

BIOLOGY

2020 — 2024

P4

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1 - (9700/42_Winter_2020_Q1) - Cell Structure, Photosynthesis

Fig. 1.1 shows a transmission electron micrograph of a chloroplast.

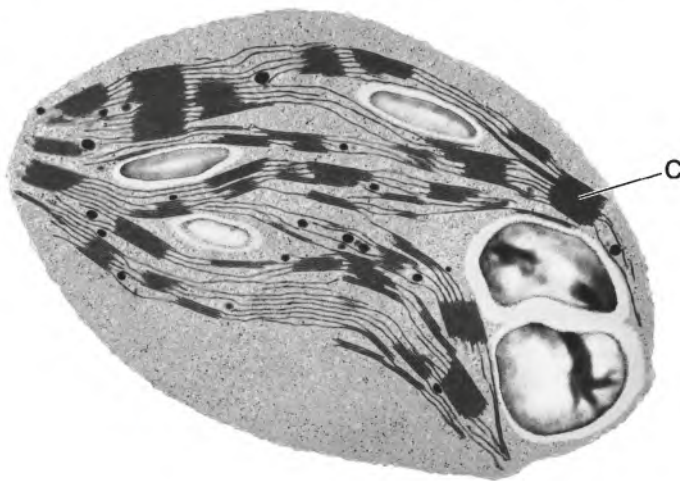


Fig. 1.1

(a) On Fig. 1.1, use label lines and letters to label:

A – the storage site of the carbohydrate product of photosynthesis

B – the site of the light independent stage.

[2]

(b) (i) Name the structure labelled **C** in Fig. 1.1.

C [1]

(ii) Explain how the structure of **C** is linked to its function.

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.....
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.....
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.....
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..... [4]

(c) (i) The anatomy of C4 plants is adapted to allow the rate of photosynthesis to remain high at high temperatures.

C3 plants do not have these adaptations and an additional reaction occurs at high temperatures that reduces the rate of photosynthesis.

Explain why the reaction that takes place at high temperatures in **C3** plants reduces the rate of photosynthesis.

.....
.....
.....
..... [2]

3 - (9700/41_Winter_2024_Q1) - Cell Structure, Control And Co-ordination, Cell Membranes And Transport

Different species of animal have neurones with different characteristics.

(a) Fig. 1.1 is a diagram of a motor neurone of a rat and a motor neurone of a snail.

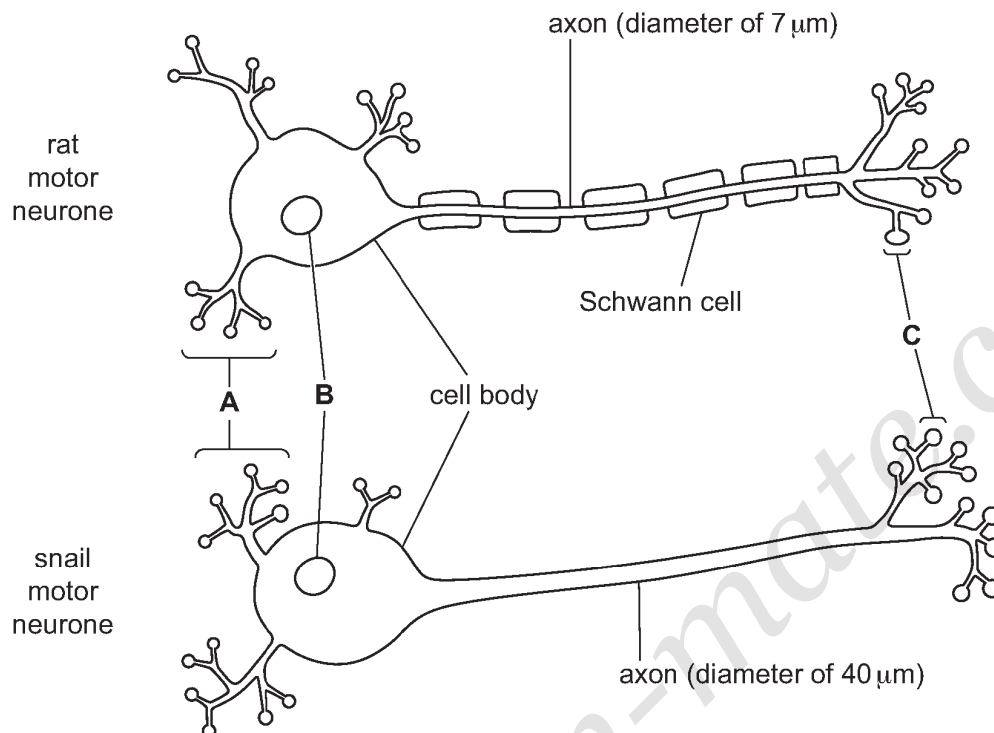


Fig. 1.1

(i) Name the structures labelled **A**, **B** and **C** on Fig. 1.1.

..... [3]

(ii) The rat motor neurone has an impulse transmission speed of 50 ms^{-1} . The snail motor neurone has an impulse transmission speed of 8 ms^{-1} .

Explain why the rat motor neurone has a faster impulse transmission speed than the snail motor neurone.

..... [2]

- (b) Fig. 1.2 shows an action potential in a rat neurone and Fig. 1.3 shows an action potential in a snail neurone.

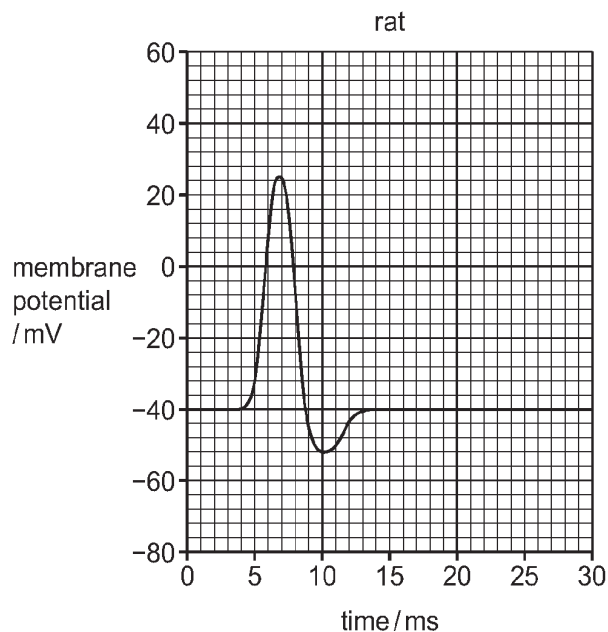


Fig. 1.2

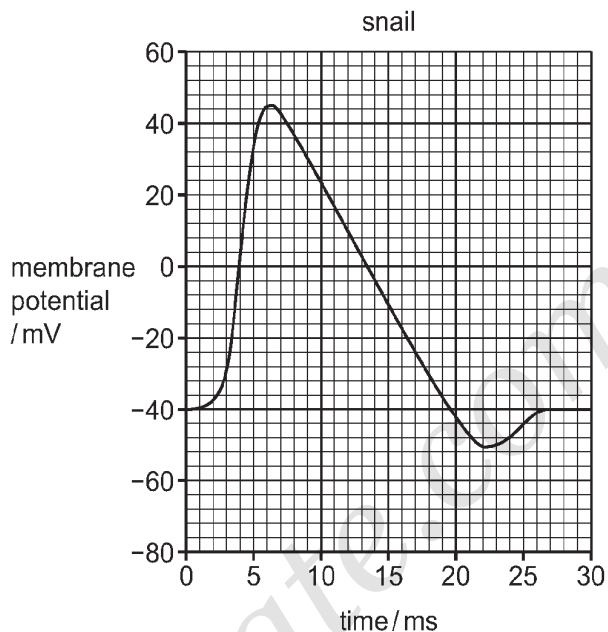


Fig. 1.3

Contrast the two action potentials shown in Fig. 1.2 and Fig. 1.3.

..... [3]

[Total: 8]

ANSWERS

1 - (9700/42_Winter_2020_Q1) - Cell Structure, Photosynthesis

(a)	A – label line pointing to starch grain ; B – label line pointing to stroma ;	2
(b)(i)	granum / grana ; A stack of thylakoids I thylakoid	1
(b)(ii)	any four from: 1 (stack of) <u>thylakoids</u> ; 2 (membranes / thylakoids / C) form large / increase, surface area ; 3 for, (named) pigments / photosystems / light-harvesting clusters ; 4 for absorption of light <u>energy</u> ; 5 so, large number of / many, enzymes / ETC / ATP synthase / stalked particles ; 6 for, light dependent stage / photophosphorylation ;	4
(c)(i)	1 oxygen, combines / reacts, with, rubisco / RuBP ; 2 less / no, carbon dioxide, combines / reacts, with, rubisco / RuBP ; A less or no carbon fixation 3 <i>ref. to photorespiration ;</i> <i>ignore refs to denaturation</i>	2
(c)(ii)	any three from: 1 photosynthesis (by C3 plants) is occurring ; 2 decrease in (atmospheric) carbon dioxide or increase in (atmospheric) oxygen or increase in / high, oxygen to carbon dioxide ratio ; 3 rubisco favours reaction with oxygen / AW ; 4 C4 plants have a selective advantage / description ; 5 oxygen acts as a selection pressure ; 6 AVP ; e.g. <i>ref. to mutation in C3 plants</i>	3

2 - (9700/42_Summer_2021_Q9) - Cell Structure, Transport In Plants

(a)	any nine from: 1 (function is) to make ATP ; 2 <i>ref. to</i> double membrane / outer and inner membrane / envelope ; <i>inner membrane</i> 3 folded / cristae, to increase / for large, surface area ; 4 has, ATP synthase / stalked particles ; 5 has, ETC / carrier (proteins) / cytochromes ; 6 (site of) oxidative phosphorylation / chemiosmosis ; 7 impermeable to protons ; <i>intermembrane space</i> 8 has low pH / high concentration of protons ; 9 protons pumped into intermembrane space ; 10 proton gradient between intermembrane space and matrix or protons diffuse from intermembrane space to matrix ; <i>matrix</i> 11 contains (co)enzymes for, link reaction / the Krebs cycle ; <i>outer membrane</i> 12 permeable to, pyruvate / reduced NAD / oxygen ; 13 AVP ; e.g. ribosomes / DNA, involved in protein synthesis	9
(b)	any six from: 1 <u>aerenchyma</u> ; 2 in stem and roots ; 3 help <u>oxygen</u> to, move / diffuse, to, roots / submerged parts ; 4 shallow roots ; 5 air (film) trapped on underwater leaves / described ; 6 greater internode growth or leaves or flowers grow above water level ; 7 (growth regulated by) gibberellin / ethene ; 8 anaerobic respiration, in roots / underwater / when submerged ; A alcoholic fermentation 9 tolerant to high <u>ethanol</u> (concentration) ; 10 <i>ref. to</i> ethanol / alcohol, dehydrogenase ;	6

3 - (9700/41_Winter_2024_Q1) - *Cell Structure, Control And Co-ordination, Cell Membranes And Transport*

(a)(i)	A = dendrite(s) ; B = nuclei ; C = synaptic knob(s) ;	3
(a)(ii)	1 rat has, myelin sheath / Schwann cell / myelinated axon / myelinated neurone ; 2 (rat has) saltatory conduction OR (rat) impulse / action potential, jumps / leaps / AW, from (one) <u>node of Ranvier</u> to, the next / another ;	2
(b)	any three from: snail / Fig. 1.3 1 greater depolarisation OR (membrane potential) gets more positive / has higher increase / has higher peak ; 2 action potential, slower / takes longer / takes more time OR longer time to return to resting potential ; 3 longer (absolute / relative) <u>refractory period</u> ; 4 longer hyperpolarisation ; 5 AVP ;	3