

Biological Molecules

Question Paper 3

Level	A Level
Subject	Biology
Exam Board	OCR
Module	Foundations in Biology
Topic	Biological Molecules
Booklet	Question Paper 3

Time allowed: 74 minutes

Score: /55

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E
>69%	56%	50%	42%	34%	26%

Question 1

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

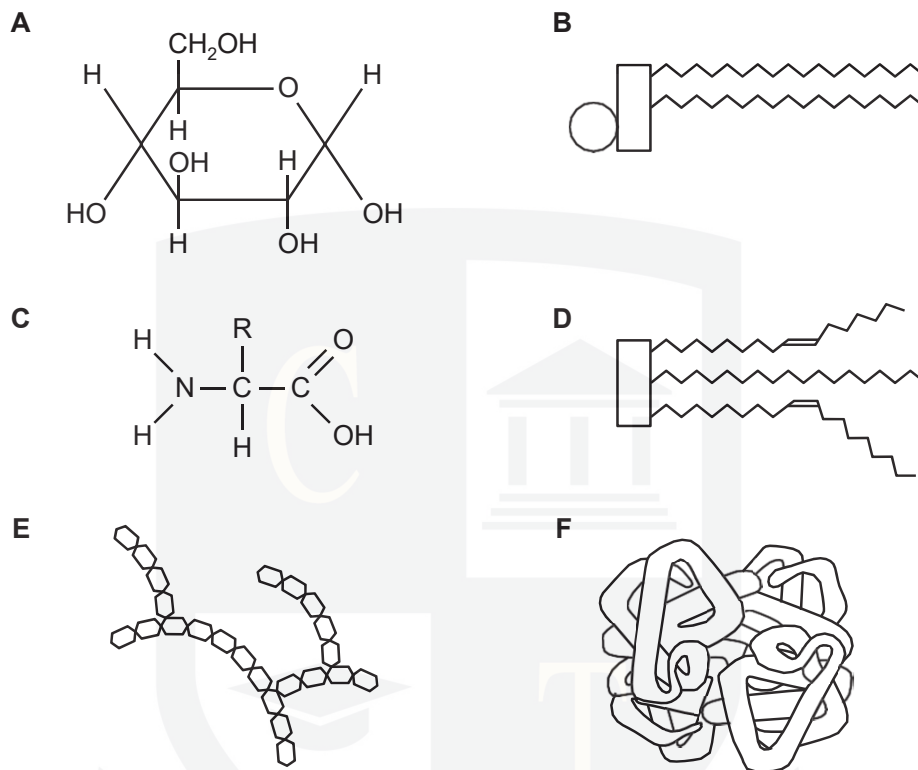


Fig. 3.1

(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.

[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]

Question 2

(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.

[4]

[Total: 11]

Question 3

Fig. 2.1 represents a water molecule.

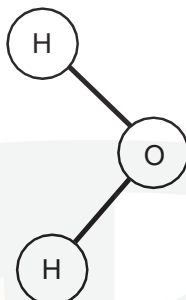


Fig. 2.1

(a) Water molecules are polar. As a result, they attract each other.

Draw a second water molecule on Fig. 2.1.

[3]

Your drawing should show:

- the bond(s) between the two molecules
- the name of the bond
- the charges on each atom.

(b) Ponds provide a very stable environment for aquatic organisms.

Three properties of water that contribute to this stability are as follows:

- the density of water decreases as the temperature falls below 4 °C so ice floats on the top of the pond
- it acts as a solvent for ions such as nitrates (NO_3^-)
- a large quantity of energy is required to raise the temperature of water by 1 °C.

Explain how these three properties help organisms survive in the pond.



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

[8]

(c) Water is important in many biological reactions.

Complete Table 2.1 by writing an appropriate term next to each description.

Table 2.1

description	term
the type of reaction that occurs when water is added to break a bond in a molecule	
the phosphate group of a phospholipid that readily attracts water molecules	

[2]

[Total: 13]

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Question 4

(a) Amino acids are the basic building blocks for proteins. Fig. 4.1 shows the amino acid cysteine.

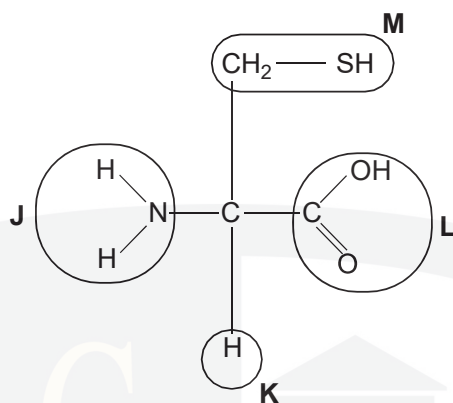


Fig. 4.1

- (i) Complete the table by selecting the letter, J, K, L or M, that represents the following groups in cysteine.

group	letter
carboxyl	
R group	
amine group	

[3]

- (ii) The primary structure of a protein consists of a chain of amino acids.

Describe how a second amino acid would bond to cysteine in forming the primary structure of a protein.

[3]

- (b) Each amino acid has a different R group.

Describe how these R groups can interact to determine the **tertiary** structure of a protein.

[4]

(c) Fig. 4.2 shows the structure of two polymers, glycogen and collagen, that are found in mammals.

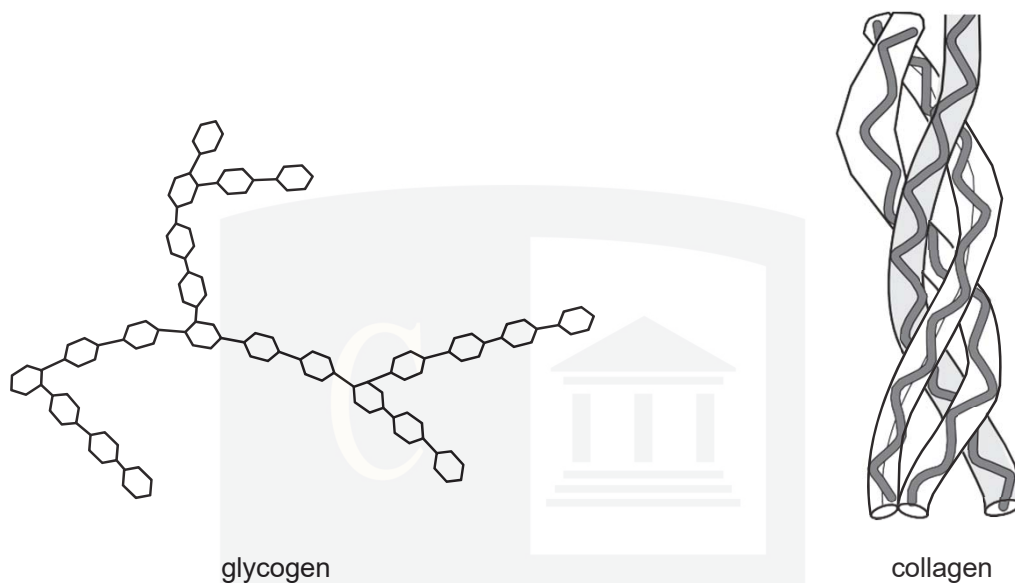


Fig. 4.2

- (i) Complete the table below to give three **differences** between the **structure** of glycogen and collagen.

glycogen	collagen

[3]

- (ii) Collagen is found in the ligaments which hold bones together at joints.

State **two** properties of collagen that make it suitable for this purpose.

[2]

[Total: 15]