the change in the pupil size shown above. State the significance of this response. (4 marks)

(c) If someone falls unconscious, the response of the above neural pathway will be assessed to confirm if this pathway is still functioning. What does this assessment tell you about the nature of this neural coordination (1 mark)

Past papers Marking Scheme – Growth responses of plants

CE - 2009 Q.10 (b)

(b) (i) (1) amount of auxins measured by degree of bending of the coleoptiles 1

(2) Hypothesis A i not supported / Light does not destroy auxins 1
The coleoptiles in experimental set-ups I and II have the same degree of bending 1
This shows that the agar blocks have collected the same amount of auxins regardless of light or dark condition 1

(ii) (1) To stop the lateral transport of auxins 1

(2) Unilateral light causes a migration of auxins from the lighted to the shaded side 1
Hence, there is less auxins diffusing to block L / more auxins diffusing to the block R 1
When the blocks are placed on the right side of the coleoptiles, block R stimulates a greater extent of growth on the right side than that of block L 1
resulting in a greater degree of bending towards the left side 1

HKDSE - 2013 1B

7. (a)
- the tip is responsible for detecting the unilateral light (1)
- because if it is removed / blocked from the stimulus, no bending growth movement occurs (1)
- on the other hand, the same response is produced even if the lower part of the coleoptile is covered in soil (1)

(3)

(b)
- to show that the failure to produce response in set-up II is not due to the effect of injury / damage (1) when the tip is removed

(1)

(c)
- some substances are produced from the tip of the coleoptiles (1)
- which can diffuses through the agar block (1) to reach the lower part of the coleoptile
- and exert effect / lead to bending growth at the lower part of the coleoptile (1)

(3)

(d)

Science is based on evidence.	✓ (1)	Both Darwin and Jensen used the results from their experiment to develop their understanding about phototropism in plants (1)
Science knowledge is tentative and dynamic.	✓ (1)	Darwin's work only provided some understanding about phototropism and Jensen's results helped develop further the science knowledge (1)

(4)