CHEM 4630 – Biochemistry of Proteins **March 17, 2015**

Term Test-2

*Answer all the 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 57 and you have 75 minutes to complete the exam.

Answer ALL questions.

(8) 1a. 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.

(4) 1b. What is the main advantage of solid-phase peptide synthesis compared to solution-phase synthesis? What is the benefit of sequential fragment condensation?

(4) 2. Explain the structural relationships between *D*-HIV Protease and *L*-HIV Protease.

(8) 3. Outline how X-ray diffraction **OR** NMR spectroscopy **OR** Circular Dichroism spectropolarimetry can be used to obtain structural information about proteins and what sort of structural information is obtained.

(6) 4. What is the hydrophobic effect and what is its importance to protein folding?

(7) 5. Draw and label a Ramachandran diagram and indicate the location of the left- and right-handed α-helix, parallel and anti-parallel β-sheet, and the collagen triple helix = polyproline helix.

(10) 6. Compare and contrast the structural features of the α-helix and 3_{10}-helix.

(10) 7. Name and describe two motifs found in all-α-helical proteins. For each motif, give an example of a protein containing the motif and describe how the structure is used to carry out the biological function of the protein.

Bonus Question

(2) 8. The Major Histocompatibility complex binds peptides in a binding pocket having walls made of α-helices. Estimate the number residues per α-helix needed to bind a 9-residue peptide in an extended conformation parallel to the α-helix.