

# 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%

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

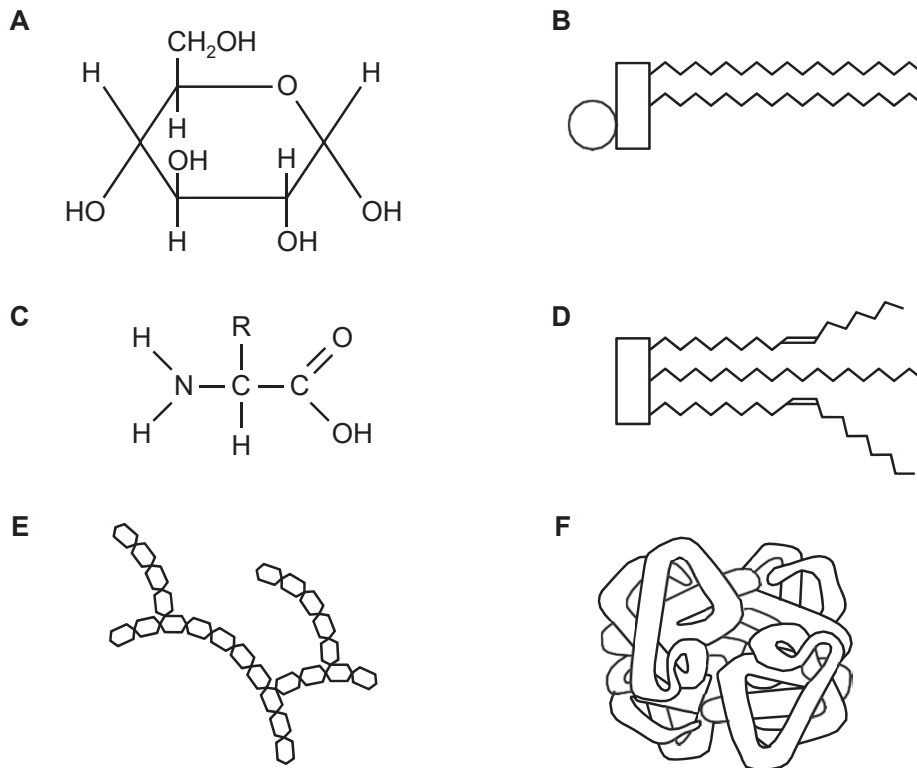


Fig. 3.1

(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
<b>no hydrogen bonding</b>	<b>hydrogen bonding</b>

[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.*

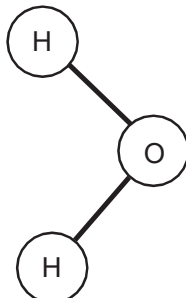
[7]

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

[4]

[Total: 11]

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 ( $\text{NO}_3^-$ )
- 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**

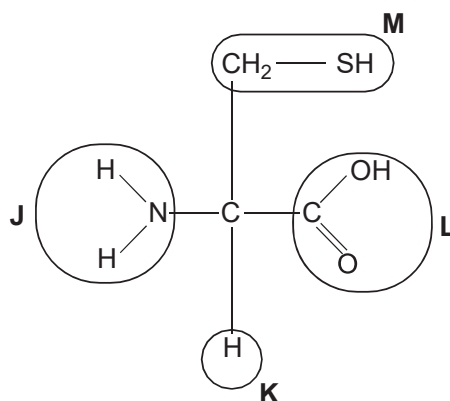
description	term
the type of reaction that occurs when water is added to break a bond in a molecule	
the phosphate group of a phospholipid that readily attracts water molecules	

[2]

[Total: 13]

## 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.

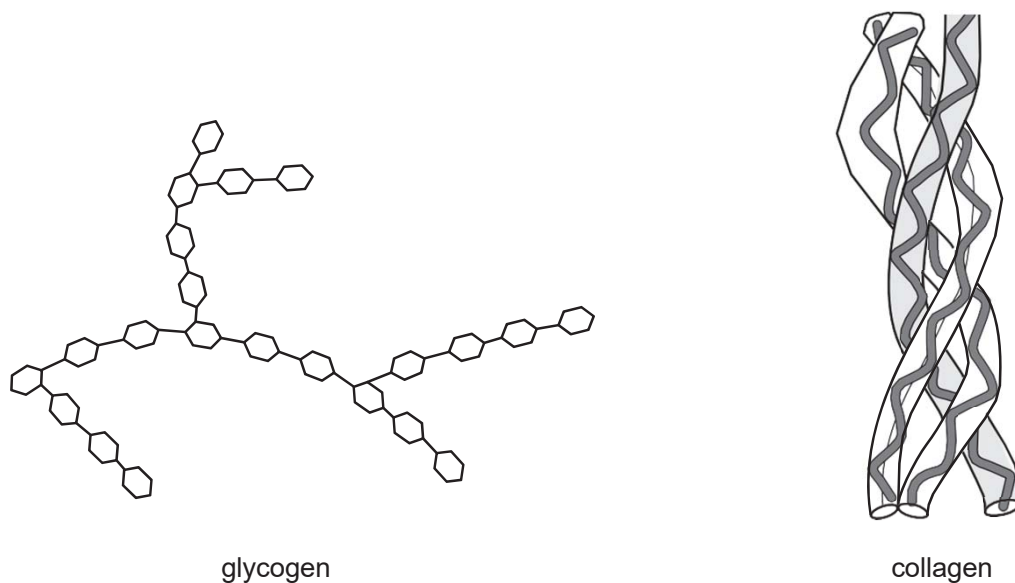
**[3]**

(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]