

Plant and animal responses

Question Paper 1

Level	A Level
Subject	Biology
Exam Board	OCR
Module	Communication, homeostasis and energy
Topic	Plant and animal responses
Booklet	Question Paper 1

Time allowed: 80 minutes

Score: /59

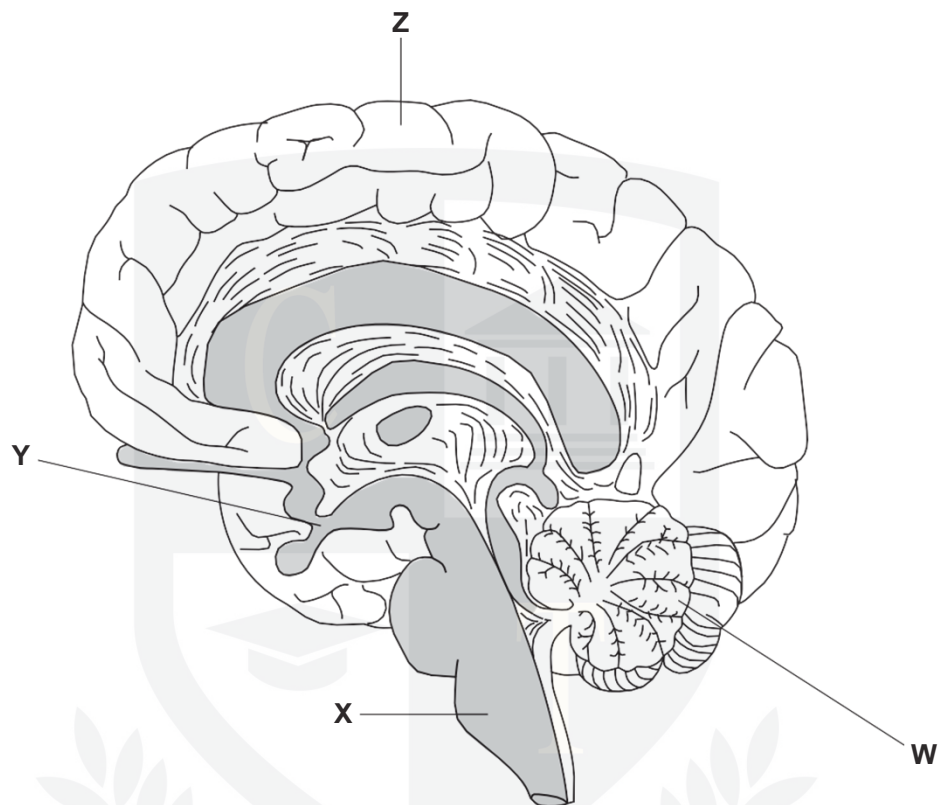
Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E
>69%	56%	50%	42%	34%	26%

Question 1

The image below is a diagram of the human brain.



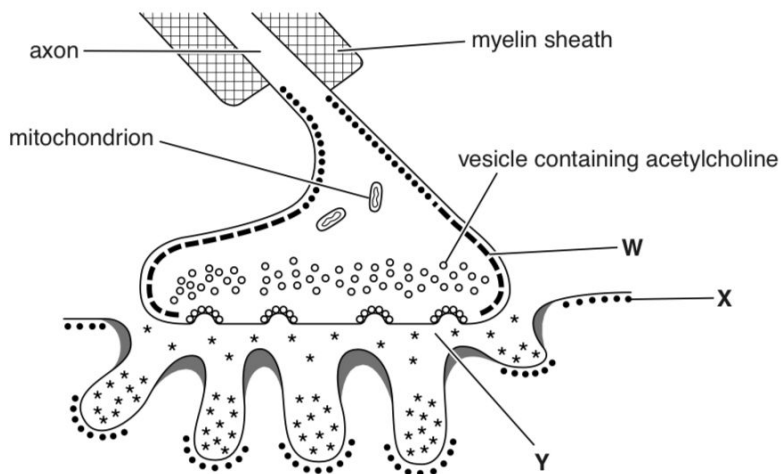
Which of the labelled regions would be directly involved in learning to play a musical instrument?

- A. W and X
- B. W and Y
- C. W and Z
- D. Y and Z

[Total: 1]

Question 2

(a) The diagram represents the neuromuscular junction in mammals



[3]

Fig. 3.3

(i) What type of molecule forms ion channels **W** and **X**?

..... [1]

(ii) Identify region **Y**.

..... [1]

(iii) Name the enzyme found in region **Y**.

..... [1]

(b) The student wrote the following summary about the control of heart rate.

When the heart rate is too low the level of carboxylic acid in the blood becomes higher than normal. The vagus nerve sends action potentials to the AVN to increase the contraction rate of the heart muscle. The baroreceptors in the walls of the blood vessels then detect that the pH of the blood is normal, so heart rate can return to resting.

The endocrine system can also change heart rate. Release of the hormone adrenaline from the adrenal medulla causes the smooth muscle of the heart to contract more frequently.

Identify **and** correct any biological errors in the student's summary.

[4]

- (c) Reflex actions are rapid responses that protect the body from harm.

The Moro reflex is found in babies up to five months of age, and occurs when the baby feels its head is suddenly no longer supported. The Moro reflex is made up of the following responses:

- The baby spreads out its arms then brings them together rapidly.
- The baby cries.

- (i) Suggest how the Moro reflex helps to prevent harm to a newborn baby. [2]

- (ii) The Moro reflex gradually disappears and usually stops completely after babies reach nine months. Other reflexes develop as children grow older.

Describe a reflex response a 3-year-old child would make to an object moving towards their eyes **and** explain the advantage of this response.

[3]

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[Total: 12]

Question 3

Plant hormones affect the growth of plant tissues in different ways.

One such effect is to promote the formation of seedless fruit.

Cytokinins are a group of plant hormones.

A commercial plant hormone firm carried out research into three different cytokinins: kinetin, zeatin and diatin.

The firm investigated the effect of adding different volumes of each cytokinin on the production of seedless fruit.

The cytokinins were sprayed on the flowers of different plants. Over time, the mass of seedless fruits produced by the plants was measured.

Fig. 21 is a summary of their results.

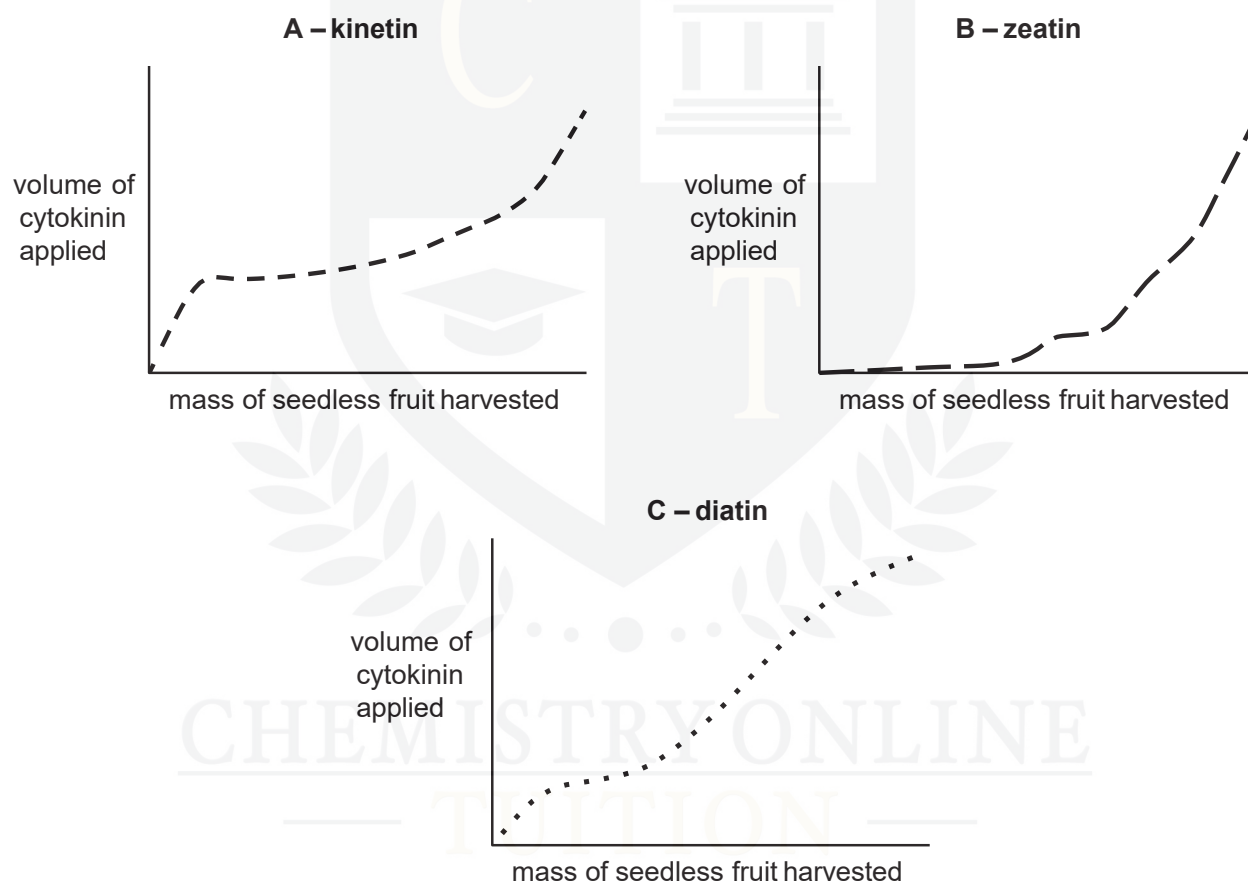


Fig. 21

On the basis of these results, the firm decided to use diatin in their new plant spray.

The firm made the following claim on their packaging:

Diatin is scientifically proven to cause production of seedless fruit when applied to flowers.

(a)* Evaluate the firm's claim, using the evidence in Fig. 21.

[6]



(b) Another response affected by plant hormones is phototropism.

A student completed an investigation into phototropism in cress seeds.

This was the method used:

- Place 50 cress seeds (*Lepidium sativum*) on a sterile paper towel in a petri dish.
- Water with 10 cm³ of distilled water.
- Repeat for 3 different sets of seeds:
 - Set 1 is placed in a box to prevent light shining on the seeds.
 - Set 2 is placed in a box with light from above only.
 - Set 3 is placed in a box with light from the right hand side only.
- Keep all 3 sets at 25°C.
- After 72 hours, remove 20 of the seedlings from each set and count how many have bent.

Identify **two** limitations of the student's method.

For each limitation, explain how it limits the validity of conclusions that can be drawn **and** suggest an improvement that would improve the validity of conclusions made.

limitation 1:

explanation:

improvement:

limitation 2:

explanation:

improvement:

[6]

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— TUITION —

[Total: 12]

Question 4

The peripheral and central nervous systems work together to enable mammals to respond to changes in their external environment.

- (a) Outline the roles of the peripheral and central nervous systems in responding to changes in the environment.

The names and functions of regions in the brain are **not** required.

[4]

- (b) The endocrine system is also involved in responding to changes in the external environment. For example, adrenaline is released in the 'fight or flight' response. When adrenaline arrives at a liver cell membrane, it binds to a receptor. Inside the cell, a cascade of events leads to glycogenolysis.

Explain how this response would be of use to a rabbit that has seen a predator.

[3]

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- (c) (i) All three types of muscle in the rabbit's body contribute to the 'fight or flight' response.

Complete the table below by filling in the blank boxes.

[3]

Organ	Type of muscle	Action of <u>muscle</u> in fight or flight response
heart		increases pulse rate
leg muscle		
arteriole to liver	smooth	

- (ii) Muscles in the rabbit's leg are made up of units.

Fig. 5.1 is a diagram of one unit.

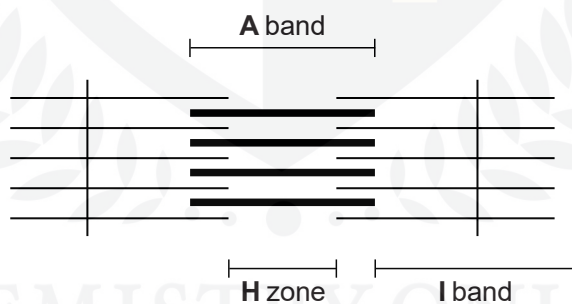


Fig. 5.1

The thick lines in the **A** band represent a protein.

Name this protein.

[1]

(d) Innate behaviour and the capacity to learn are further assets that animals have in avoiding danger.

- (i) Slugs are active at night. It would be useful to slugs to eat all day. But when dawn comes, they move away from the light.

State **one** advantage of this innate behaviour.

[1]

- (ii) Describe how you could use the slug's response to light to demonstrate habituation.

[2]

- (iii) Woodlice also respond to light. When it shines, they tend to move away from it.

What name do biologists give to this behaviour?

[1]

(e) Chimpanzees are usually vegetarian. Meat is a dietary supplement for them.

A famous TV wildlife documentary showed a group of chimpanzees trapping colobus monkeys in order to eat them. The colobus sought refuge in trees. They can climb better than chimpanzees. Being much lighter, they can retreat to thinner branches.

- (i) Place a tick ☒ in **one** box next to the biological name that correctly describes this type of chimpanzee behaviour.

[1]

☐

Classical learning

☐

Social behaviour

☐

Disruptive behaviour

☐

Insight learning

☐

Natural selection

- (ii) Fig. 5.2 shows the arm bones of a chimpanzee and a human, drawn to the same scale.

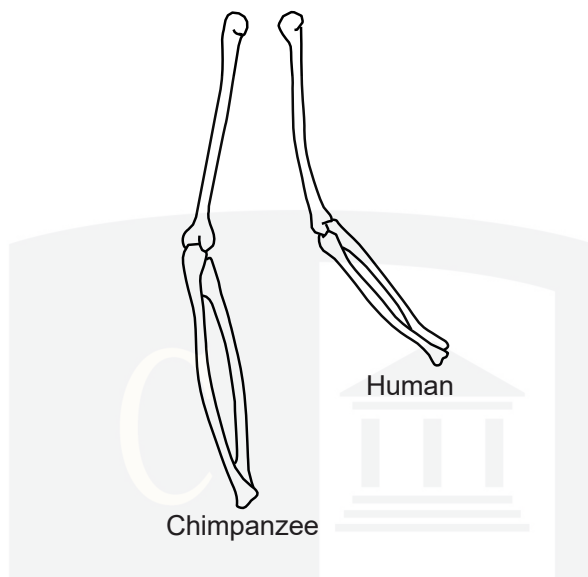


Fig. 5.2

The muscles of the chimpanzee arms are approximately the same thickness as the arm muscles of an athletic man, yet those of the chimpanzee are stronger than those of most men.

Suggest why.

[2]

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[Total: 18]

Question 5

Animals and plants respond to changes in their environment.

- (a) Plants respond to changes in their environment using chemicals known as plant hormones or plant growth regulators.

A student carried out a two-part experiment to identify the contents of two unlabelled bottles, **J** and **K**. One bottle contained auxin and the other contained gibberellin.

In Part 1 of the experiment, 30 seedlings had their shoot tips removed. The 30 seedlings were then divided into three groups of 10 and treated as shown in Table 3.1 and Fig. 3.1.

Group	Treatment
1	no treatment applied
2	solution of J applied to cut stem at apex of seedling
3	solution of K applied to cut stem at apex of seedling

Table 3.1

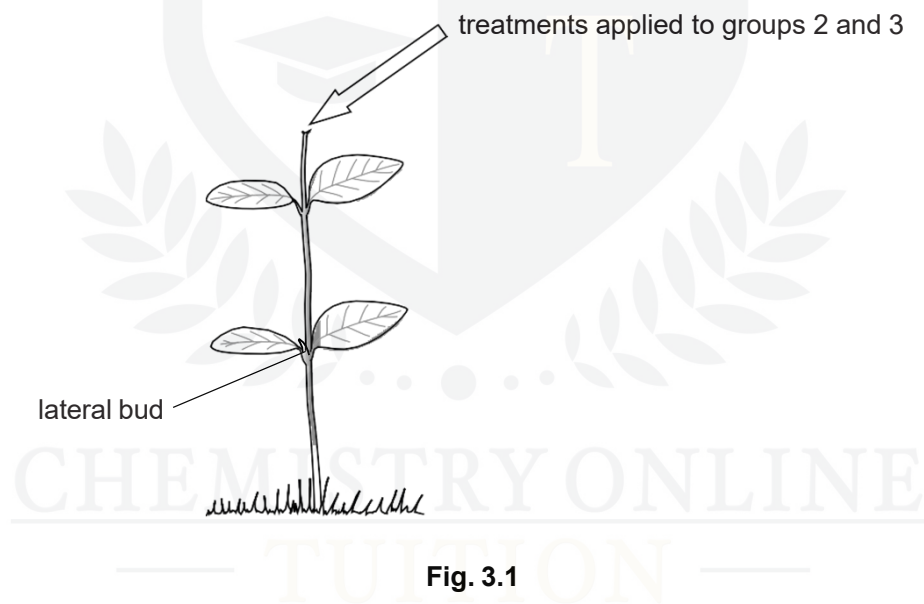


Fig. 3.1

All the seedlings were then exposed to light from **all** directions and left for seven days.

In Part 2 of the experiment, 30 coleoptiles had their tips removed. They were then divided into three groups of 10 coleoptiles and treated as shown in Table 3.2 and Fig. 3.2.

Group	Treatment
4	no treatment applied
5	solution of J applied to cut tip of coleoptile
6	solution of K applied to cut tip of coleoptile

Table 3.2

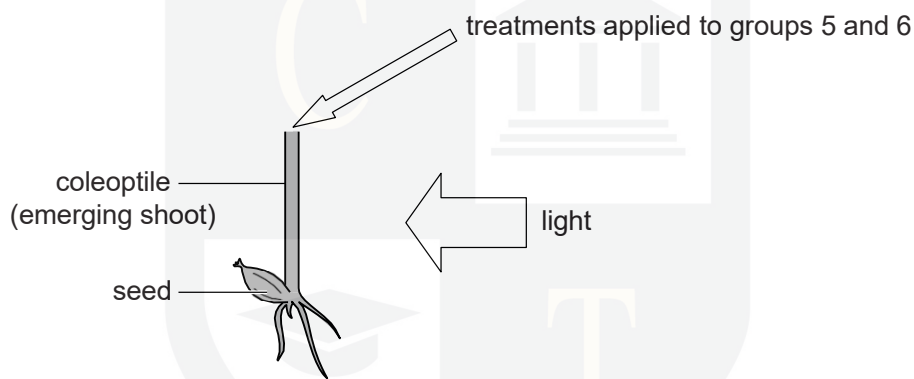


Fig. 3.2

The coleoptiles in groups **4**, **5** and **6** were then exposed to light from **one direction**, as shown in Fig. 3.2, and left to grow for two days.

- (i) Identify **three** variables that must be controlled in this experiment to produce valid results.

[3]

- (ii) Groups **1** and **4** were controls in this experiment.

Explain why these controls were necessary.

[1]

The observations at the end of each part of the experiment are shown in Table 3.3.

Group	Treatment	Observations
1	none	increase in stem length of 10 mm and growth of lateral buds
2	J on cut stem apex	no growth of lateral buds
3	K on cut stem apex	increase in stem length of 40 mm and growth of lateral buds
4	none	vertical growth of the coleoptiles
5	J on cut coleoptile tip	growth of the coleoptiles towards the light source
6	K on cut coleoptile tip	vertical growth of the coleoptiles

Table 3.3

- (iii) Using the information from Table 3.3, identify the contents of bottles **J** and **K** and give reasons for your answer.

[3]

J

K

reasons

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(b) Fig. 3.3 is a diagram representing the neuromuscular junction in mammals.

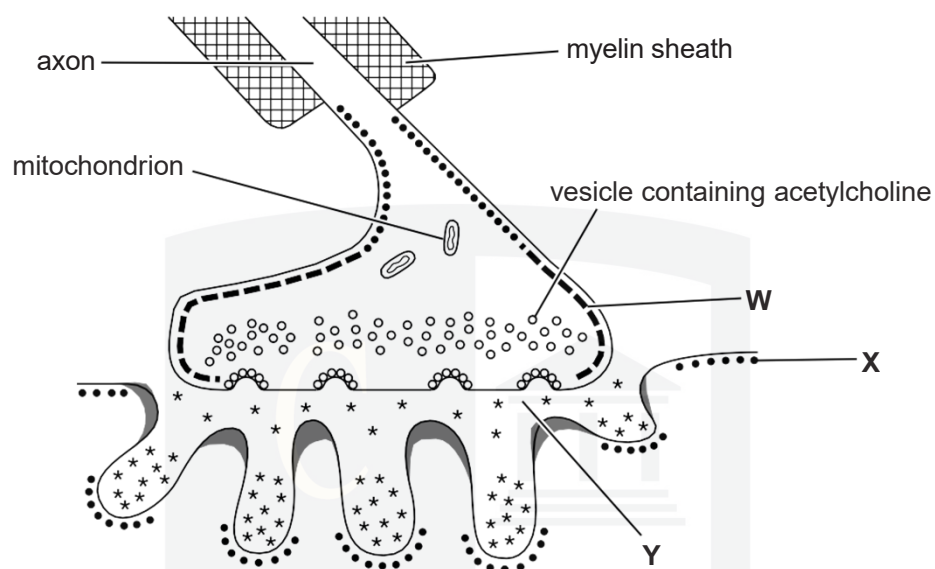


Fig. 3.3

- (i) What type of molecule forms ion channels **W** and **X**? [1]
- (ii) Identify region **Y**. [1]
- (iii) Name the enzyme found in region **Y**. [1]

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(c) As mammalian muscle uses energy to contract, it needs an energy supply.

Complete the following passage by choosing the best term to fill each gap.

[6]

Most ATP for muscle contraction is generated by aerobic respiration in organelles called Most of this ATP is produced by the stage of aerobic respiration called

If the oxygen supply is insufficient, ATP can also be obtained from anaerobic respiration, in which pyruvate is converted to the toxic product

A third source of ATP in muscle involves the transfer of a phosphate group to ADP from a substance called

During the contraction of skeletal muscle, energy from ATP is used to break the that hold the actin and together.

[Total: 16]

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