Biochemistry of Proteins CHEM 4630 **February 10, 2015**

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 58 and you have 75 minutes to complete the exam.

Answer question 1. It is worth 8 marks.

1. Draw the chemical structure at pH 7 of the following octapeptide in the oxidized form.

Phe-Cys-Ile-Trp-Lys-Thr-Cys-Glu

Answer question 2. It is worth 6 marks.

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

Answer questions 3 OR question 4. Each is worth 15 marks.

3. 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 serine? What can be done about this?

4. Describe in chemical detail the main steps of an Edman degradation describing the role and importance of pH, buffers, and organic solvents.

Answer question 5. It is worth 3 marks.

5. Why is the monoisotopic peak in the mass spectrum of a small peptide the most abundant peak whereas the monoisotopic peak is only a minor peak in the mass spectrum of a large protein?

Answer question 6. It is worth 8 marks.

6. With the use of the following table of amino acid masses deduce the sequence of the peptide that generates the following fragment ions in a tandem CID spectrum.

Ala	71	Arg	156	Asn	114
Asp	115	Cys	103	Glu	128
Gln	129	Gly	57	His	137
Ile	113	Leu	113	Lys	128
Met	131	Phe	147	Pro	97
Ser	87	Thr	101	Trp	186
Tyr	163	Val	99		

The mass of the parent ion is 598 Da. The fragment ions have masses of 395 Da, 264 Da and 165 Da. It may be helpful to know the masses of the atoms: H = 1 Da, C = 12 Da, N = 14 Da, O = 16 Da, S = 32 Da.

Answer question 7. Each is worth 8 marks.

7. What is an osmolyte? Why is proline a good osmolyte? How does it work?

Answer question 8. It is worth 10 marks.

8. Show how an oxidizing agent can catalyze disulphide bond formation in a protein. What is the role of performic acid in amino acid analysis?

Bonus Question: 2 marks maximum

9. How long would it take a cell to synthesize 1 titin?