

UNIVERSITY OF RUHUNA
BACHELOR OF SCIENCE GENERAL DEGREE (LEVEL III) SEMESTER (I)
EXAMINATIONS NOVEMBER - 2021

SUBJECT: Chemistry

Time: One and Half (1 ½) hours

COURSE UNIT: CHE 3112 (*Industrial Chemistry –I*)

Answer Three (03) questions only.

(01) Answer **all** parts

(a) Certain food additives improve the nutritional profile as well as prevent diseases caused by malnutrition of foods.

(i) List **two (02)** ingredients used to improve nutritional profile of foods. Name the diseases that prevent by each ingredient.

(ii) Discuss the processes involved in;

(I) Nutrification

(II) Fortification

(III) Enrichment

(IV) Flavor enhancing

(40 marks)

(b) Canning is an important and safe method for preserving food if practiced properly.

(i) What is food preservation?

(ii) Briefly discuss the unit operations involved in canning and explain briefly how each unit operation contributes to food preservation.

(iii) Discuss the main differences between boiling water canning and pressure canning.

(40 marks)

(c) Write a short account on food additives.

(20 marks)

(02) Answer **all** parts

(a) Draw a process flow diagram to show the general steps involved in the food chain from food production to food consumption.

(20 marks)

(b) Approximately one-third of all food manufactured in the world is lost due to spoilage.

(i) Explain what is meant by “food spoilage”.

(ii) What changes would you observe in foods when they get spoiled?

(iii) Discuss **three (03)** principle food spoilage factors that need to be inhibited in preserving the foods.

(40 marks)

(c) Temperature management is an important area in food preservation.

(i) Differentiate “chilling” and “freezing” with respect to food preservation

(ii) Discuss briefly the advantageous and disadvantages of food preservation by quick freezing process.

(40 marks)

(03) Answer **all** parts

(a) The rate of a chemical reaction is determined by several factors.

Write down **five (05)** factors affecting the rates of chemical reactions and briefly describe action of each of them on the rates of the chemical reactions.

(30 marks)

(b) “The Haber process provides a good case study to illustrate how industrial chemists use their knowledge on factors that affect chemical equilibria to find the best conditions needed to produce a good yield of products at a reasonable rate”.

(i) Write down the balanced chemical reaction for the production of ammonia gas with the enthalpy change, $\Delta H = -92 \text{ kJ mol}^{-1}$.

(5 marks)

(ii) With a brief description, justify the selection of **four (04)** following materials or the conditions in the Haber process.

- I. Source of raw materials
- II. Catalyst and the promotor used in this process and the role of the promotor.
- III. The mixture of the catalyst and the promotors are ground to a fine powder.
- IV. Pressure under which the reaction takes place
- V. Percentage conversion of raw materials
- VI. Volume proportions of nitrogen to hydrogen

(30 marks)

(c) The manufacture of nitric acid is achieved by the catalytic oxidation of ammonia over platinum-rhodium catalyst.

(i) Write down the balanced chemical equations for the **three (03)** steps of the production of nitric acid.

(15 marks)

(ii) There is a side reaction when ammonia and oxygen combine in the first stage of nitric acid manufacture. It occurs when one of the products of the first step begins to react with ammonia.

Explain why this reaction to be highly undesirable.

(10 marks)

(iii) Explain how the adjustment of the gas flow rates through the catalyst can prevent that side reaction taking place.

(10 marks)

(04). Answer **all** parts.

(a) Explain the following terms;

- (i) Quality in terms of producer's and customer's viewpoints.
- (ii) Quality assurance.

(16 marks)

- (b) Explain what you understand by *quality audit* and explain the necessity of doing it. (20 marks)
- (c) Explain the difference between the following audit procedures; (18 marks)
- (i) First party audit
 - (ii) Second party audit
 - (iii) Third party audit
- (d) Differentiate the terms *adequacy audit* and *compliance audit*. (20 marks)
- (e) Sketch a diagram to show the “*audit life cycle*”. (06 marks)
- (f) Imagine that you are appointed as the “Team Leader of an Internal Audit Firm”. Briefly explain how you would prepare to do this activity. (20 marks)

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