

2.3 Proteins

Question Paper

Course	CIE A Level Biology (9700) exams from 2022
Section	2. Biological Molecules
Topic	2.3 Proteins
Difficulty	Hard

Time allowed: 10

Score: /10

Percentage: /100

Question 1

What describes a globular protein that is not soluble in water?

- A** having amino acids with polar R groups facing out
- B** having amino acids with hydrophobic R groups facing out
- C** having amino acids with hydrophilic R groups facing out
- D** having a central core of amino acids with hydrophobic R groups

[1 mark]

Question 2

Four proteins 1, 2, 3 and 4 are described below

- 1 consists of four polypeptides each with a prosthetic group
- 2 consists of a globular tertiary structure with a binding site
- 3 consists of four polypeptides held together by disulfide bonds
- 4 consists of three polypeptides tightly coiled together

Which description matches the proteins collagen, haemoglobin and the enzyme lipase?

	Collagen	Haemoglobin	Lipase
A	1	3	4
B	3	2	1
C	4	3	2
D	4	1	2

[1 mark]

Question 3

An experiment was undertaken to test the permeability of the plasma membrane and tonoplast of beetroot cells in various different chemicals. Vacuoles of beetroot cells carry a red pigment which cannot diffuse through their plasma membranes and tonoplasts to leave the cell.

The beetroot was cut into equal 1 cm³ cubes before being washed under a tap for 15 minutes to remove pigment released from outer damaged cells. The cubes were then placed in the various solutions, all of which turned red.

The table below shows four possible behaviors of phospholipids and proteins in different solutions, which is correct?

	solution	protein denatures	solution	phospholipids dissolve
A	ethanol	✓	dilute HCl	✓
B	dilute HCl	✓	ethanol	✓
C	ethanol	✓	40°C water	✓
D	40°C water	✓	dilute HCl	✓

[1 mark]

Question 4

A total of four polypeptide chains, 2 alpha chains and 2 beta chains, make up a globular protein called Haemoglobin. In normal cases, the DNA code for each beta chain for glutamic acid in the sixth triplet.

However, Sick cell anaemia in individuals causes the base triplet to change and code for valine instead.

This mutation changes one aspect of the haemoglobin molecule. Which is it?

- A** the quaternary structure
- B** the iron content
- C** the secondary structure
- D** the primary structure

[1 mark]

Question 5

When leaving the lungs, haemoglobin is 98 % saturated.

How many oxygen atoms will be carried by the majority of haemoglobin molecules?

- A** 2
- B** 4
- C** 6
- D** 8

[1 mark]

Question 6

There is estimated to be 20,000 genes in the human body, but over 300,000 proteins.

If a chain consists of y amino acid residues and there are *no* different amino acids available, how many different polypeptides can be made?

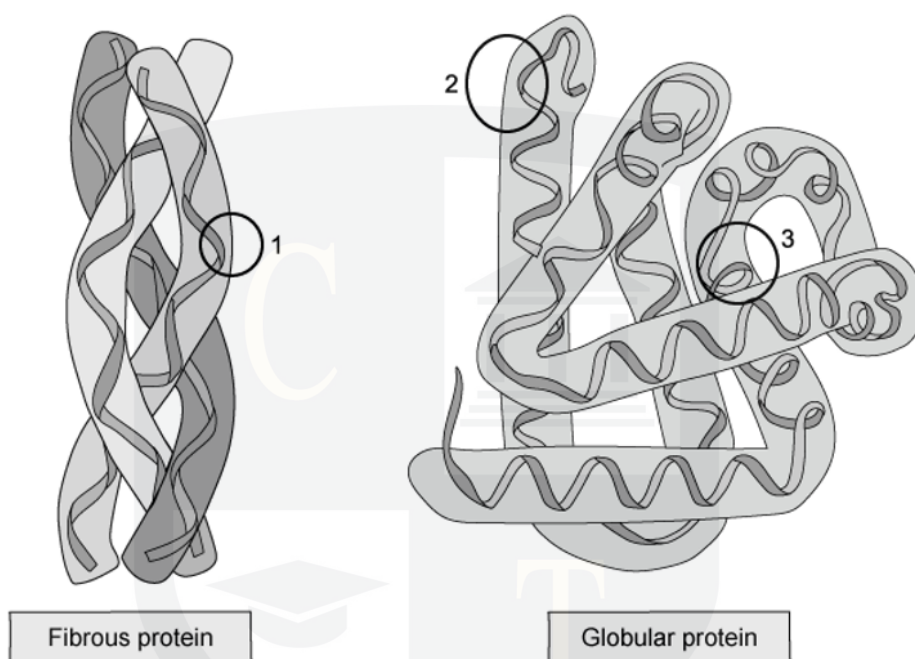
- A n^y
- B $n \times y$
- C y^n
- D n / y

[1 mark]



Question 7

The diagram shows a fibrous and globular protein with three amino acids labelled 1, 2 and 3. Amino acids 1 and 2 are on the outer surface of the protein whereas amino acid 3 is internal.



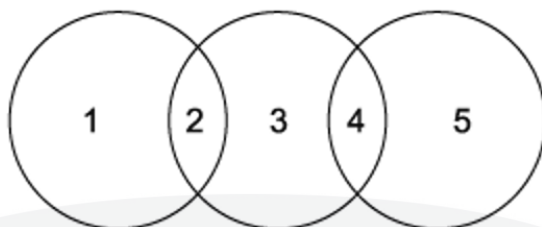
Which row identifies the most likely amino acid R group at each point?

	R group		
	1	2	3
A	H	$\text{CH}(\text{CH}_3)_2$	$\text{CH}(\text{CH}_3)_2$
B	H	$(\text{CH}_2)_4\text{NH}_2$	CH_2OH
C	CH_3	$\text{CH}(\text{CH}_3)_2$	$(\text{CH}_2)_4\text{NH}_2$
D	CH_3	CH_2OH	$\text{CH}(\text{CH}_3)_2$

[1 mark]

Question 8

The relationship between bond types and levels of protein is shown in this diagram.



Which row correctly labels the diagram?

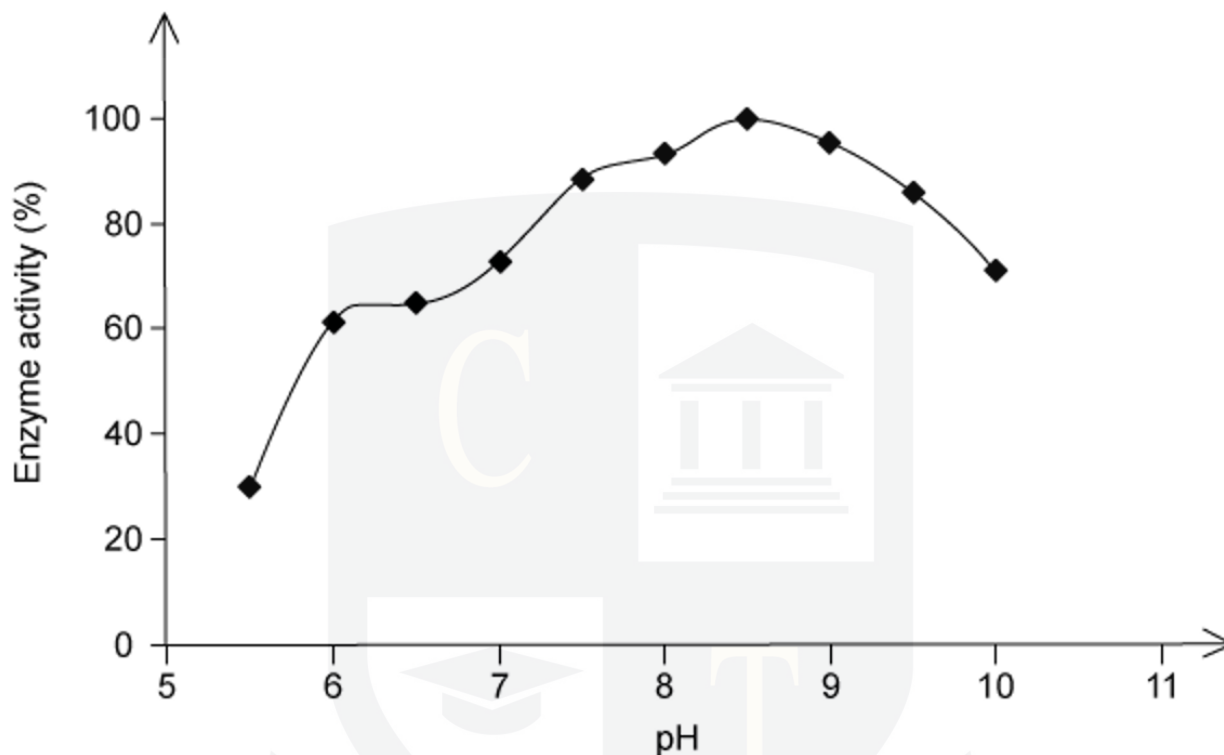
	1	2	3	4	5
A	primary	peptide	tertiary	hydrogen	secondary
B	secondary	ionic	tertiary	hydrogen	quaternary
C	tertiary	ionic	secondary	peptide	primary
D	quaternary	peptide	primary	peptide	primary

[1 mark]

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Question 9

The graph shows the effect of pH on enzyme activity.



Which of the following R groups in the active site will be directly affected by pH?

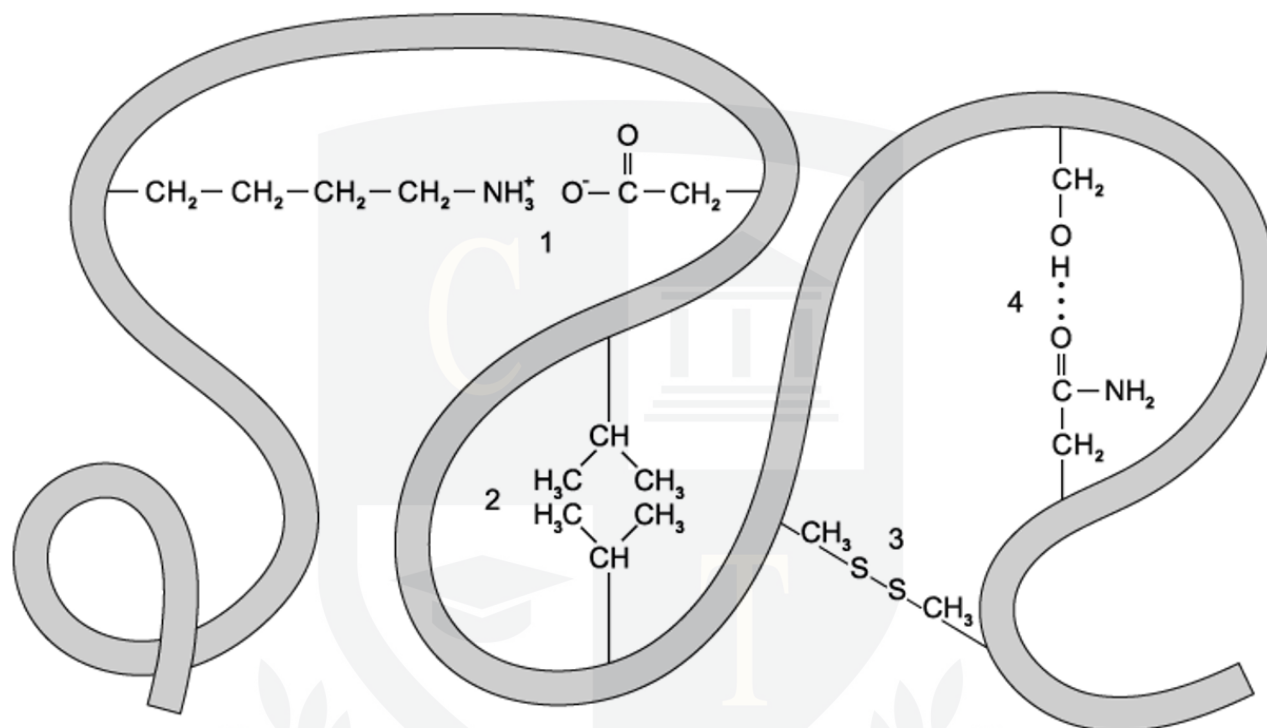
- A** -CH₃
- B** -CH₂OH
- C** -CH₂SH
- D** -(CH₂)₄NH

[1 mark]

Question 10

A protein found in the stomach is placed in water, this causes the protein to denature.

Which of the following bonds are affected?



A 1 only

B 1, 3 and 4

C 1 and 4

D All

[1 mark]

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