1. June/2022/Paper_41/No.1(b, c)

(b) The toxin in the skin of the golden mantella affects the action of the sarcomeres in muscle fibres (muscle cells) of mammalian striated muscle. The toxin inhibits a protein, Ca^{2+}ATPase, found in the membrane of the sarcoplasmic reticulum.

Ca^{2+}ATPase pumps calcium ions from the cytoplasm into the sarcoplasmic reticulum when the fibre is no longer stimulated.

Suggest the consequences to the sarcomere of the action of the golden mantella toxin.

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(c) Describe the role of calcium ions in a cholinergic synapse.

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2. June/2022/Paper_41/No.10

(a) Motor neurones and sensory neurones have different roles in nervous coordination.

Contrast the structure **and** function of sensory neurones and motor neurones.

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(b) Mammals have many types of neurones, which vary in axon diameter and myelination.

Table 10.1 shows the axon diameter and mean impulse transmission speed of four different types of mammalian neurone.

Table 10.1

neurone type	myelination	mean axon diameter /μm	mean impulse transmission speed / $m s^{-1}$
motor α	✓	13.0–20.0	80–120
motor β	✓	6.0–12.0	35–75
motor δ	✓	1.0–5.0	5–35
motor C	✗	0.2–1.5	0.5–2.0

Using the data shown in Table 10.1, comment on the relationship between:

- myelination and mean impulse transmission speed
- axon diameter and mean impulse transmission speed.

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(c) Fig. 10.1 is a graph of an action potential in a mammalian neurone.

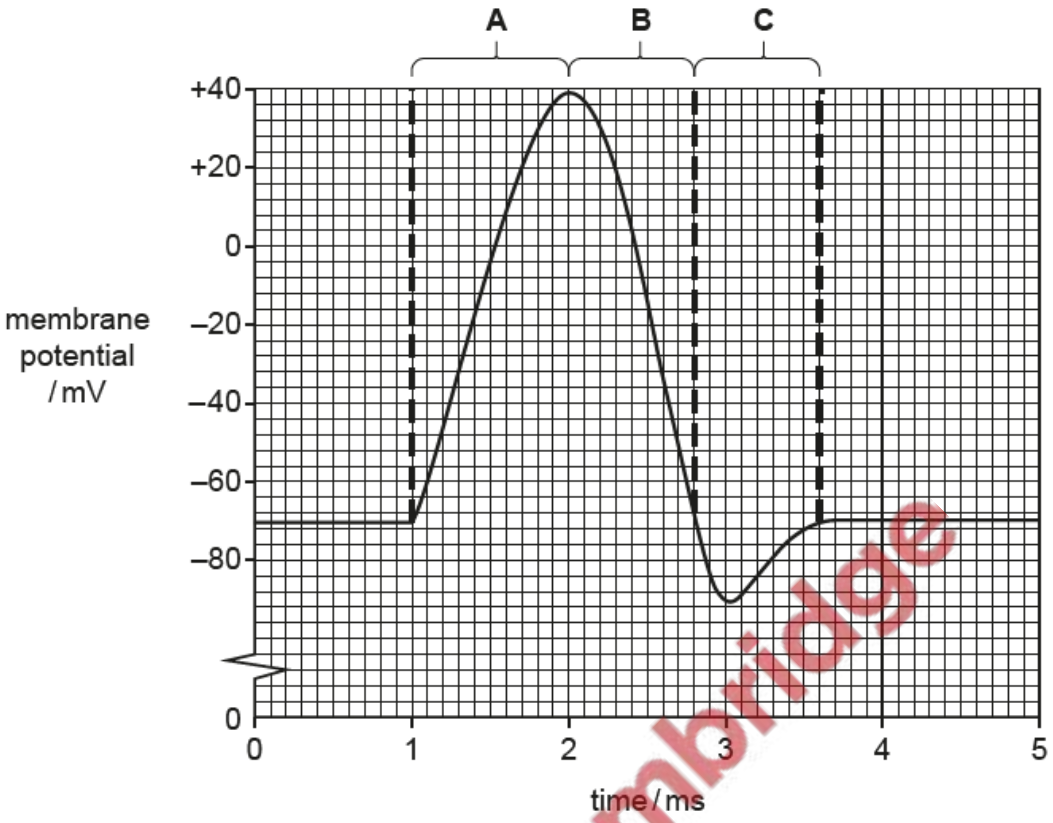

Fig. 10.1

With reference to Fig. 10.1 suggest why:

- no further action potential can occur during **A** and **B**
- it is difficult for a further action potential to occur during **C**.

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[Total: 9]

3. June/2022/Paper_42/No.6

(a) Gibberellin is a plant hormone that has an important role in seed germination.

Fig. 6.1 is a diagram of a section through a barley seed (grain).

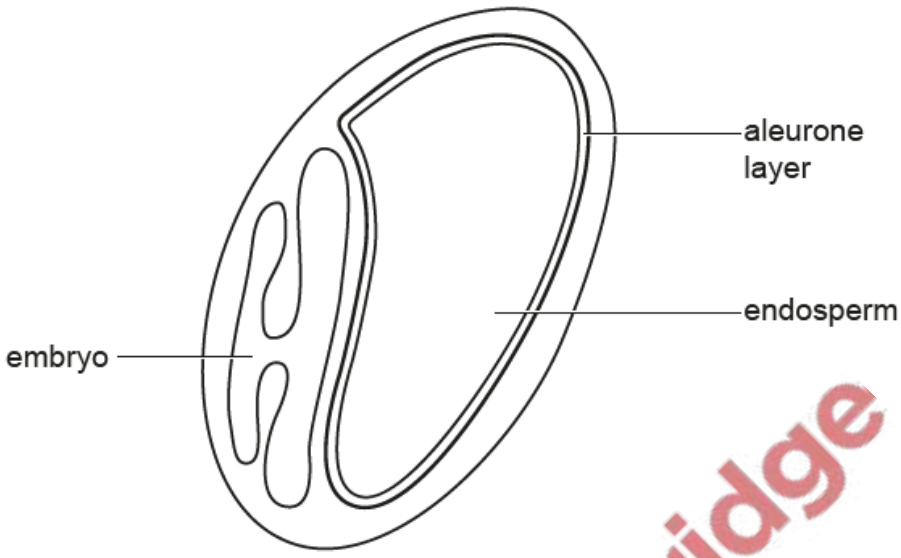

Fig. 6.1

On Fig. 6.1:

- Draw **one** arrow, labelled **G**, to show the movement of gibberellin during germination.
- Draw **one** arrow, labelled **A**, to show the movement of amylase during germination.

[2]

(b) Outline the role of amylase in seed germination.

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(c) The germination of three groups of seeds of the plant *Penstemon digitalis* was investigated.

The seeds were soaked for 24 hours in distilled water or in a solution of gibberellin. The were then sown on filter paper in dishes and kept moist for 10 days.

Fig. 6.2 shows the results for each group.

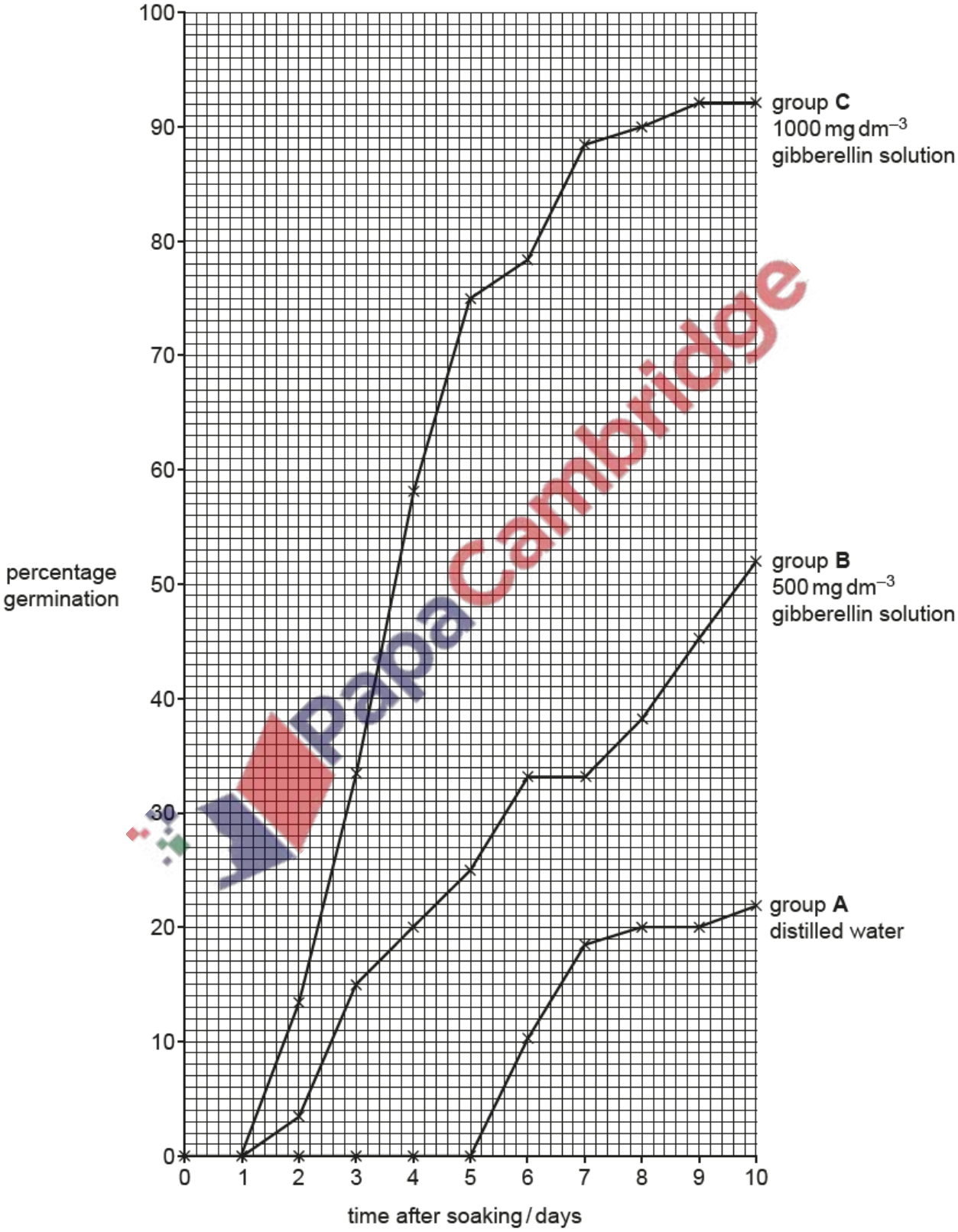

Fig. 6.2

Describe the results shown in Fig. 6.2.

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[Total: 9]

4. June/2022/Paper_42/No.8

The role of sensory receptor cells in mammals is to detect stimuli and generate action potentials in sensory neurones.

Human taste buds on the tongue contain chemoreceptor cells. Different chemoreceptor cells respond to different chemical stimuli.

Fig. 8.1 is a diagram of chemoreceptor cells in a taste bud.

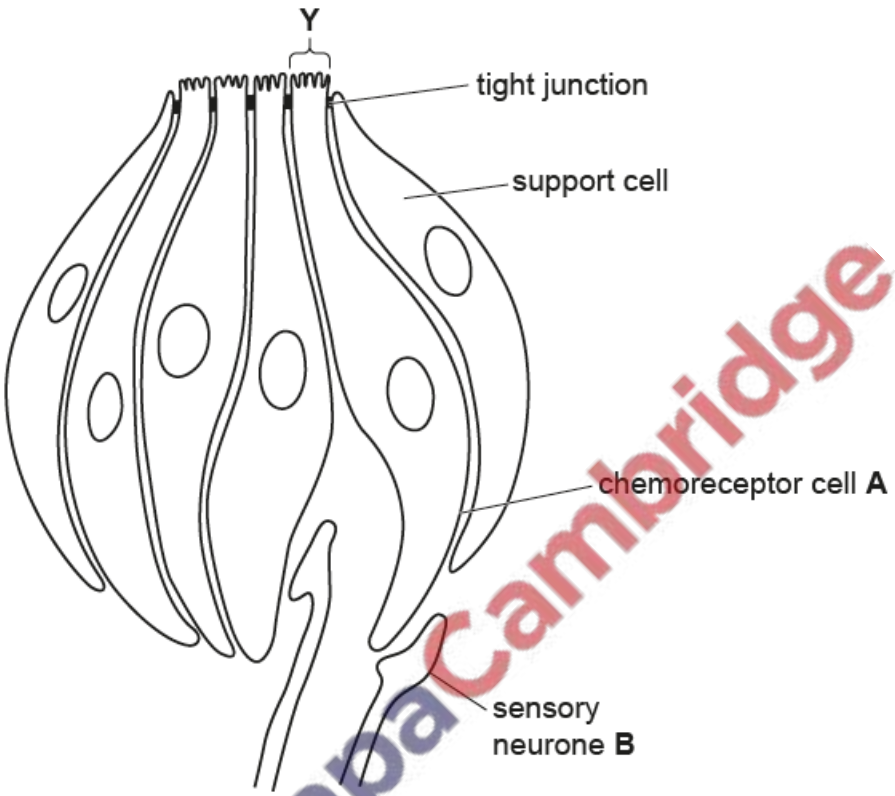

Fig. 8.1

(a) Name the structures in the region **Y**.

..... [1]

(b) Suggest a reason for the tight junctions between the chemoreceptor cells.

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(c) Chemoreceptor cell **A** responds to sodium ions (Na^+) in salt.

Describe how the contact of cell **A** with Na^+ can result in an action potential in sensory neurone **B**.

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[Total: 9]

5. June/2022/Paper_43/No.6

The role of sensory receptor cells in mammals is to detect stimuli and generate action potentials in sensory neurones.

Human taste buds on the tongue contain chemoreceptor cells. Different chemoreceptor cells respond to different chemical stimuli.

Fig. 6.1 is a diagram of chemoreceptor cells in a taste bud.

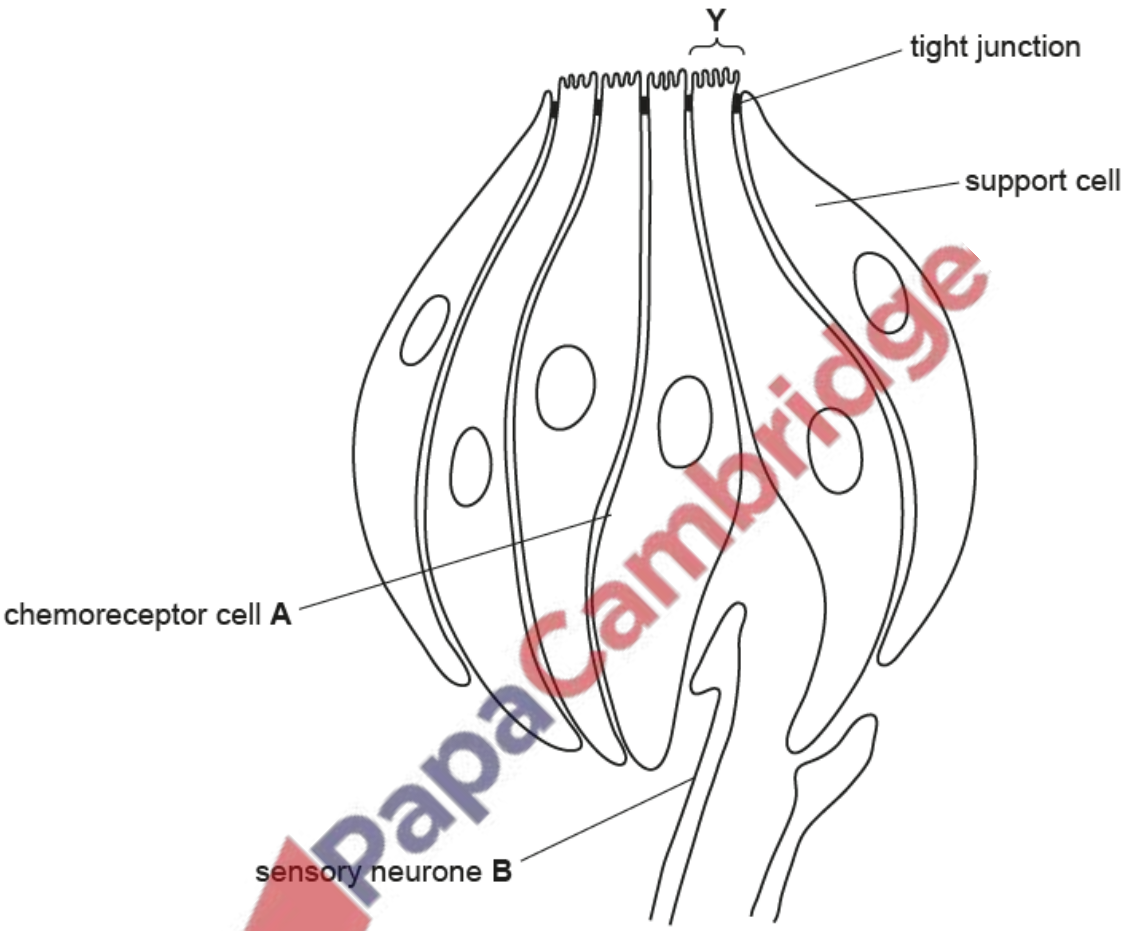

Fig. 6.1

(a) Name the structures in the region **Y and** describe their function in a chemoreceptor cell.

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(b) When a sugar molecule binds to a receptor protein on the cell surface membrane of cell **A**, calcium ions are released into the cytoplasm of the cell by the endoplasmic reticulum.

Explain how the release of calcium ions will lead to an action potential being generated in sensory neurone **B**.

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[Total: 9]

6. June/2022/Paper_43/No.9

(a) Fig. 9.1 shows a cross-section through a myelinated neurone.

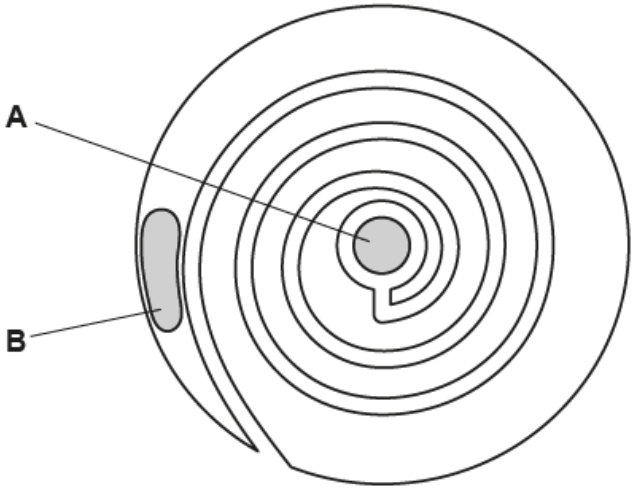

Fig. 9.1

Identify structures **A** and **B**.

A .....

B .....

[2]

(b) With reference to voltage-gated sodium ion channels, explain the difference in speed of transmission of an action potential along a myelinated neurone and a non-myelinated neurone.

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[Total: 6]