2.3 Proteins

Question Paper

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

Time allowed: **10**

Score: **/10**

Percentage: **/100**

Question 1

Protein molecules contain multiple different types of bond, some of which are stronger than others.

Which is the correct order from weakest to strongest?

A disulfide bonds, ionic bonds, hydrogen bonds, hydrophobic interactions

B ionic bonds, disulfide bonds, hydrophobic interactions, peptide bonds

C hydrophobic interactions, hydrogen bonds, peptide bonds, ionic bonds

D hydrophobic interactions, hydrogen bonds, disulfide bonds, peptide bonds

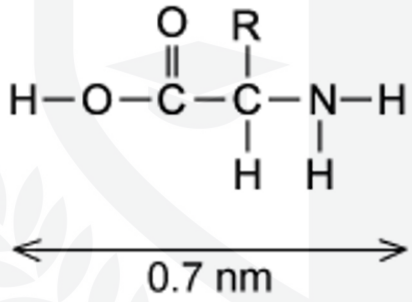
[1 mark]

Question 2

Amino acids consist of oxygen, hydrogen, carbon and nitrogen atoms. The diameter of each atom when bonded to another atom is shown in the table below.

atom	single bond / nm	double bond / nm
O	0.13	-
H	0.06	0.110
C	0.154	0.120
N	0.14	0.134

Using the figures in the table, the approximate length of one amino acid is 0.7nm.



What is the approximate length of a dipeptide of this amino acid?

A 1.0 nm

B 1.2 nm

C 1.4 nm

D 1.6 nm

[1 mark]

Question 3

Haemoglobin carries oxygen in the blood.

Which of the following best describes why this is possible?

1 Oxygen binds to iron reversibly

2 Oxygen binding causes haemoglobin to change shape

3 Oxygen binds to the haem group

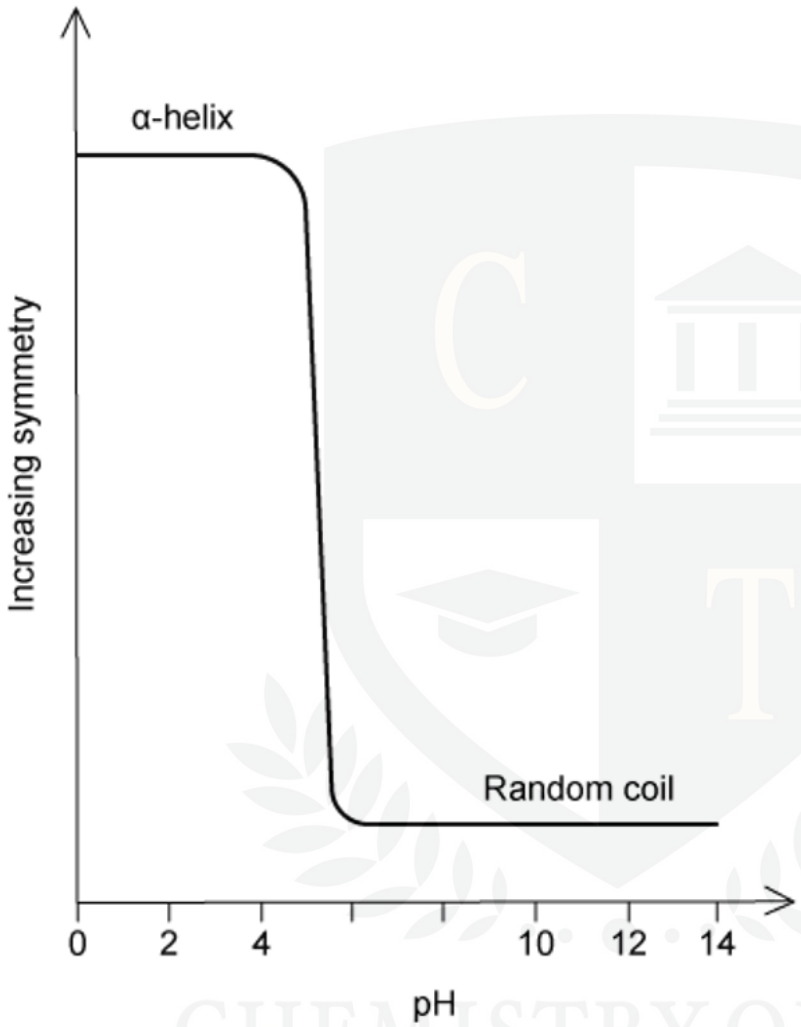
A 1 only **B** 1 and 2 **C** 2 and 3 **D** 1, 2 and 3

[1 mark]

Question 4

A protein entirely made from repeating residues of the same amino acid was produced.

The graph shows the structure of this protein molecule at different pH values.



Which statement is true?

A At pH2 the protein has lost its secondary structure

B At pH2 the protein has lost its tertiary structure

C At pH10 the protein has lost its primary structure

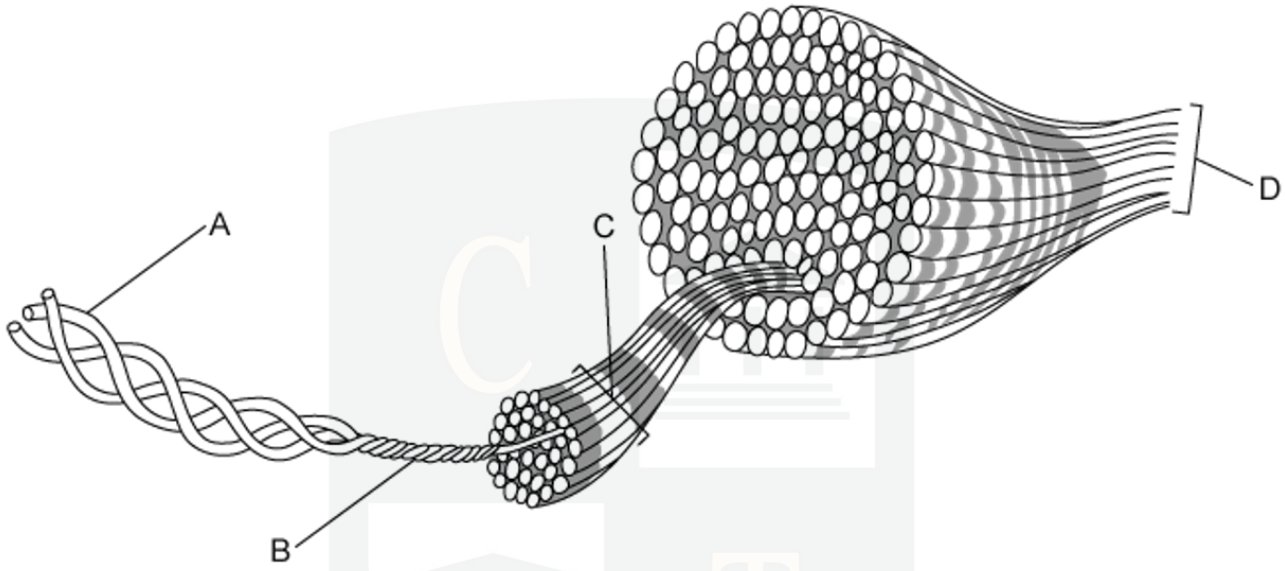
D At pH10 the protein has lost its secondary structure

[1 mark]

Question 5

The structure of collagen is illustrated in the diagram below.

Which label correctly identifies a molecule of collagen?



[1 mark]

Question 6

Which of the following causes fibrous proteins to be insoluble?

A They are very long

B Their surface has non polar amino acids

C They are usually structural

D They have more than one polypeptide chain

[1 mark]

Question 7

Which row of statements describes haemoglobin correctly?

A	polypeptide chains interact to produce an almost spherical molecule	an iron ion is present within each haem group	quaternary structure of two alpha chains and two beta chains	each molecule can transport a total of four oxygen atoms
B	four polypeptide chains, each containing a prosthetic group	iron ions can associate with oxygen forming oxyhaemoglobin	in each chain, hydrophobic R groups of amino acids point towards the centre of the molecule	at 50 % saturation, two oxygen molecules are transported by the molecule
C	polypeptide chains produce a loose helical shape, which curls to form a spherical molecule	iron ions in the molecule can bind reversibly with oxygen	in each chain, hydrophobic R groups of amino acids surround the iron ion	each molecule can transport a total of eight oxygen atoms
D	polypeptide chains interact to produce a globular chain	each chain contains a prosthetic group of amino acids surrounding an iron	two identical alpha chains and two identical beta chains	each chain can transport an oxygen molecule

[1 mark]

Question 8

Which of the following facts about collagen explain its role in muscles and tendons?

1 Collagen is insoluble

2 Collagen chains form a helical structure

3 Different collagen molecules are bonded together by covalent bonds

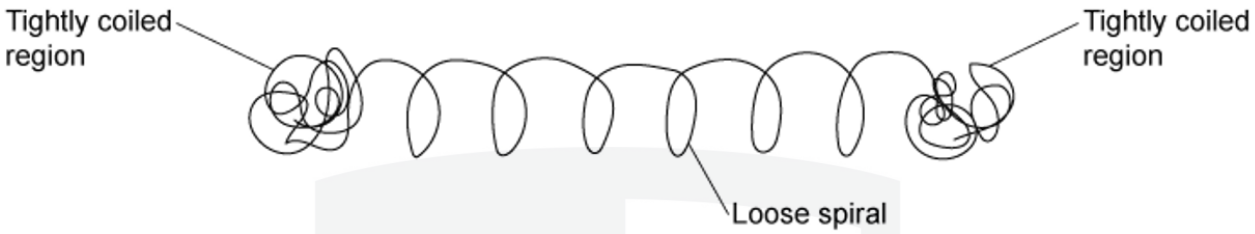
4 Collagen is made of amino acids with small R groups

A 1 and 2 **B** 1, 2 and 3 **C** 2, 3 and 4 **D** All

[1 mark]

Question 9

The diagram shows a polypeptide of the protein glutenin, which has an important role in maintaining the strength and elasticity of bread dough.



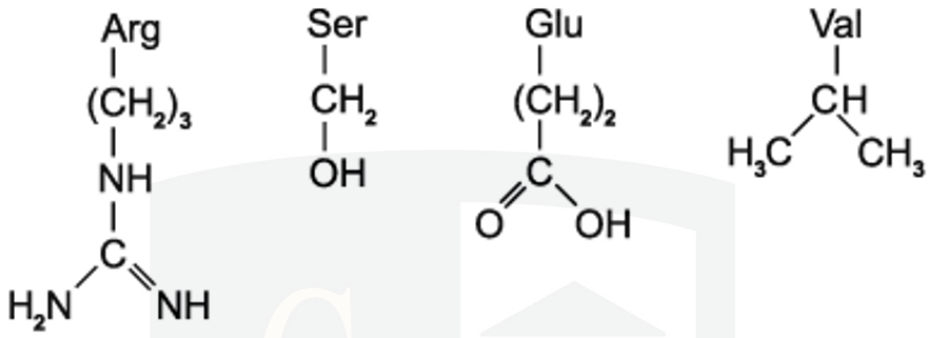
What is the structure of glutenin and why?

	Structure	Reason
A	Secondary	the loose spiral is an alpha helix
B	Tertiary	a 3D shape is formed from the different regions
C	Quaternary	there are globular and fibrous regions
D	Quaternary	the structure consists of spiral and coiled regions

[1 mark]

Question 10

Every amino acid has an R group which gives the molecule its properties. The diagram below shows the R groups for the amino acids Arg, Ser, Glu and Val.



	Acidic	Basic	Hydrophilic	Hydrophobic
A	Glu	Arg	Ser	Val
B	Ser	Arg	Glu	Val
C	Glu	Val	Ser	Arg
D	Arg	Val	Glu	Ser

[1 mark]