**Biochemistry of Proteins CHEM 4630** **February 9, 2016**

## 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 all questions.**

1. (**8**) Draw the chemical structure at pH 7 of the following octapeptide following oxidation with HOCl.

   Tyr-Cys-Leu-Ala-Lys-Met-Cys-Arg

2. (**4**) Explain the difference between normal phase and reverse-phase chromatography.

3. (**8**) Describe affinity tag purification of a protein using glutathione-S transferase.

4. (**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 β-branched dipeptides? What can be done about this?

5. (**6**) A 35 micromolar solution of a newly discovered protein, Euphorin, has an absorption at 280 nm of 1.40 and an absorption at 288 nm of 0.96, in a cell of 1 cm path length. The extinction coefficients (in $M^{-1} \cdot cm^{-1}$) for tyrosine and tryptophan at the two wavelengths are listed below. From the information given, calculate the number of Tyrosine and Tryptophan residues in Euphorin. **For full marks show your work**.

| | $\varepsilon_{280}$ | $\varepsilon_{288}$ |
|---|---|---|
| Trp | 5690 | 4815 |
| Tyr | 1280 | 385 |

6. (**6**) Show the mechanism by which oxidized glutathione can assist in the formation of a disulphide bond in a protein. What is the name of this reaction? What can suppress it?

7. (**4**) Describe how a magnetic sector **OR** a time-of-flight mass spectrometer works.

8. (**6**) Describe Fast-Atom Bombardment **OR** Matrix-Assisted Laser Desorption Ionization, **OR** Electrospray Ionization.

9. (**4**) 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?

**Bonus Question:**

10. (**2**) What is the deadliest known protein and what is its approximate $LD_{50}$?