CHEMISTRY ONLINE
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BIOLOGY

ORGANISMS RESPOND TO CHANGES IN ENVIRONMENTS

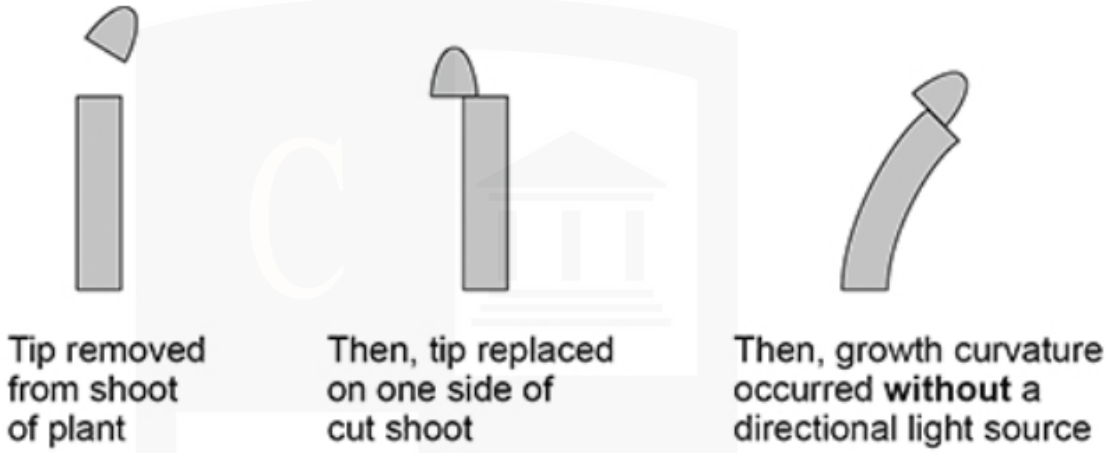
Level & Board	AQA (A-LEVEL)
TOPIC:	SURVIVAL& RESPONSE
PAPER TYPE:	QUESTION PAPER - 1
TOTAL QUESTIONS	5
TOTAL MARKS	25

Survival and Response - 1

1.

An analysis of plant development factors is shown in Figure 1.

Figure 1



(a) Apply your understanding of indoleacetic acid (IAA) to the explanation of Figure 1 growth curve. **(3)**

A bioassay measures a substance's concentration by seeing how it affects live tissues.

The actual process for a growth curvature bioassay to ascertain the IAA content in shoot tips is depicted in Figure 2.

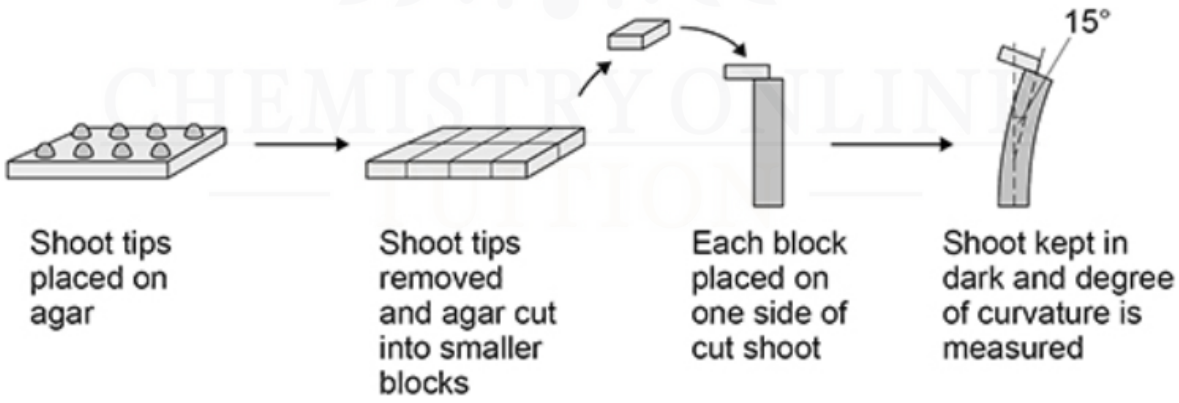
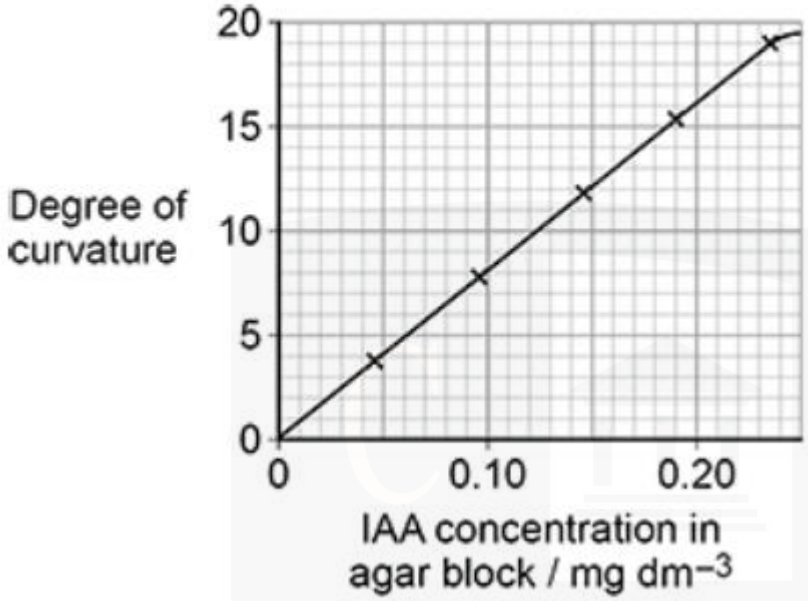


Figure 3 shows the calibration curve for this growth curvature bioassay.

Figure 3



(b) Describe the process for comparing the IAA concentration in the shoot tips of two distinct plant species using the calibration curve in Figure 3 and the process shown in Figure 2.

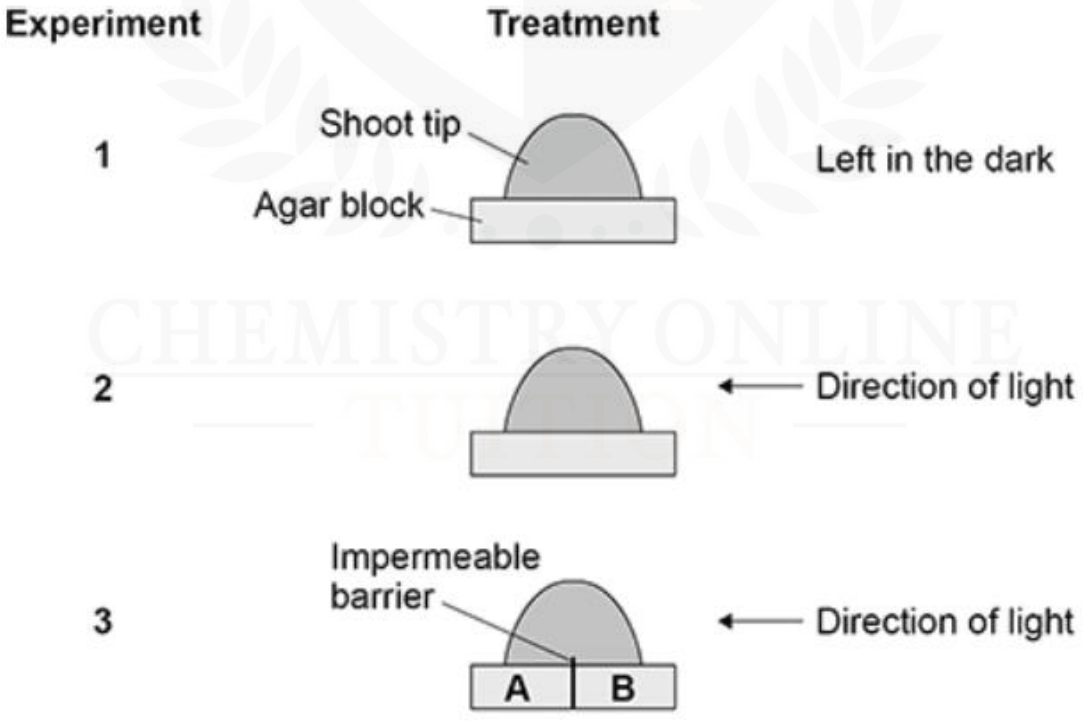
You must address every variable that has to be regulated in order to generate an accurate comparison in your response. **(5)**

2.

A scientist looked into how the distribution of IAA in shoot tips was affected by a directional light stimulus. As seen in Figure 4, the scientist set up three tests.

Everything was under control except for the amount of light exposure.

Figure 4



Afterwards, she compared the IAA concentrations in the agar blocks from experiments 1, 2, 3, section A, and section B using the growth curvature bioassay.

The scientist's findings are shown in the table below.

Experiment	Degree of curvature in Bioassay / degrees
1	17.69
2	17.61
3A	11.22
3B	6.50

(a) Give two inferences about IAA that you may draw from the data in the above table. **(2)**

3.

Researchers looked into how adult pine bugs moved. From crevices in tree bark, adult beetles emerge.

G, a recently emerging adult beetle, was released by the scientists from the middle of a sample area with a single light source pointing in one direction. They sketched out the beetle's walking route. They did the same with J, P, and R, three additional beetles.

The scientists findings are displayed in Figure 1.

Figure 1

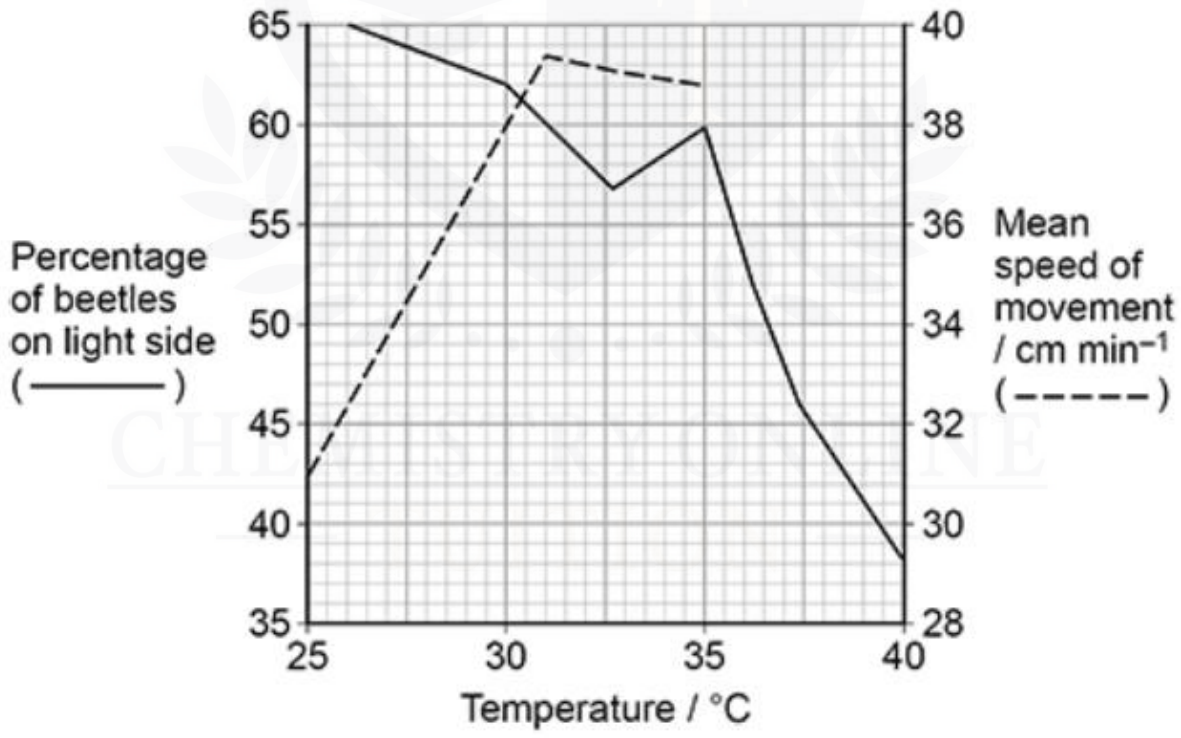
(a) Identify the behavior exhibited by beetles G, J, P, and R, and mention a benefit that the behavior type may have for adult beetles. **(2)**

Adult pine beetles typically travel more when it's hotter outside and there is more light available.

These adult beetles move slowly as they get ready to take flight. The movement of adult beetles at various temperatures and in both light and dark conditions was studied by the experts. They made a box that had two halves: one lit and the other dark. At the center of the line that divides the zones of light and shade, they released an adult beetle. After five minutes, they tracked the beetle's movement and location. They computed the average speed of movement using this information. The experiment was performed in multiple temperatures and with a large number of insects.

The scientists' findings are displayed in Figure 2.

Figure 2



(b) A student came to the following conclusions after reviewing these experiments:

• there is a noticeable shift in movement between 35 °C and 37.5 °C;

• more beetles migrate away from the light between 35 °C and 37.5 °C;

• more beetles walk more slowly between 35 °C and 37.5 °C.

Provide arguments for the possible invalidity of these conclusions. **(3)**

4.

Undergraduate conducted research on how indoleacetic acid (IAA) affected the development of oat seedlings, or young plants.

The student did the following: chopped off the shoot tip from each seedling and cut out a 10 mm length of shoot; put 10 lengths of shoot into each of 5 Petri dishes; added an equal volume of 5% glucose solution to each Petri dish; added 40 cm3 of a different concentration of IAA solution to each Petri dish; left the Petri dishes at 20 °C in the dark with their lids on for 5 days; removed the shoots after 5 days and measured them; calculated the mean change in length of shoot at each concentration of IAA.

Her results are displayed in Table 1.

Table 1

IAA concentration added to Petri dish / parts per million	10^{-5}	10^{-3}	10^{-1}	1	10
Mean change in length of shoot / mm	0.0	0.1	1.3	2.4	3.1

(a) Justify the student's decision to cut each seedling's shoot tip off. **(2)**

(b) Why was the glucose solution supplied to each Petri dish by the student?

(2)

(c) Justify the decision to leave the Petri dish lids on**. (2)**

5.

Table 1

IAA concentration added to Petri dish / parts per million	10^{-5}	10^{-3}	10^{-1}	1	10
Mean change in length of shoot / mm	0.0	0.1	1.3	2.4	3.1

(a) Explain and describe the findings displayed in Table 1 above, and speculate as to how the results could have changed if different root lengths had been utilized. (3)

(b) Using distilled water and a stock 1 g dm^{-3} solution of IAA (1 g dm^{-3} = 1 part per thousand), the student created the various IAA concentrations.

Fill in Table 2 with the amounts of distilled water and stock IAA solution needed to make 40 cm^3 of 10 ppm (parts per million) IAA solution. **(1)**

Table 2

Concentration of IAA solution / parts per million	Volume of stock IAA solution / cm^3	Volume of distilled water / cm^3
10		

I am Sorry !!!!!

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