

**Australian Islamic College 2018**

**ATAR Chemistry Units 3 and 4**

**Task 10 (Weighting: 5%)**

**Amino Acids and Proteins Validation Test**

Test Time: 25 minutes

Please do not turn this page until instructed to do so.

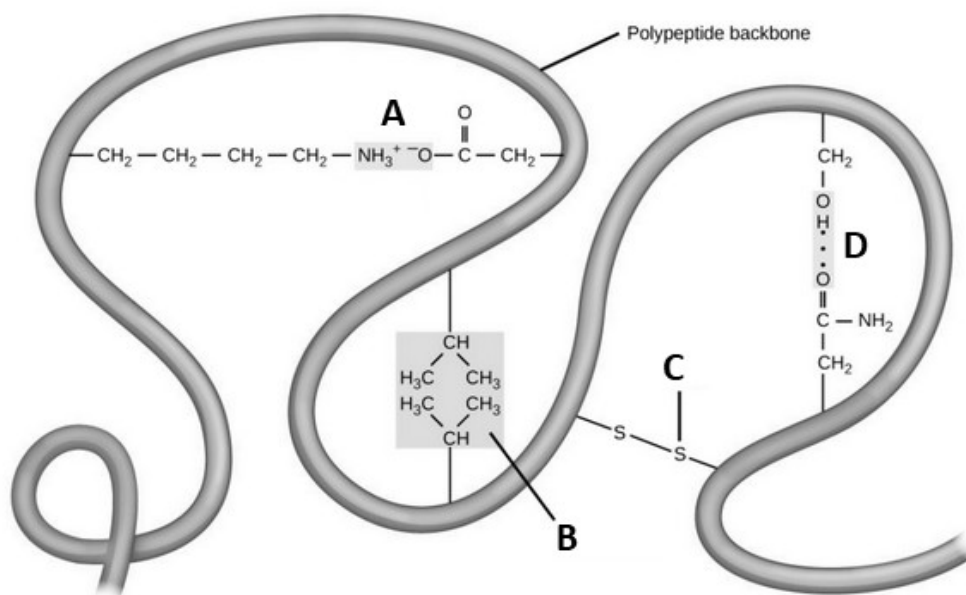
First Name	Surname

Teacher

Mark / 23	Percentage

Equipment allowed: Pens, pencils, erasers, whiteout, rulers and non-programmable calculators permitted by the Schools Curriculum and Standards Authority.

1. This question refers to the diagram below that shows four types of side chain interactions maintaining the tertiary structure of a protein. [8 marks, 1 each]



(a) Name the following labelled side chain interactions seen on the diagram.

A \_\_\_\_\_

B \_\_\_\_\_

C \_\_\_\_\_

D \_\_\_\_\_

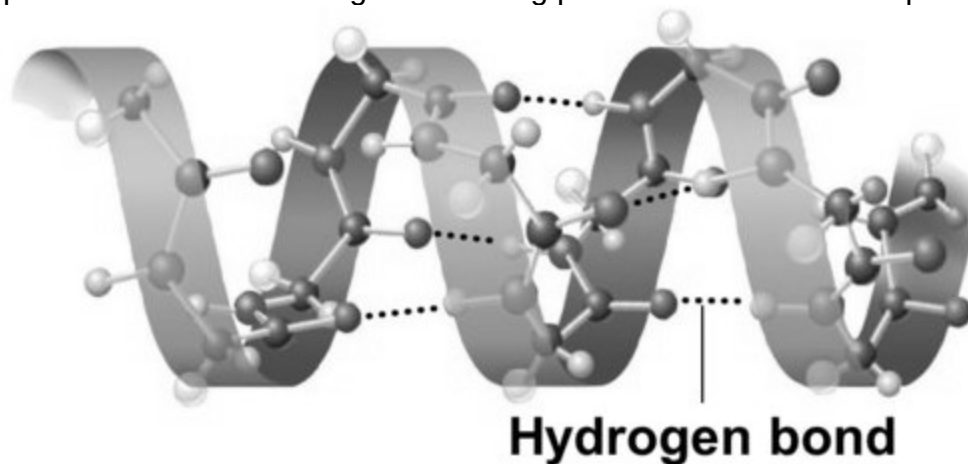
(b) Which side chain interaction (A, B, C or D) is maintained by a covalent bond?

(c) Which side chain interaction (A, B, C or D) involves cysteine residues?

(d) Which side chain interaction is typically found in the centre of a globular protein?

(e) Which type of side chain interaction (A, B, C or D) also maintains the secondary structure of a protein?

2. Which of these amino acids is least likely to be found in the hydrophobic core of a protein? Circle the correct answer. [1 mark]
- a. Glycine
  - b. Tyrosine
  - c. Isoleucine
  - d. Proline
3. This question refers to this diagram showing part of the structure of a protein.



- a. Name the type of secondary structure represented by this diagram. [1 mark]
- b. Which of these pairs of amino acids is most likely to be involved in maintaining the type of secondary structure seen in this diagram? Circle the correct answer. [1 mark]
- i. Serine – asparagine
  - ii. Alanine – methionine
  - iii. Cysteine – proline
  - iv. Lysine – glutamic acid
4. Draw the amino acid alanine as it exists in neutral solution i.e. draw the zwitterion form of the amino acid alanine. Show all atoms and all bonds. [1 mark]

5. Draw the chemical structure, showing all bonds and all atoms, of the amino acid glycine as it would exist in solution at pH=1. [1 mark]

6. Bradykinin is a short peptide that lowers blood pressure. The primary structure of bradykinin is shown in diagram 1.

Arg-Pro-Pro-Gly-Phe-Ser-Pro-Phe-Arg

Diagram 1

A short section of a bradykinin molecule is shown in Diagram 2.

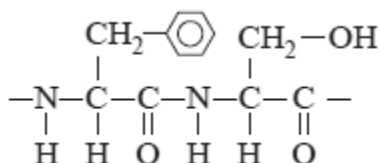
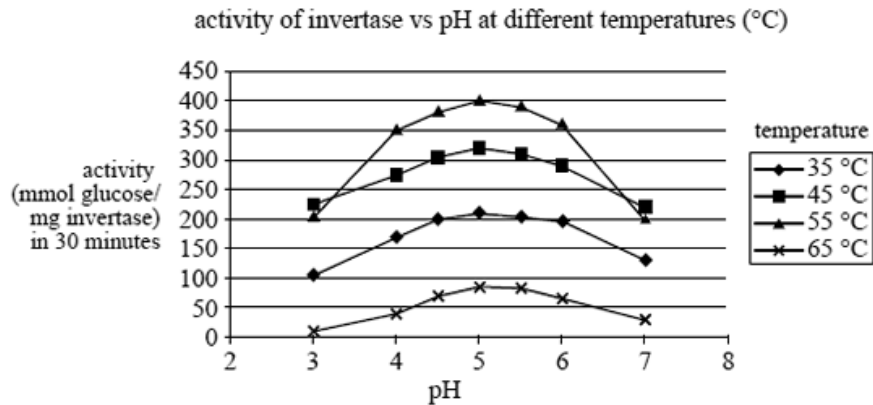


Diagram 2

- On diagram 1 circle the section of bradykinin that is shown in diagram 2. [1 mark]
7. Peptides can be completely hydrolysed to their component amino acids by treatment with 6M HCl. Name the two functional groups that are formed as a result of the hydrolysis of the peptide link. [2 marks]
8. Name the functional group on the end of the side chain of serine. [1 mark]

9. Enzymes are important proteins. Invertase is an enzyme which catalyses the conversion of sucrose to glucose and fructose. Invertase has a maximum activity temperature different from many other enzymes. The graph below shows the results of a study into the effects of both pH and temperature on the activity of invertase in sucrose solution.



- a. At what temperature and pH does invertase have maximum activity?  
[2 marks]

Temperature

pH

- b. Why does changing the pH from the optimum value cause a decrease in the activity of the enzyme? [1 mark]

10. Draw the dipeptide formed between phenylalanine and serine. Circle the peptide (amide) functional group in the dipeptide you have drawn. [2 marks]

11. Draw a disulfide link (disulfide bridge) showing the full structure of both amino acids involved. [2 marks, 1 off per mistake]

**END OF PAPER**