

450



(University of Choice)

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

MAIN CAMPUS

2022/2023 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER EXAMINATIONS

**FOR THE DEGREE
OF**

**BACHELOR OF SCIENCE (CHEMISTRY) & BACHELOR OF
EDUCATION SCIENCE**

COURSE CODE: SCH 101

COURSE TITLE: FUNDAMENTALS OF CHEMISTRY II

DATE: ~~12~~ ^{MAR} FEB, 2023

TIME: 8.00 AM- 10.00 AM

14/03/2023

INSTRUCTIONS TO CANDIDATES

Total Marks: 70

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 1 (18 MKS)

Q 1. A. Define the following gas Laws.

i). Charles law (1mk

ii). Boyle's law (1mk

iii). Sketch a plot to represent a graph of Volume against temperature for ideal gasses showing the origin of the Kelvin scale (2mks

B). Answer the following questions

i). The volume of sample of a sample of nitrogen gas at a temperature of 291K and 1.0×10^5 Pascal's was $3.5 \times 10^{-2} \text{ m}^3$. Calculate the temperature at which the volume of the gas would be $2.8 \times 10^{-2} \text{ m}^3$ at 1.0×10^5 Pascal's. (3mks

ii). A gas occupies a volume of 250 cm^3 at -23°C and 1 atmosphere. Determine its volume at 127°C when pressure is kept constant. (2 mks

C. (i) What is a mole (1mk

ii). Determine the molecular formula of styrene used to prepare the plastic wrapping material polystyrene. It is a compound of carbon and hydrogen only that contains 92% carbon and has a molar mass of 104 g/mol (2mks

iii). Calculate the number of moles of hydrogen gas that can be produced by reaction of 0.750 mol of hydrochloric acid with calcium metal. (3mks

iv) Calculate the number of moles of aqueous NaOH that must react completely with aqueous H_2SO_4 to produce 1.24 mol of Na_2SO_4 (3mks

QUESTION 2 (17 MKS)

Q2. Answer the following

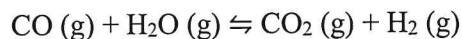
A .i). Name the three colligative properties and write brief notes on each (9 mks

ii).Name the process and describe how pure water can be obtained from saline water (3mks

B- i). The following equation describes the osmotic pressure equation analogous to the ideal gas law equation: $\Pi V = nRT$. What do the symbols stand for (2 mks

ii) Write an equilibrium constant expression for the decomposition of ammonia to form nitrogen and hydrogen at 500°C (1mks

iii). The reaction below took place at high temperature.



The concentrations in a above equilibrium mixture are CO (g), 0.06mol/L; H₂O, 0.120mol/L; CO₂, 0.150; and H₂, 0.300 mol/L. Calculate the value of the equilibrium constant at this temperature. (2mks

QUESTION 3 (18 MKS)

Q3A-I . Answer the following.

- what are acid- base indicators (2mks
- What is PH (1 mk
- What does PH value stand for? (1 mk
- What is a buffer solution (1mk

II). Describe the change in color of acid-base indicators according to the

- Quinonoid theory (3 mks
- Ostwald theory (3mks

B-I).Define the term solubility (1mk

II). Calculate the solubility, in mol L⁻¹, of Ag Cl (s) if the K_{sp} (AgCl) = 1.8 x 10⁻¹⁰ (3mks

III). Calculate the solubility product constant for PbCl₂ (mw =278.1), if 50.0ml of a saturated solution of PbCl₂ was found to contain 0.2207g dissolved in it. (3mks

QUESTION 4 (17 MKS)

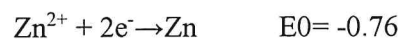
Q4. Answer the following

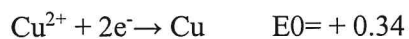
A). Define the following terms as used in electrochemistry (3mks

- Electrodes
- Electrolyte
- Anode and Cathode

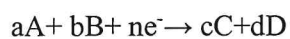
B- i). Draw a sketch diagram for an electrolytic cell (3mks

ii) Given the half-cell potentials below, calculate the cell potentials of a Daniel cell (2mks





iii). Provide the Nernst equation for standard cell, for a general half- reaction using the equation below
(2mks



iv). Using the Nernst equation calculate the potential of a Zinc/ Zinc ion half- cell in which the pure Zinc electrode is immersed in a 0.100 M zinc ion solution (3mks



v) Calculate the potential of a Zinc/ silver cell in which the pure Zinc electrode is immersed in a 0.100 M zinc nitrate and the silver electrode in 0.500M silver nitrate. Determine which metal is reduced spontaneously (4mks

