

Response & Stimuli

Question Paper 1

Level	International A Level
Subject	Biology
Exam Board	Edexcel
Topic	Respiration, Muscle and Internal Environment
Sub-Topic	Response & Stimuli
Booklet	Question paper 1

Time Allowed: 45 minutes

Score: /37

Percentage: /100

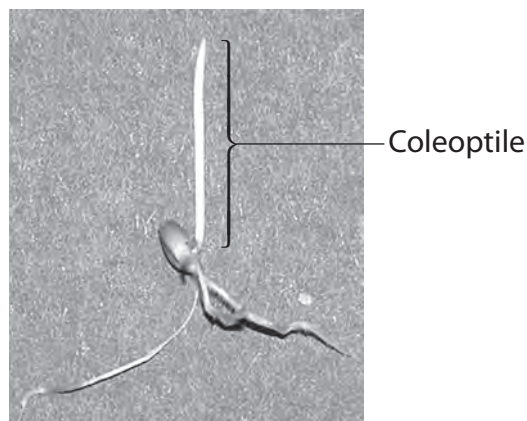
Grade Boundaries:

A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

- 1 The young shoot of a germinating wheat grain is enclosed in a structure called a coleoptile.

Scientists use coleoptiles to investigate the role of IAA (auxin) in the growth responses of plants to light.

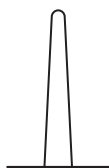
The photograph below shows a germinating wheat grain.



Magnification $\times 1$

In one investigation, a coleoptile was exposed to light from one direction. The diagram below shows the appearance of the coleoptile before and after exposure to light from one direction.

Before exposure



After exposure



- (a) Place a cross in the box next to the correct description of the response of this coleoptile after exposure to light from one direction.

(1)

- A** negative phototropism to light shining from the left
- B** negative phototropism to light shining from the right
- C** positive phototropism to light shining from the left
- D** positive phototropism to light shining from the right

(b) The response of the coleoptile occurs because IAA (auxin) binds to membrane receptors. This promotes the active transport of hydrogen ions out of the cell cytoplasm.

(i) Explain what is meant by the term **active transport**.

(2)

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(ii) Hydrogen ions provide the optimum pH for enzymes that break the bonds between adjacent cellulose microfibrils.

Name the bonds that are broken by these enzymes.

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(iii) Suggest what happens to cells in the coleoptile, after the breaking of these bonds, that allows the response to light from one direction.

(2)

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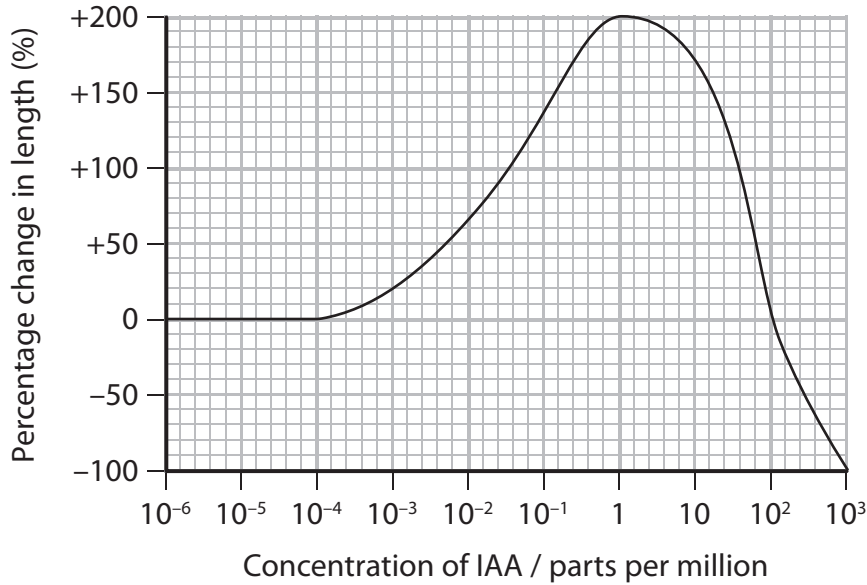
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- (c) Scientists also investigated the effect of IAA concentration on the elongation of coleoptiles.

Coleoptile sections of the same length were placed in Petri dishes containing IAA solutions of different concentrations. The change in length was measured.

The graph below shows the percentage change in length when compared to control coleoptile sections placed in water.



- (i) Use the information in the graph to describe the effect of IAA concentration on the elongation of coleoptiles.

(3)

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- (ii) The method used by the scientists made sure that a valid comparison could be made from the data collected.

Suggest a method the scientists could use to make a valid comparison of the elongation of coleoptiles at each IAA concentration.

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- 2 A student decided to investigate whether drinking coffee containing caffeine had an effect on reaction times.

She selected 27 students who regularly had drinks containing caffeine.

The students did not have any drinks containing caffeine for 24 hours before the investigation. On the morning of the investigation, the students drank either one cup of coffee containing caffeine or one cup of coffee with no caffeine.

The students then went to their first lesson. Immediately after the lesson, the reaction times of the students were measured in milliseconds (ms).

The raw results are shown below.

Group given coffee containing caffeine

355 ms, 310 ms, 270 ms, 450 ms, 350 ms, 316 ms, 298 ms, 368 ms, 394 ms, 347 ms, 246 ms, 340 ms, 415 ms, 274 ms, 300 ms

Group given coffee with no caffeine

426 ms, 440 ms, 510 ms, 412 ms, 398 ms, 450 ms, 340 ms, 484 ms, 365 ms, 410 ms, 380 ms, 264 ms

- (a) Write a suitable null hypothesis for this investigation.

(2)

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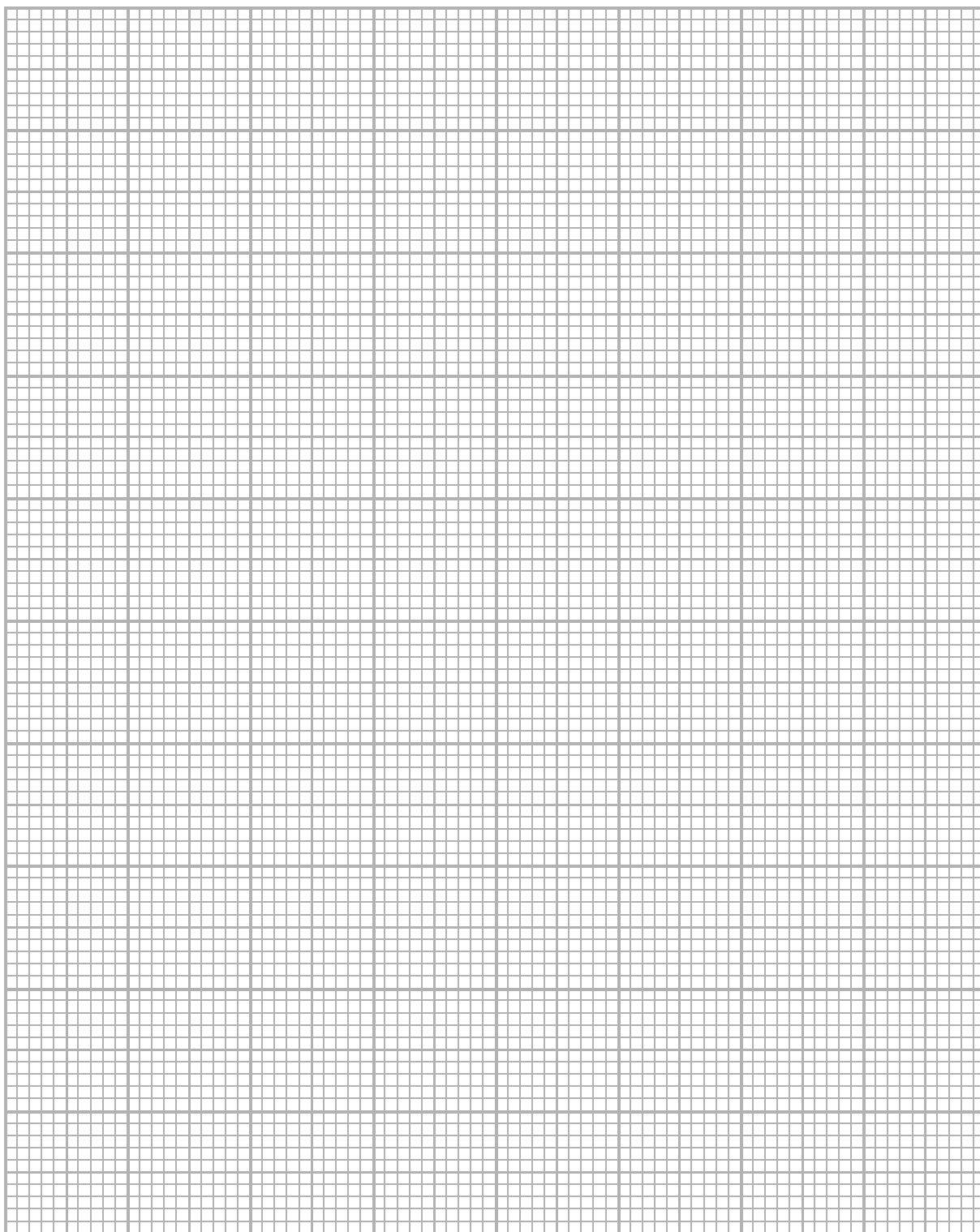
- (b) Calculate the **mean value** for each group.

Prepare a suitable table to display the mean value and the **sample size** for each group.

(3)

- (c) On the graph paper below, draw a suitable graph to show the effect of caffeine on mean reaction times and the variability of the data.

(3)



(e) Suggest why it is difficult to draw a valid conclusion from the results of this investigation.

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(Total for Question 2 = 14 marks)

- 3 An investigation was carried out to study the effect of positive and negative physical and emotional experiences on humans.

The positive physical experience was a warm object placed on the arm of a person for five seconds.

The negative physical experience was a hot object placed on the arm of a person for five seconds.

All other variables were kept constant.

Two groups of people were used in this investigation. In the first group, the warm object was used before the hot object. In the second group, the hot object was used before the warm object.

After each experience, the individuals were asked to rate their feelings using the scoring system below.

Feelings	Score
Very bad	1
Bad	2
Neutral	3
Good	4
Very good	5

- (a) Suggest why one group had the warm object placed on their arm before the hot object and the other group had the hot object placed on their arm first.

(2)

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(c) This investigation then used a scanning technique to study whether the same areas of the brain were involved in both physical experiences and emotional experiences.

(i) Suggest the scanning technique required to study the brain in this investigation. Give reasons for your choice.

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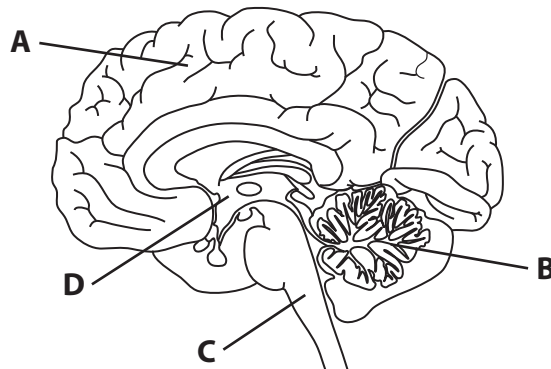
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(ii) It was found that an area of the brain called the insula was involved in both physical experiences and emotional experiences. The insula is found just above the hypothalamus.

Using the diagram below, place a cross in the box ☒ that identifies the area of the insula.

(1)



- A
- B
- C
- D