



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY**

(MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS (SUPP/SPECIAL)

2021/2022 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DEGREE

OF

**BACHELOR OF SCIENCE & BACHELOR OF INDUSTRIAL
CHEMISTRY**

COURSE CODE: SCH 251

COURSE TITLE: AQUATIC CHEMISTRY

DATE: 04/08/2022

TIME: 8.00 am - 10.00 am.

INSTRUCTIONS TO CANDIDATES

Answer all the Questions

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 5 Printed Pages. Please Turn Over. ▶

QUESTION ONE (15 MARKS)

- a. I. What property of water makes it useful in the human body as a medium in which biological and chemical reactions occur and also allows it to become polluted or contaminated very easily in the environment? 2mks
- i. What is the range of pH of natural water? 1mk
- ii. Name two environmental cause of reduced pH in water. 2mks
- iii. State two ways by which the pH can be raised. 2mks
- iv. What problem would arise if the pH of a water body is below this range 2mks
- b) Define the following with reference to water chemistry;
- i. Impurity 2mks
- ii. Pollutant 2mks
- iii. Eutrophication 2mks

QUESTION TWO (15 MARKS)

- a. i) Give 4 important properties of pollutants that govern their behavior in water (2mks)
- ii. With help of chemical equation, explain the natural source of hardness in water bodies 2mks
- iiii. Ground water and surface water have appreciable difference in characteristics. Explain this statement in relation to water pollution (3mks)
- b) Explain the significance of the following in relation to aquatic system;
- i) Coliform bacteria (4mks)
- ii) Soaps and detergents (4mks)

QUESTION THREE (20 MARKS)

- 2.a) i) Explain the term ' ppm' in relation to units used in natural water 2mks
- ii) State 4 factors that affect DO levels/concentration in natural water bodies (2 mks)
- b)i Differentiate between alkalinity and basicity (2 mks)
- ii. Treatment of water for domestic use may involve several stages. These stages may include sedimentation, flocculation and filtration. Describe what happens at each of these stage (6mks)
- c) i) Explain the meaning of Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) ? (2mks)
- ii) What are the limitations of BOD test when used for water quality monitoring (2mks)
- iii 5 cm³ of wastewater is added to 300 cm³ BOD bottle. The initial DO was found to be 8.0mg/L while the final DO after incubation was 2.0 mg/L. State the conditions for this process and calculate the BOD. (4 mks)

QUESTION FOUR (20 MARKS)

a) i. A supply of hard water is treated for domestic use by ion-exchange. You may assume that all the hardness is by $\text{Ca}(\text{HCO}_3)_2$. Explain using chemical equation how a cation exchange resin RNa softens this water 4 mks

ii. Calculate the Carbonate Hardness (CH), Non-Carbonate hardness (NCH) and Total Hardness (TH) for the water containing the following; MgSO_4 25mg/L; $\text{Mg}(\text{HCO}_3)_2$ =32 mg/L; CaCl_2 =55 mg/L (First, calculate the Equivalent of CaCO_3 mg/L, for each species) 10mks

b.i Name 4 important water quality parameters that are commonly measured. 2mks

ii. Nitrates in drinking water continue to raise concern. Discuss the sources of nitrates in drinking water and give 2 major health effects. (4mks)