



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

2021/2022 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DEGREE

OF

BACHELOR OF SCIENCE (INDUSTRIAL CHEMISTRY)

COURSE CODE: SCI 264

COURSE TITLE: UNIT OPERATIONS

DATE: THURSDAY 21ST APRIL 2022

TIME: 3:00 PM – 5:00 PM

INSTRUCTIONS TO CANDIDATES

Answer all the Questions

TIME: 2 Hours

QUESTION ONE (20 MARKS)

- a) Differentiate between unit operations and unit processes (4 Marks)
- b) Clearly describe the process of crystallization (3 Marks)
- c) List at least three ways through which crystallization may occur (3 Marks)
- d) Give four ways of achieving supersaturation (4 Marks)
- e) What is meant by the terms 'raffinate' and 'theoretical plate' in liquid-liquid extraction?
(2 Marks)
- f) Using an image, show how cross current liquid-liquid extraction equipment works and list two of its disadvantages (4 Marks)

QUESTION TWO (15 MARKS)

- a) List three things/events through which heat transfer by conduction can be attributed to (3 Marks)
- b) Give, and explain, at least three factors that may determine the selection of a solvent during liquid-liquid extraction (6 Marks)
- c) Give three features of an ideal crusher or grinder in size reduction (3 Marks)
- d) Describe the operation of a ball mill (3 Marks)

QUESTION THREE (20 MARKS)

- a) List three differences between drying and evaporation (3 Marks)
- b) You are to design a 4ft x 4ft window that for a room that is to be maintained at 25⁰C. The outside temperature is 40⁰C. The window should allow only 20.9 kJ of heat to pass through it per day, and the thermal conductivity of the glass you are to use is 0.96W/m.K. What will the thickness of the window be? (6 Marks)

- c) What is meant by the phrase '**boiling point**' (2 Marks)
- d) Describe how steam distillation works/occurs (4 Marks)
- e) Define leaching (2 Marks)
- f) Give three advantages of filter leaf (3 Marks)

QUESTION FOUR (15 MARKS)

- a) Give three reasons why drying may be necessary within an industry (3 Marks)
- b) Define the following terms (4 Marks)
 - Mixing
 - Agitation
- c) Leaching occurs in two steps. Describe them (4 Marks)
- d) What are the four principles of size reduction (4 Marks)