



MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

(MMUST)

Main CAMPUS

UNIVERSITY EXAMINATIONS

2021/2022 ACADEMIC YEAR

Semester II

MAIN EXAMINATION

(BSC Chemistry)

FOR THE DEGREE

OF

BACHELOR OF SCIENCE IN CHEMISTRY

COURSE CODE: SCI 160

COURSE TITLE: Introduction to Industrial chemistry

DATE: 20/04/2022

TIME: 12.00 – 2.00 pm

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**INSTRUCTIONS TO CANDIDATES**

Answer all the Questions

Find the attached periodic table

**TIME: 2 HOURS**

MMUST observes ZERO tolerance to examination cheating

**QUESTION ONE (18 MARKS)**

1 a). Explain the following terms (3 marks)

- i. Explain what commodity chemicals are
- ii. Specialty Chemicals
- iii. Fine Chemicals

b). Arrange the following randomised chemical processes in the order that they should occur in a typical industrial process. (4 marks)

- separation of products from by-products is carried out
- conversion takes place
- raw materials are pre-treated
- refining/purification of products takes place

c). Explain what a chemical process is. (2 marks)

d). Explain what a Unit process is. (2 marks)

e). Group the following chemicals in their respective groups in the table below; (7 marks)

Standard mixed pesticides for lab analysis, Agrochemicals, Nitrogen, vitamin B<sub>2</sub>, pigments, oxygen, peptides, fragrances, Phosphoric acid, Calibration chemical standards, Adhesives, NaOH, Amino acids, surfactants, Ammonia,

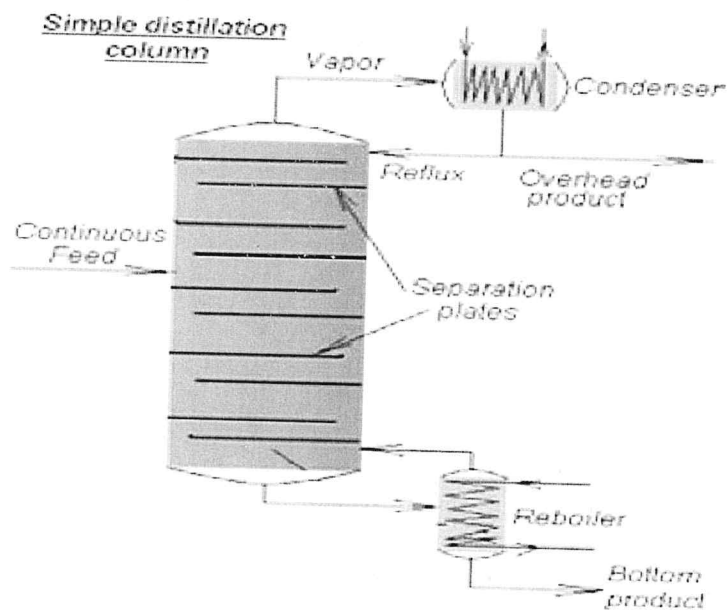
Fine Chemicals	Specialised chemicals	Commodity chemicals

**QUESTION TWO (19 MARKS)**

2 a). The following unit operations, their purpose and application are not matched correctly. Match the following unit operations according to their **purpose** and **application** in the table below. (9 marks)

Unit Operation	Purpose	Application
Electrostatic separation	A liquid containing a dissolved solid is sprayed And contacted with hot air Which evaporates the solvent Yielding a powdered Product	Sugar manufacture
Spray drying	Removal of a component from a gas mixture by dissolving It in a liquid	Removal of hydrogen Sulphide (H <sub>2</sub> S) from hydrocarbon gases using alkaline solutions.
Crystallization	Separation of solids from liquids mostly by gravitational forces	Water treatment plants
Absorption	Separation of solid particles from their saturated solutions	Mineral ore dressing
Sedimentation	Separation of solids on the basis of the difference in electrical conductivity of components	Production of pigments, detergent powder, powdered milk, synthetic resins and inorganic salts

b). Below is a simple sketch of a continuous distillation column. Study it carefully and use it to answer the following questions. (10 Marks)



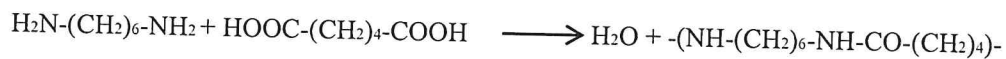
If we feed the column with a liquid of components A and B that have boiling points  $T_A$  of 40 °CF and  $T_B$  80°C for components A and B respectively;

- i. Which component will make the majority of the bottom product?
- ii. Which component will make the majority of overhead product?.
- iii. After the topmost vapor is condensed at the condenser, some of the distillate is returned to the column at the top plate. What do we call the returned liquid?
- iv. What do we call the enriching the vapor with the more volatile component above the feed location?
- v. What do we call the removal or depletion of this component from the liquid below the feed location?
- vi. Give an example of the major application of the distillation process industry known globally

**QUESTION THREE (18 MARKS)**

3. a). In Polymerization reactions, what will happen if;

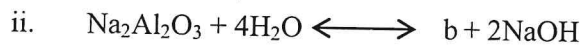
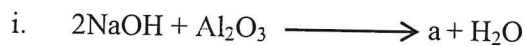
- i. A monomer reaction gives a cyclic product (2 marks)
  - ii. If one of the reactants in a step-reaction polymerization contain more than two functional groups (2 marks)
- b. For polymerization to yield polymers with long chain or high polymers, give **two** conditions that the monomers must have. (4 marks)
- c. For the following reaction, state which is the monomer (2 marks)



- d. Give the common name of the polymer in c above. (2 marks)
- e. Explain the following
  - i. the initiation step of the polymerization. (2 marks)
  - ii. Propagation (2 marks)
  - iii. Name two chain termination processes that can occur in polymerization? (2 marks)

**QUESTION FOUR (15 MARKS)**

4 a). Complete the following Equations related to Chemical treatment of bauxite (4Marks)



b). You are a production manager at a sugar factory. You are provided with the following operations, processes and materials (not arranged in order):

Sugarcane, Heating, Distillation, By product (Vinasse), Fermentation, Milling and bagasse separation, Sugarcane juice, Molasses, Ethanol.

i. Sketch a simple block diagram for the production of ethanol (9 Marks)

ii. What other product(s) can you produce from such an industry? (2 marks)

.....70 marks.....