



# MASENO UNIVERSITY

## UNIVERSITY EXAMINATIONS 2012/2013

SECOND YEAR SECOND SEMESTER EXAMINATION  
FOR THE DEGREE OF BACHELOR OF SCIENCE IN  
INDUSTRIAL CHEMISTRY WITH INFORMATION  
TECHNOLOGY  
(MAIN CAMPUS)

### **SIC 206: INTRODUCTION TO FOOD CHEMISTRY**

*Date: 15<sup>th</sup> July, 2013*

*Time: 11.00 a.m. – 1.00 p.m.*

---

**Sic 206: Introduction to Food Chemistry**

**Instruction: Attempt Question ONE in Section A and any other THREE Questions in Section B.**

**Time: Two Hours.**

**SECTION A: ANSWER Q 1.**

**Q1 Give brief definition of the following terms.**

- i. Food chemistry.
  - ii. Protein.
  - iii. Carbohydrate.
- (5 marks)

**(b) Briefly describe and give equations for the fixation of the following elements by organisms which make food stuffs such as carbohydrates and proteins**

- i. Carbon and oxygen
  - ii. Nitrogen.
  - iii. Sulphur.
- (5 marks)

**(c) Define the following terms.**

- i. Fertilizer.
  - ii. Essential animal nutrients.
  - iii. Plant trace elements.
- (5 marks)

- (d)**
- i. Name two macronutrients which provide energy for animals.
  - ii. Name three substances which support body metabolism in animals.
  - iii. Name three states of water.
- (5 marks)

**(e) Define the following terms and give formula which describes (i) and (ii).**

- i. Water activity.

- ii. Relative humidity.
  - iii. Water sorption isotherm  
(5 marks)
- (f) i. Name two instruments used for the measurement of water activity.
- ii. Describe the instrument and the principle of functions of one of the answers in (i).
- iv. Describe gravimetric analysis of moisture content in carrots.  
(5 marks)

**SECTION B : ANSWER ANY THREE QUESTIONS.**

**Q2** Water activity and moisture content are very important in design and processes used in food

industry. Describe and explain the above statement with reference to following aspects.

- i. Importance of water availability in foods as measured by water activity.(10 marks)
- ii. Importance and use of moisture sorption isotherm.(10 marks)

**Q3** Carbohydrates and lipids are important in the processing and storage of food stuffs and value

added products.

- i. Draw the structures of sucrose, lactose and a triglyceride.(3 marks)
- ii. Name sources of each item in (i) above. (3 marks)
- iii. Describe and explain how sweetness is enhanced in food stuffs during processing.(4 marks)
- iv. Describe and explain the maillard browning and its importance in food processing.(5 marks)
- v. Describe the chemical industrial process for the manufacture of margarine from vegetable oils. (5 marks).

Q4 Fatty acids and glycerides are raw materials used in food processing and have important nutritional values.

- i. Using a general formula of fatty acids and glycerol describe the terms; esterification and hydrolysis.(3 marks)
- ii. Describe the functions of glycerides in the food industry.(2 marks)
- iii. Explain the terms unsaturation and geometric isomerism as applied to the structure of oleic acid.(3 marks)
- iv. Name three sources rich in polyunsaturated fatty acids.(3 marks)
- v. Describe the effects of oxidation on unsaturated fatty acids on the quality of foods under processing conditions. (5 marks)

Q5 Proteins and amino acids are body building, energy, providing and metabolic materials in

life and food processing and storage must take into account changes during the stages.

- (i) Describe the general structure of an amino acid and its existence in two enantiomers.(2 marks)
- (ii) Using equations explain how pH affects the ionization of the amino acid as drawn in (i) (2 marks)
- (iii) What is a peptide bond found in protein? Draw the structure to illustrate the answer.(2 marks)
- (iv) Name four structures of a protein molecule.(2 marks)
- (v) Name four sources of food stuffs containing at least 20% of protein.(2 marks)
- (vi) Describe adverse and beneficial effects of heat treatments between moderate temperature and  $100-300^{\circ}\text{C}$  on globular proteins in food stuffs such as eggs and milk (10 marks).