

CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Semester 1 Examinations 2012/13

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 4 out of these 6 proposed questions. Each question carries a equal mark weighing of 25%. Please state clearly the questions addressed in your paper.

Duration: 2 hours

Sitting: Winter 2012

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 the water activity of a food product. (5 marks)
- b) Describe how water activity is measured. (3 marks)
- c) Elaborate on the different types of “bonded water” and on how this is related to the water activity of the food product. (7 marks)
- d) Discuss the links between water activity and the perishability of food products. (10 marks)

- Q2. A Biuret reaction experiment was conducted using BSA to obtain a standard curve. The following results were attained:

Conc. of BSA mg/ml	0	1	2	3	4	5	6
Abs 540nm	0	0.5342	1.0582	1.5925	2.1452	2.452	2.784

You tested the concentration of protein in a number of beers and obtain the following data:

Beer 1: $\text{Abs}_{540\text{nm}}=3.625$ Beer1 after dilution at 1/20: $\text{Abs}_{540\text{nm}}=1.342$

Beer 2: $\text{Abs}_{540\text{nm}}=3.128$ Beer2 after dilution at 1/20: $\text{Abs}_{540\text{nm}}=0.782$

Beer 3: $\text{Abs}_{540\text{nm}}=2.345$ Beer3 after dilution at 1/20: $\text{Abs}_{540\text{nm}}=0.275$

- a) Draw the standard curve for the Biuret assay (BSA as standard protein). (5 marks)
- b) Calculate the equation determining the correlation between BSA concentration and $\text{Abs}_{540\text{nm}}$ (5 marks)
- c) Estimate the protein concentrations for each beer using the graph. (5 marks)
- d) Detail your calculations to obtain protein concentrations using the equation from b). (10 marks)
- Q3. a) Describe the oxidation processes of fat and oils. (8 marks)
- b) What are the main contributing factors of lipid oxidation? (5 marks)
- c) Discuss strategies used to limit the impact of the main factors of lipid oxidation. (5 marks)
- d) Discuss the role of antioxidants and illustrate with examples of common antioxidant compounds. (7 marks)

- Q4. a) Lipids are made of very different molecules with common properties. What is the main type of lipid found in food? Give its general molecular structure. (5 marks)
- b) Elaborate on how the nature of the fatty acids impacts on the melting-point of fat. (10 marks)
- c) Describe the main processes used for the extraction of fat and oils. (5 marks)
- d) Describe the refining processes oil may require after extraction. (5 marks)
- Q5. a) Proteins are made of chain of amino acids. Describe the condensation reaction leading to the creation of amide linkage (also called peptide bond) between two amino acids. Support your description with a chemical equation. (7 marks)
- b) What is meant by “limiting amino acid” in food ingredients and discuss its consequences in nutrition? (5 marks)
- c) Explain the concept of “complete protein” and discuss its implications in Human Nutrition. (5 marks)
- d) One of the methods to measure the amount of protein in a food product is the Kjeldahl method. Describe the principle of this method and discuss its limitations. (8 marks)
- Q6. a) Give a definition of an enzyme. (5 marks)
- b) Discuss the factors affecting the activity of enzymes. (8 marks)
- c) Corn starch can be treated to produce sweetening syrups. Describe the enzymatic steps leading to the production of glucose syrup. (7 marks)
- d) Discuss how glucose syrup can be used to make an even sweeter product. (5 marks)