

**Mid-Term Test**

*Answer all questions in the Exam Booklets. Put your name and student number on all exam booklets.*

*You may use a calculator and diagrams where appropriate.*

*The total number of marks is 75 and you have 75 minutes so spend about 1 min. per mark i.e. 20 min. for a 20 mark question etc.*

**Do 1 of the following 2 questions. Each is worth 20 marks.**

- 1 What is Joule Heating and how does it affect electrophoresis? Describe the separation of molecules by Capillary Electrophoresis. What are some advantages of this method over slab gel electrophoresis?
- 2 Describe in detail the three main steps of an Edman degradation indicating the role and importance of pH, buffers, and organic solvents.

**Answer question 3. It is worth 20 marks.**

3. Describe the total synthesis of Ribonuclease A by enzymatic ligation of short peptides. What are the advantages of this approach compared to other methods of protein synthesis?

**Do 1 of the following 2 questions. Each is worth 20 marks.**

- 5 Describe the determination of the sequence of a protein by Mass Spectrometry.
- 6 Name 3 methods for the determination of the  $M_r$  of a protein. Explain the physical meaning of the symbols in the following equation:

$$\frac{dr}{dt} = \frac{M_r (1 - \bar{v}\rho) \omega^2 r}{N \cdot f}$$

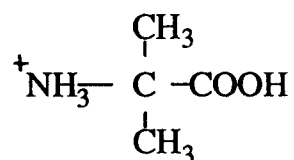
Explain how the  $M_r$  of a protein is deduced using the above equation and include a simple description of the experiment.

Do both of the following questions. Each is worth 7.5 marks

7. During a complete amino acid analysis a protein is usually hydrolysed for 18, 24, 36, 48 and 72 hours. Explain why multiple hydrolyses are necessary and how the information from them is used.
8. Compare and contrast solid vs. solution peptide synthesis

**Bonus Question: Worth 5 points**

The amino acid,  $\alpha$ -amino isobutyric acid, is produced by several species of fungi and incorporated into short peptides which function as antibiotics when secreted into the environment of the fungus. The structure of the amino acid is:



Explain the advantages of incorporating such an amino acid into an antibiotic peptide. Speculate on the biosynthesis of the peptide.