Biochemistry of Proteins CHEM 4630 **February 11, 2010**

Term Test-1

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

The total number of marks is 54 and you have 75 minutes to complete the exam.

Answer question 1. It is worth 6 marks.

1. Draw the chemical structure at pH 7 of the following peptide:

   Thr-Pro-Asn-Phe

   Name all of the products of base hydrolysis of the peptide above.

Answer question 2 OR question 3. Each is worth 15 marks.

2. Outline a protocol for amino acid analysis of a protein and describe in chemical detail peptide hydrolysis by strong acid. What problem arises in the determination of Trp? Describe an alternative method for Trp analysis.
3. Describe in chemical detail the main steps of an Edman degradation indicating the role and importance of pH, buffers, and organic solvents.

Answer question 4. It is worth 4 marks.

4. Explain the origin of electroendosmosis.

Answer question 5. It is worth 6 marks.

5. With the use of the following equation explain how Fourier-transform ion cyclotron resonance mass spectrometry measures the masses of proteins:

$$\frac{m}{z} = \frac{B}{2\pi\omega_C}$$

Answer question 6. It is worth 15 marks.

6. Explain how electrospray ionization AND matrix-assisted laser desorption ionization methods insert proteins into the vacuum of the mass spectrometer. Explain how mass spectrometry can be used to sequence proteins.

Answer question 7. It is worth 8 marks.

7. Describe the "*Stable Isotope Labelling with Amino Acids in Cell Culture*" method and its principal purpose.

Bonus Question: 2 marks maximum

8. Name the oldest studied protein. What conclusion was reached based on the study of this protein?