

A Level Biology A
H420/01 Biological Processes

Question Set 11

11 (a)

Honey pot ants belong to several different genera. Some specialised individuals are used as food storage vessels. These individuals have swollen abdomens that store various foods, which can be given to members of the colony when required.

One such individual is shown in Fig. 19.1.



Fig. 19.1

An investigation was carried out into the respiratory substrate of three different genera of honey pot ant, by measuring oxygen uptake and carbon dioxide production.

The data are shown in Table 19.1.

Genus	CO ₂ produced(mm ³ s ⁻¹)	O ₂ consumed(mm ³ s ⁻¹)
<i>Camponotus</i>	0.89	0.88
<i>Melophorus</i>	0.59	0.66
<i>Cataglyphis</i>	1.01	1.47

Table 19.1

Use the data in Table 19.1 to suggest the likely diet of each genus of honey pot ant.

Justify your answer.

$$RQ = \frac{CO_2 \text{ eliminated}}{O_2 \text{ consumed}}$$

Genus	Diet	Justification
<i>Camponotus</i>	mainly carbohydrate	RQ is 1.0
<i>Melophorus</i>	mainly protein	RQ is 0.9
<i>Cataglyphis</i>	mainly fat	RQ is 0.7

- 11 (b) Chitin is a polysaccharide found in insects. It is used to form the hard outer casing of their bodies.

Fig. 19.2 shows the chemical structure of chitin.

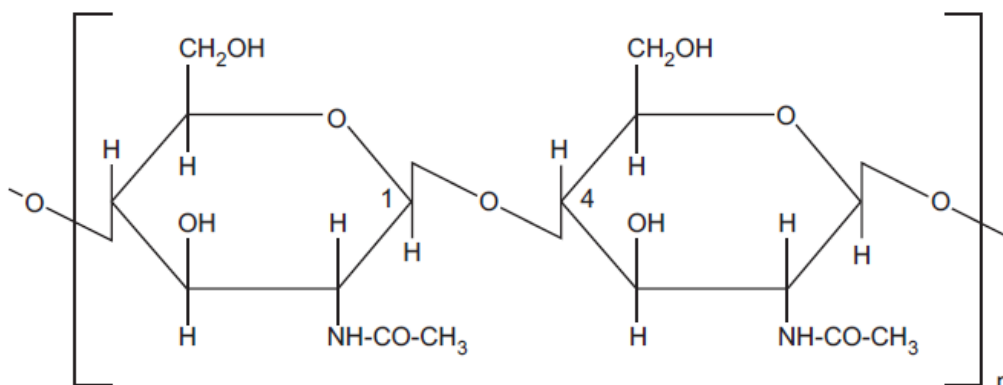


Fig. 19.2

Using information from Fig. 19.2, state **two** similarities and **two** differences between the structures of chitin and glycogen.

Similarity 1

..... **Both are polysaccharides**

Similarity 2

..... **Both have 1,4-glycosidic bonds**

Difference 1

..... **Chitin contains N whereas glycogen doesn't**

Difference 2

..... **Chitin has β -glycosidic bonds whereas glycogen has α -glycosidic bonds**

[4]

- 11 (c) Insects use glucose to generate ATP.

Outline the processes involved in the generation of ATP through **chemiosmosis**. [6]

Chemiosmosis involves the movement of ions down their electrochemical gradient across a semi-permeable membrane. It takes place across the inner mitochondrial membrane. Proton pumping due to the release of energy from high energy e^- builds a high H^+ concentration in the intermembrane space, generating an electrochemical gradient. This gradient is maintained due to the impermeability of the inner membrane to H^+ . A proton motive force is established which stores energy. H^+ can only move back across the membrane into the matrix through hydrophilic membrane channels linked to ATP synthase. The movement of H^+ down their electrochemical gradient through these transmembrane proteins generates the energy used to synthesise ATP from ADP and P_i . Theoretically, 38 ATP should be produced per molecule of glucose. However, the inner mitochondrial membrane is often 'leaky' to H^+ so the process is not completely efficient.

Total Marks for Question Set 11: 13

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