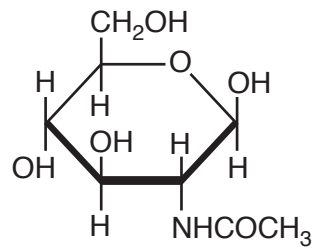


**3 (a)** Polymers are important molecules that have structural and functional roles in organisms.

Chitin is a polymer that is found in insects, where it forms a major part of the structure of the exoskeleton.

- Chitin is a macromolecule that is similar to a polysaccharide.
- Chitin is composed of molecules of N-acetylglucosamine, the structure of which is shown in Fig. 3.1 below.
- The monomers of N-acetylglucosamine join by 1–4 glycosidic bonds to form the chitin molecule.



**Fig. 3.1**

- (i) How does the composition of N-acetylglucosamine differ from the composition of a monosaccharide sugar?

.....  
 ..... [1]

- (ii) Which monosaccharide sugar does N-acetylglucosamine most closely resemble?

..... [2]

- (iii) Using your knowledge of the formation of structural polysaccharides, describe the formation of the chitin molecule from its monomer and predict its structure.

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..... [4]

(b) Fig. 3.2 is a photomicrograph of the trachea of a honeybee, *Apis mellifera*.

The trachea of this honeybee is infected with honeybee tracheal mites, *Acarapis woodi*. Some of these mites are labelled **M** on Fig. 3.2.

The trachea and tracheoles of insects have circular bands of chitin. One of these bands is labelled **C** on Fig. 3.2.

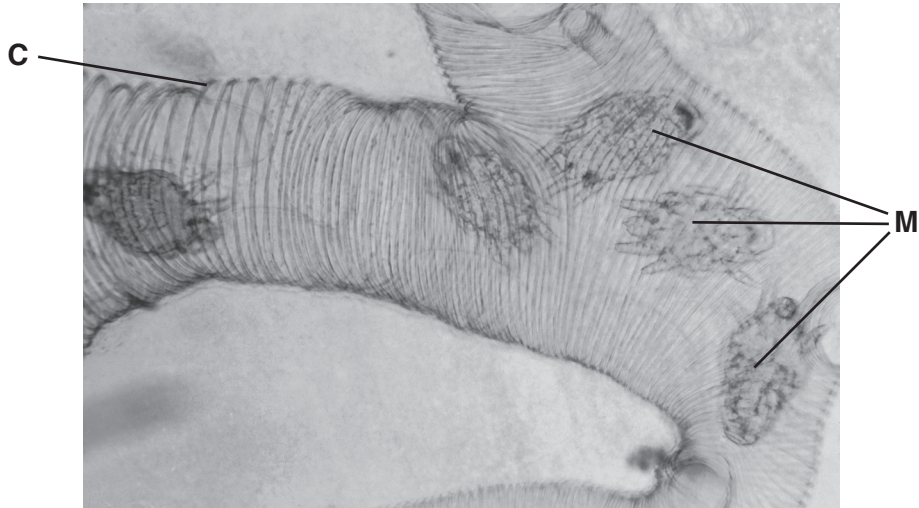


Fig. 3.2

(i) What is the function of the circular bands of chitin labelled **C**?

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.....  
..... [1]

(ii) The mites use their mouthparts to bite through the walls of the trachea. They then feed off the haemolymph, the blood-like liquid that bathes the cells and organs of the honeybee.

Suggest **one** other way in which the presence of the mites might affect the honeybee.

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.....  
..... [1]