

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 53 and you have 75 minutes to complete the exam.

Answer questions 1 and 2.

1. (6) Draw the chemical structure at pH 7 of **one** of the peptides that results from treatment of the following peptide with cyanogen bromide in 90% formic acid:

Leu-Gly-Pro-Met-Ser-Tyr-Gln-Arg

2. (8) Explain how Glutathione-S-transferase affinity tags can be used to purify proteins.

Answer questions 3 or 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 Ser and Thr? What can be done about this? Explain the role of 5,5'-dithiobisnitrobenzoic 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 or 6.

5. (6) Discuss the disinfection of materials contaminated by prions.
6. (6) A 50 micromolar solution of a protein comprising a single polypeptide chain has an absorbance in a 1 cm cuvette at 290 nm of 0.632 at pH 7 and an absorbance of 1.500 at pH 12. The molar extinction coefficient for tyrosinate at pH 12 is $2480 \text{ M}^{-1}\text{cm}^{-1}$ and for tyrosine at pH 7 is 0. How many tyrosine residues are in this protein? For full marks show your work. Draw the structure of tyrosinate.

Answer questions 7 and 8.

7. **(10)** Draw the structure of N-formylmethionine. What role does it play in protein synthesis? Describe the mechanism by which it functions and explain the implications of this to the evolution of the genetic code.

8. **(8)** What is an osmolyte? What structural features of proline make it a good osmolyte? Explain how proline works to protect cells under extreme conditions of temperature, pH or dehydration.