1 Biological molecules are held together by a variety of bonds.

(a) The diagram in Fig. 1.1 represents an amino acid.

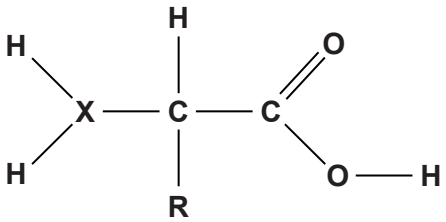


Fig. 1.1

(i) One of the atoms that make up an amino acid has been replaced with the letter **X**.

State the chemical symbol of the atom represented by the letter **X** in Fig. 1.1.

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

(ii) Name the polymer formed from a chain of amino acids.

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

(iii) Name the bond that is formed when two amino acids are joined together. Describe the formation of this bond.

name of bond .....

description of formation

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.....

.....

..... **[3]**

(b) Fig. 1.2 shows a hydrogen bond between two water molecules.

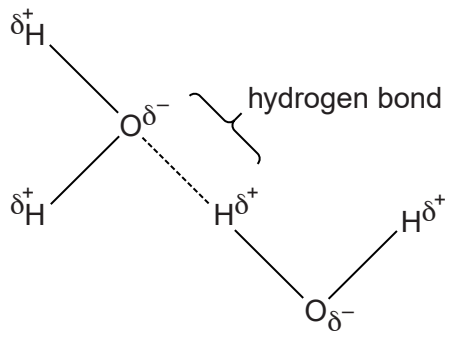


Fig. 1.2

(i) Many of the physical properties of water arise as a result of these hydrogen bonds.

Describe ways in which the physical properties of water allow organisms to survive over a range of temperatures.

In your answer you should make clear links between the properties of water and the survival of organisms.

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..... **[9]**

(ii) List **three other** examples of where hydrogen bonds are found in biological molecules.

1 .....

2 .....

3 ..... **[3]**

[Total: 17]

2 Cholesterol is an important biological molecule.

(a) State **two** roles of cholesterol in living organisms.

1 .....

.....

2 .....

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

(b) Fig. 3.1 represents the structure of a cholesterol molecule.

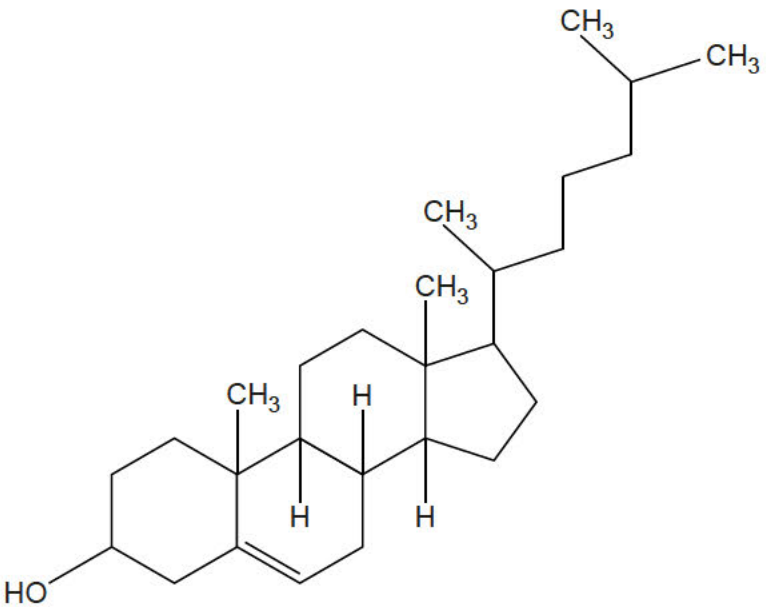


Fig. 3.1

(i) Identify **one** way in which the molecular structure of cholesterol is similar to the molecular structure of a carbohydrate.

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

(ii) Cholesterol is transported in the blood within molecules of low-density lipoprotein (LDL).

Name **two** molecules that combine with cholesterol to form LDLs.

.....

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

(iii) LDL and a similar molecule, high-density lipoprotein (HDL), carry cholesterol in the blood. LDL and HDL affect the formation of atheromas in the arteries.

Describe the different ways in which LDLs and HDLs affect the formation of atheromas.

In your answer you should make clear the differences in the involvement of LDL and HDL in the formation of atheromas.

[7]

(c) (i) In countries such as the UK, in which red meat forms a large part of the diet, people tend to have high levels of blood cholesterol compared with people in countries in which little red meat is eaten.

Suggest why diets with a high red meat content are associated with high blood cholesterol.

.....

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

(ii) Name a disease, other than atherosclerosis, for which high blood cholesterol is a risk factor.

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

[Total: 15]

3 A number of different biological molecules are represented in Fig. 3.1.

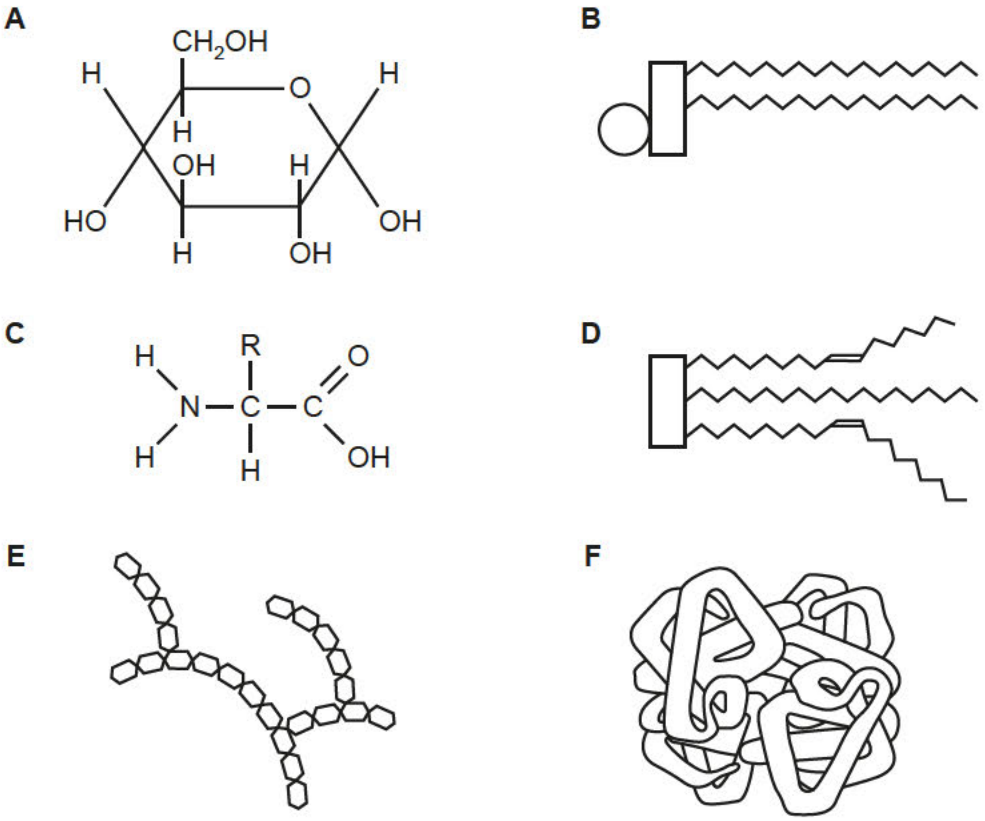


Fig. 3.1

(a) (i) State the letter of the molecule shown in Fig. 3.1 that represents:

a triglyceride .....

a monosaccharide .....

a protein ..... **[3]**

(ii) State the letter of the molecule shown in Fig. 3.1 that contains:

phosphate .....

glycosidic bonds .....

peptide bonds .....

disulfide bonds ..... **[4]**

(b) Molecule **E** shown in Fig. 3.1 is part of the carbohydrate molecule glycogen.

Explain why glycogen makes a good storage molecule.

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..... **[3]**

(c) **(i)** When glycogen is hydrolysed, molecule **A** shown in Fig. 3.1 is produced.

State the **precise name** of molecule **A** ..... **[1]**

(ii) State **one** function of molecule **A.**

.....

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

(iii) State the letter of a molecule shown in Fig. 3.1, other than molecule **E**, that is used as a storage molecule.

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

(d) Cellulose is a carbohydrate molecule found in plants.

Complete the table below to give three **differences** in the **structures** of glycogen and cellulose.

One difference has been done for you.

glycogen	cellulose
no hydrogen bonding	*hydrogen bonding*

[3]

[Total: 16]

4 **(a)** Haemoglobin is a globular protein.

Describe the structure of a haemoglobin molecule.

In your answer, you should include details of the secondary, tertiary and quaternary structure of the molecule.

[7]

(b) Describe the ways in which the structure of collagen is **similar** to the structure of haemoglobin.

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

[Total: 11]