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KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER
MAIN EXAMINATIONS

FOR THE DEGREE OF B.ED (SCIENCE)

COURSE CODE: SCH 101

COURSE TITLE: FUNDAMENTALS OF CHEMISTRY 1

DURATION: 2 HOURS

DATE: 17TH JANUARY 2018 **TIME:** 2 – 5PM

INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of 3 printed pages. Please Turn Over



KIBU observes ZERO tolerance to examination cheating

Answer Question ONE and ANY other TWO Question.(70Marks)

Important information; $R: 8.314\text{Jk}^{-1} = 0.0821\text{L atm mol}^{-1}\text{k}^{-1}$, $1\text{ atm } 101325\text{NM}^{-2} = 101325\text{Pa} = 760\text{mmHg}$

Question ONE (30 Marks)

Question One

a). State the following

i). Boyle's law (2marks)

ii). Daltons law of partial pressure (2marks)

b). Explain the terms acids and bases according to Arrhenious and Bronsted-Lowry concepts (4marks)

c). The volume of a gas at 2 atmospheres is 399 cm^3 at 5°C . Calculate the volume that the gas will occupy if the pressure is increased to 2.5 atmospheres at the same temperature (3marks)

d). If it takes 30 seconds for 100 cm^3 of carbon (iv) oxide to diffuse across a porous plate. How long will it take for 200 cm^3 of NO_2 to diffuse across the same porous plate under similar conditions? ($C = 12.0$, $N = 14.0$, $O = 16.0$) (3marks)

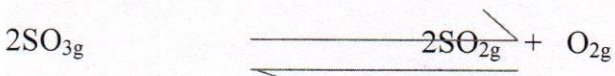
e). The solubility of Agcl is 1.67×10^{-5} moles per litre at 25°C . Calculate the solubility product of Agcl . (3marks)

f). State the four assumptions of the kinetic theory of matter (4marks)

g). Write the equilibrium expression for k_c and k_p for the following reaction (2marks)



h). Consider the reaction given below



At temperature of 1000 K , k_c has the value of 4.07×10^{-3} . Calculate the value for k_p (3marks)

i). Basing your answer on Raoult's, state three colligative properties of dilute solutions (3marks)

j). State the *Le Châtelier's principle*. (1Mark)

Question TWO

Consider the following electrochemical cell whose E^0 of the cell is 1.10V .

Zn/ZnSO₄ (0.05M) /CuSO₄ (5M)/Cu

- i) Write the half-cell reactions and the overall reaction 4Marks
- ii) Draw the cell diagram and show the flow of electrons
5Marks
- iii) Calculate the e.m.f of the cell given that the standard e.m.f of the cell is 1.10 V
4Mark
- iv) Explain Two application of electrolysis 4Marks
- v) In an experiment to electrolyte copper(II)sulphate solution using copper electrodes
0.2 amperes were passed through the solution for 1,930 seconds. The mass of copper
Cathode increased from 6.35 to 6.478g. Find the charge on a copper ion (1F=96500C
Cu = 64) 3Marks

Question THREE

1 a) Define the following terms (4 marks)

- (i) Molar mass
- (ii) Avogadro's number
- (iii) Formular mass
- (iv) Elemental analysis

(b) A sample of a certain alcohol is known to contain only C, H and O. Combustion of 0.255 grams of the alcohol produces 0.561 grams of CO₂ and 0.306 grams of H₂O. From this information determine the empirical formula of the alcohol 6Marks

(c) Iron can react with Chlorine gas to give two different compounds, FeCl₂ and FeCl₃. Under given conditions, 0.558 grams of metallic Fe react with Chlorine gas to yield 1.621 grams of Iron chloride. Which Iron compound is produced in the experiment? 4Marks

(d) Lysine is an amino acid which has the following elemental composition: C, H, O, N. In one experiment, 2.175 g of lysine was combusted to produce 3.94 g of CO₂ and 1.89 g H₂O. In a separate experiment, 1.873 g of lysine was burned to produce 0.436 g of NH₃. The molar mass of lysine is approximately 150 g/mol. Determine the empirical and molecular formula of lysine.

4Marks

e) Differentiate between empirical formula and molecular formula of a compound 2Marks

Question FOUR

- (a) Define the ideal gas equation $\frac{p v}{T} = nR$ 5Marks
- (b) Explain why real gases do not obey the ideal gas equation 3Marks
- (c) State and explain the application of the equilibrium constant 6Marks
- (d) Calculate the pressure for 5.0 dm³ of 2.0 moles CO₂ at 298 K, using
- (i) The ideal gas law 3Marks
- (ii) The Van der waals equation ($a = 3.592 \text{ L atm/mol}^2$, $b = 0.04267 \text{ l/mol}$) 3Marks

Question FIVE

- (a) Calculate the PH of 0.07 M H₂SO₄ 2Marks
- (b) Define the following terms 2Marks
- (i) Saturated solution
- (ii) Solubility
- (c) State three factors that affect the solubility of a substance 3Marks
- (d) The K_{sp} for magnesium chloride is 3.9×10^{-11}
- (i) Calculate the concentrations of magnesium chloride ions in a solution of MgCl₂ at 25 C
5Marks
- (ii) Determine the solubility of MgCl₂ in g/l. 2Marks
- (c) i). What is a buffer solution 2Marks
- ii). How is buffer solution prepared? 2Marks
- iii) State the application of a buffer solution 2Marks