

**Term Test-1**

*Answer all questions in the Exam Booklets. Put your name and student number on all exam booklets. You may use a non-programmable calculator. Draw **structures** and **diagrams** where appropriate.*

*The total number of marks is 61 and you have 75 minutes to complete the exam.*

**Answer questions 1 & 2.**

1. (8) Draw the chemical structure at pH 7 of one of the peptides resulting from treatment of the following peptide with trypsin:

Phe-Cys-Val-Lys-Arg-Met-Ile-Thr-Gln

2. (6) Explain how Immobilized Metal Affinity Chelate Chromatography can be used to purify proteins.

**Answer question 3 or question 4. Each is worth 15 marks.**

3. (15) Outline a protocol for amino acid analysis of a protein and describe in chemical detail peptide hydrolysis by strong acid. What problem arises in amino acid analysis of proteins containing  $\beta$ -branched dipeptides? What can be done about this? Explain the role of performic acid in amino acid analysis.
4. (15) Describe in chemical detail the main steps of an Edman degradation describing the role and importance of pH, buffers, and organic solvents.

**Answer questions 5 - 8.**

5. (10) Which ionization state of the Cys side-chain is chemically reactive? Show the reaction between oxidized glutathione or oxidized dithiothreitol and a reduced protein. Explain how these reactions could be involved in the protein folding process. Outline how cells maintain cytoplasmic proteins in a reduced state.
6. (6) What did Brooks *et al.*, (2002) learn about the evolution of amino acid composition by deducing the sequences of about 100 proteins in the last universal common ancestor?
7. (10) Describe selenocysteine structure, function, biosynthesis and incorporation into proteins. What is the coevolution theory of the genetic code?
8. (6) List 6 methods for estimating the molecular weight of a protein.