CHEM 4630 – Biochemistry of Proteins **March 19, 2013**

Term Test-2

Answer all questions in the Exam Booklets. Put your name and student number on all exam booklets. Draw ***structures*** *and* ***diagrams*** *where appropriate.*

The total number of marks is 50 and you have 75 minutes to complete the exam.

Answer ALL questions.

(2) 1a. Define "*Proteomics*".

(12) 1b. Describe the proteomics method called Stable Isotope Labelling with Amino Acids in Cell Culture (SILAC) and explain what it is used for.

(8) 2. Give an **outline** of the steps involved in the solid-phase synthesis of peptides. Molecular structures are required for full marks. You must show the formation of a peptide bond but you need not show any other mechanisms such as amino acid activation.

(10) 3. Describe the results of a study in which synthetic *D*- and *L*-snow flea antifreeze protein were produced.

(10) 4. Describe protein structure determination by X-ray diffraction.

(*4*) 5a. Draw and label a Ramachandran diagram and indicate the positions of right- and left-hand α-helices.

(4) 5b. Explain the structural feature of the peptide bond that makes it possible to describe the conformation of a polypeptide using two bond angles only.

Bonus Question

(2) 6. Describe the H-bonding in a π-helix.

(6) 7. Explain what structural features of proline account for it being described as a helix breaker. Why is it often found in turns?

(6) 8. Draw a topology diagram showing the secondary structure in an up-and-down β -barrel and a Greek key β-barrel. For each structure name one protein that contains the structure and describe its biological function.

(6) 6. *D*-amino acid oxidases found in the livers and kidneys of animals seem to function as detoxifying agents for the removal of harmful *D*-amino acids. They catalyze the oxidative deamination of *D*-amino acids producing ammonia, hydrogen peroxide, and a keto acid. They have an absolute specificity for *D*-amino acids and will not recognize *L*-amino acid substrates. Explain what structural features of enzymes make such selectivity possible.