

# 9.3 Growth in Plants

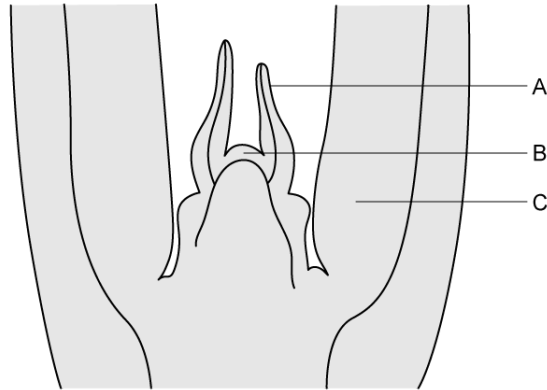
## Question Paper

Course	DP IB Biology
Section	9. Plant Biology (HL Only)
Topic	9.3 Growth in Plants
Difficulty	Medium

**Time allowed:** 60  
**Score:** /45  
**Percentage:** /100

### Question 1a

a)  
The image below shows the tip of a shoot.



Identify the structure labelled **B** in this image.

[1 mark]

### Question 1b

b)  
Outline how structure **B** in part a) leads to the extension of the stem in a plant.

[2 marks]

### Question 1c

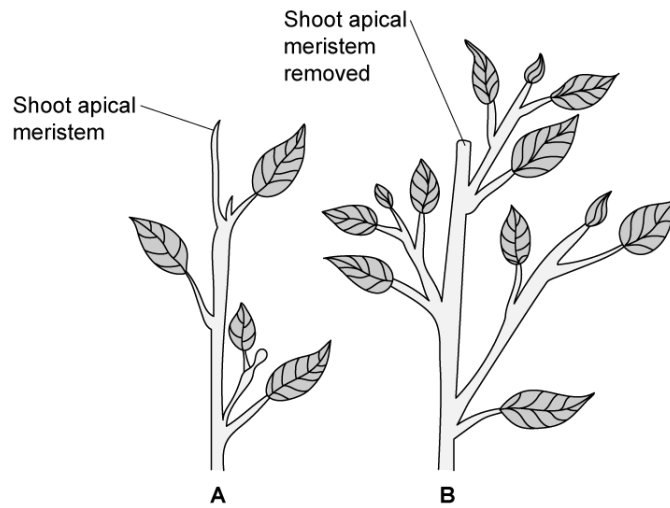
c)  
Describe the response the tip of the shoot would show if it received light from one side only.

[2 marks]

**Question 1d**

d)

The image below shows two plants that illustrate a specific pattern of growth.

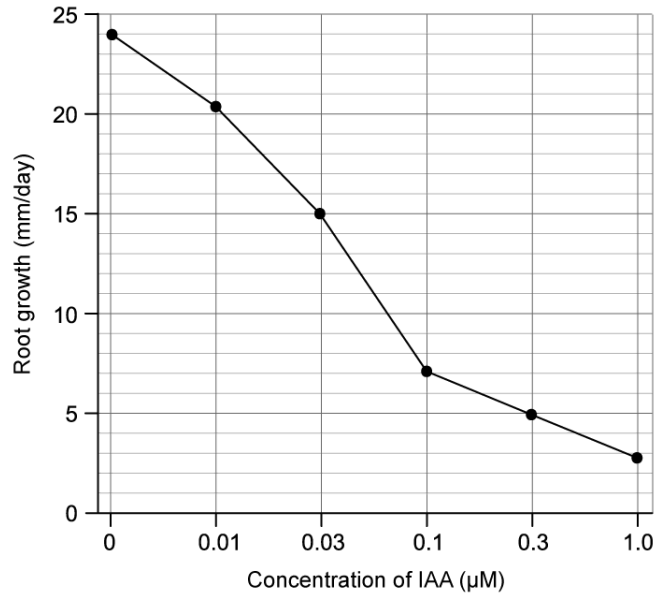


Identify, with a reason, the pattern of growth observed in the two plants shown in the image above.

[3 marks]

### Question 2a

a)  
Indole-3-acetic acid (IAA) is a common auxin that affects the growth of plants. An investigation was done to determine the effect of different concentrations of IAA on the growth of young roots. The results of this investigation are shown in the graph.



State the conclusion that can be drawn from these results.

[1 mark]

### Question 2b

b)  
Contrast the root growth observed at IAA concentrations of  $0.03 \mu\text{M}$  and  $0.3 \mu\text{M}$ .

[2 marks]

### Question 2c

c)  
Calculate the rate of root growth per hour when roots are **not** exposed to IAA from the graph in part a).

[2 marks]

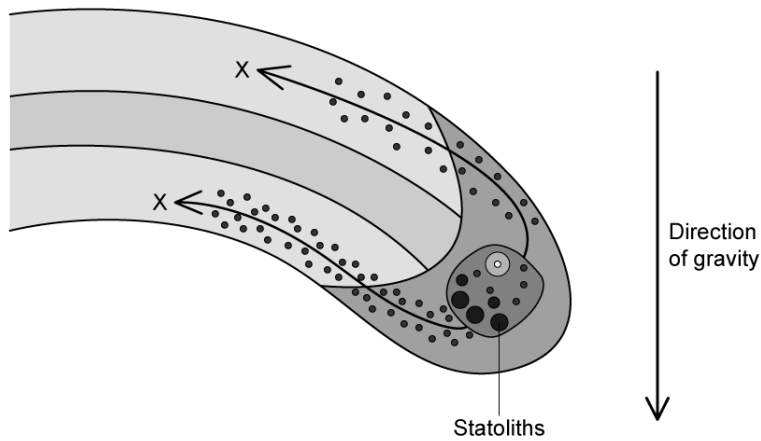
### Question 2d

d)  
Explain the importance of gravitropism in roots.

[2 marks]

### Question 3a

a)  
The image below shows the tip of a root that was placed in a horizontal position, as well as the changes taking place inside the root.



State the function of statoliths in a root.

[2 marks]

### Question 3b

b)  
Identify the substance labelled **X** in the image in part a)

[1 mark]

### Question 3c

c)  
Explain the link between the presence of statoliths and the distribution of substance **X** shown in the image in part a).

[3 marks]

### Question 3d

d)  
A group of students investigated the effect of removing the root tip on the gravitropic response of a radicle.

The students had two groups of plants, each containing five seedlings, that were germinated at the same time and under the same conditions. Group 1 had the end 2 mm of the root tip removed, while Group 2 was left intact. All ten seedlings were laid flat and the position of each root tip was marked on a sheet of paper that was placed beneath the seedlings. After five hours the new position of the root tips were marked on the paper and the angle of bending was measured. An upward-bending root was recorded as a negative value and a downward-bending root was recorded as a positive value.

The results are displayed in the table.

Plant seedling	Root bending / degrees	
	Group 1 (without root tip)	Group 2 (with root tip)
1	0	42
2	-3	39
3	0	37
4	0	40
5	-2	35
Mean	-1	39

Suggest an explanation for the results shown in the table above.

[2 marks]

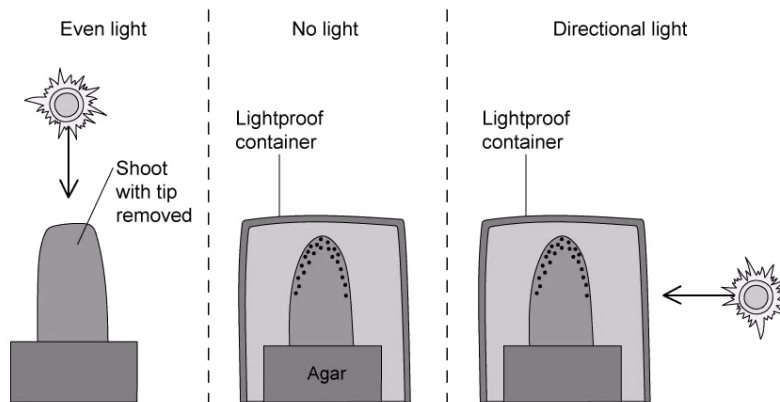
### Question 4a

a)  
In an investigation to test the effect of auxin on shoot growth in seedlings, three different experiments were set up:

**Group A** = Shoot with the tip removed.

**Group B** = Shoot has been covered in a light proof container.

**Group C** = Shoot was grown under a directional light source.



Contrast the growth that would be seen in **group A** and **group B**.

[1 mark]

### Question 4b

b)  
Explain how directional light in **group C** from the experiment in part a) will affect gene expression in the shoot.

[3 marks]

**Question 4c**

c)

Explain how being unable to respond to light stimuli would lead to reduced growth in a plant.

**[3 marks]****Question 5a**

*One mark is available for clarity of communication throughout this question.*

a)

Describe the process of plant micropropagation.

**[7 marks]**



**Question 5b**

b)

Outline some of the commercial and environmental benefits of micropropagation.

**[5 marks]****Question 5c**

c)

Explain how microarrays are used in genomics to increase our understanding of plant hormones and their effect on gene expression.

**[3 marks]**