GS

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS 2022/2023 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 (MAIN EXAM)

DATE: 19/04/2023 **TIME:** 12.00-2.00 PM

INSTRUCTIONS TO CANDIDATES

Answer all the Questions

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 4 Printed Pages. Please Turn Over.

QUESTION ONE (15 MARKS)

a. Name two main sources of natural water. **(2 mks)**

b. Water sources can be classified as protected or unprotected. **(2 mks)**
Give four characteristics of a protected water source

c. i). Explain the meaning and importance of "water Quality Standards". **(2 mks)**

ii) Name any two water conservation techniques adopted in Kenya. **(2 mks)**

d i) Name 4 important water quality parameters that are commonly measured. **(2 mks)**

ii) State one most important reason for the unusual properties of water **(1 mk)**

e. Define the following with reference to water chemistry;

i) Impurity **(2 mks)**

ii) Pollutant **(2 mks)**

QUESTION TWO (15 MARKS)

a. i) Name three main sources of water pollution **(2 mks)**

b i) Explain acid rain formation? **(3 mks)**

ii) State three environmental effects of acid rain **(3 mks)**

d. Explain the significance of the following in relation to water pollution;

i) Coliform bacteria **(4 mks)**

ii) Soaps and detergents **(3 mks)**

QUESTION THREE (20 MARKS)

a i) With reference to water quality, state the meaning of DO? And what are the units of measurements? **(2 mks)**

ii) State 4 factors that affect DO levels in natural water bodies **(2 mks)**

iii) Treatment of water for domestic use may involve several stages. These stages include Sedimentation, flocculation and filtration. Describe these processes **(6 mks)**

b) i) Explain the term BOD and its use as a water quality indicator. **(3 mks)**

ii) What are the limitations of BOD test when used for water quality Monitoring **(3 mks)**

iii) 5 cm^3 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) Temporary Hardness in water can be removed by boiling, but the hardness in Permanent Hard water cannot. Use chemical equations to explain this statement **(3 mks)**

ii) State and explain four disadvantages of hard water **(2 mks)**

iii) A sample of water contains 40mg/lof Calcium, and 20mg/l of Magnesium as ions. Calculate the Calcium and Magnesium hardness expressed as Calcium carbonate ($CaCO_3$) and hence Total hardness **(3 mks)**

Given equivalent wt of $CaCO_3$ =50.045 ,Ca=20.04.Mg=12.15

b. Use the diagram below/next page to answer the following questions ;

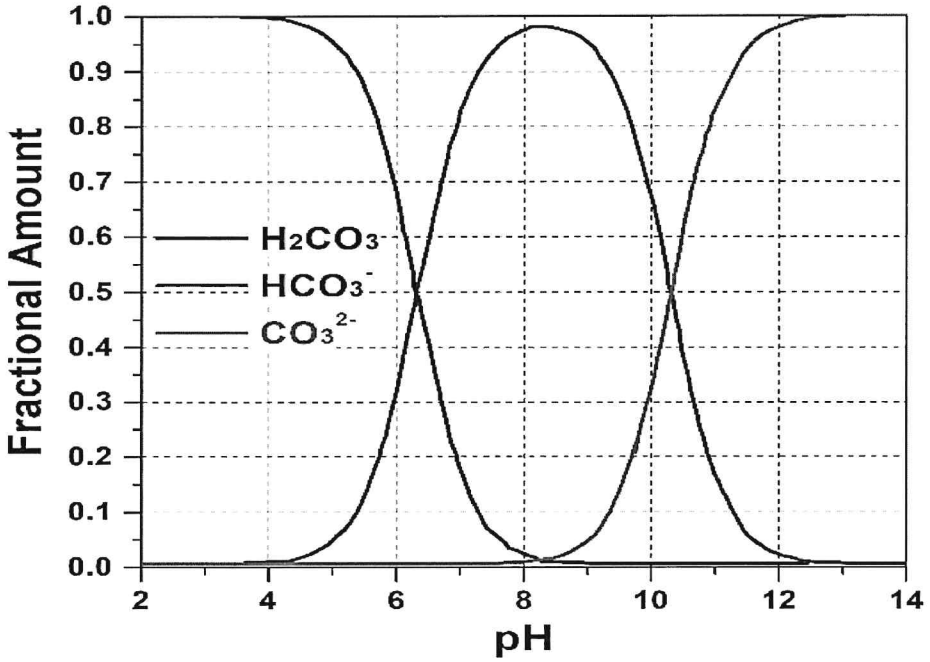
i. What is the common name of the species represented as fractions on the x-axis **(1mk)**

ii. Write a balanced equation for the reversible reactions represented in the diagram. **(1mk)**

iii. Explain how the reaction would protect a water body from pollution by acid rain **(2mks)**

iv. Write the formulae of the predominant species at the following specified Ph values; 4.5, 6.2, 8-9, and13.0 (2 mks)

DIAGRAM-SHOWING-BICARBONATE,-SYSTEM



c. i) Nitrates in drinking water continue to raise concern. Discuss the sources of nitrates in drinking water and give 2 major health effects. **(3 mks)**

ii.Explain, the process and environmental effect of eutrophication **(3 mks)**