

CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Autumn Examinations 2012/2013

Module Title: Food and Healthcare Chemistry

Module Code: CHEM7002

School: Biological Sciences

Programme Title: B.Sc. (Honours) in Herbal Science
B.Sc. (Honours) in Food Science & Technology
B.Sc. (Honours) in Nutrition and Health Science

Programme Code: SHERB_8_Y3
SFSTE_7_Y3
SNHSC_8_Y3

External Examiner(s): Prof Torres Sweeney

Internal Examiner(s): Germain Levieille

Instructions: Answer any 4 of the 6 questions asked. Each question carries a equal mark weighing.
Please state clearly the questions addressed in your paper.

Duration: 2 hours

Sitting: Autumn 2013

Requirements for this examination:

Note to Candidates: Please check the Programme Title and the Module Title to ensure that you have received the correct examination paper.
If in doubt please contact an Invigilator.

- Q1. a) Give a definition of an enzyme. (5 marks)
- b) Indicate the main types of enzymes that have significant importance in Food Science. Please give relevant examples. (10 marks)
- c) Oxidoreductases are enzymes that may cause unwanted effects in some foods. Give two examples of such enzymes involved in the degradation of food products. (10 marks)

- Q2. A Bradford protein assay was conducted using BSA (Bovine Serum Albumin) as standard to obtain of standard curve and you have obtained the following results:

Conc. of BSA mg/ml	0	0.2	0.4	0.6	0.8	1.0
Abs 595nm	0	0.262	0.512	0.785	0.984	1.322

Three soya solutions were prepared with 1g of soya flour dissolved in 50ml water adjusted a three different pH (pH 3, pH6.5 and pH8 respectively). These preparations were then centrifugated to eliminate the flour insoluble residues. The three supernatants containing soluble proteins were assayed using Bradford in the same conditions as the BSA standard and you obtained the following data:

Soya extract at pH3: $\text{Abs}_{595\text{nm}}=0.550$

Soya extract at pH6.5: $\text{Abs}_{595\text{nm}}=0.935$

Soya extract at pH8: $\text{Abs}_{595\text{nm}}=1.250$

- a) Draw the standard curve for the Bradford assay (BSA as standard protein). (5 marks)
- b) Calculate the equation establishing the correlation between BSA concentration and $\text{Abs}_{595\text{nm}}$ (4 marks)
- c) Estimate the protein concentrations of each soya solutions using the graph. (3 marks)
- d) Calculate the values of these protein concentrations using the equation from b). (5 marks)
- e) Calculate the yields of extraction for each pH assuming that soya flour is 50% protein. (3 marks)
- f) Comment on the causes of difference of solubility of protein at different pHs. (5 marks)

- Q3. a) What is the main class of lipids? Give a general chemical representation. (7 marks)
- b) What is “fat plasticity”? Why is it important from a food processor point of view? (8 marks)
- c) Describe the process of oxidation of lipids. What are the contributing factors and how can we prevent lipid oxidation. (10 marks)
- Q4. What is the Maillard reaction? How does it differ from caramelization? Supported by examples indicate why both these reactions are important in food processing. (25 marks)
- Q5. Prevention of spoilage is an important concern for the food industries and a key factor is the water activity of the food products.
- a) What is meant by water activity in food product? (5 marks)
- b) Indicate how water activity is measured. (5 marks)
- c) Why is it important to know the a_w of a food product? (7 marks)
- d) What are the main strategies used to reduce the water activity of a food product? (8 marks)
- Q6. a) Proteins are made of chain of amino acids. Give the general chemical structure of amino acids. (3 marks)
- b) Give the semi developed equation of the creation of amide linkage (also called peptide bond) between two amino acids. (5 marks)
- c) Describe the primary, secondary and tertiary structure of a protein. (7 marks)
- d) Explain why certain amino acids are referred to as “essential amino acid” for the Human diet. (10 marks)