CHUKA UNIVERSITY

UNIVERSITY EXAMINATIONS

FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN AGRICULTURAL EDUCATION AND EXTENSION

CHEM 102: GENERAL INORGANIC AND PHYSICAL CHEMISTRY

STREAMS: B.SC (AGED) LIBII (SB) **TIME: 2 HOURS**

DAY/DATE: FRIDAY 06/12/2019 **11.30 A.M. – 1.30 P.M.**

INSTRUCTIONS:

- **Do not write anything on the question paper.**
- **Answer question ONE and any other TWO questions.**

QUESTION ONE (30 MARKS)

(a) Briefly explain the meaning of the following terms. (7 marks)

(i) Nuclide
(ii) Relative atomic mass
(iii) Electronegativity
(iv) Coordinate bond
(v) Exothermic process
(vi) Enthalpy
(vii) Chromatography

(b) Given that atomic members of nitrogen, sulphur, titanium, iron and copper are 7, 16, 22, 26 and 29 respectively, write the electronic configuration of the following. (5 marks)

(i) N
(ii)
(iii) Ti
(iv)
(v) Cu

(c) Calculate the percentage by mass of nitrogen in the following fertilizers (N=14, H=1, 0=16, S=32, Ca=40) (6 marks)
(i) Ammonium nitrate
(ii) Ammonium sulphate
(iii) Calcium nitrate

(d) (i) A certain amount of gas occupies at At what temperature will the same gas occupy if pressure is kept constant? (3 marks)

(ii) State two assumptions of ideal gas. (2 marks)

(e) Calculate the pH of a solution whose

(i) Hydronium ion concentration is 0.0024 M. (2 marks)

(ii) Calculate the pH of a solution whose hydroxide ion concentration is 0.00056 M. (3 marks)

(f) State two reasons for separation in chemistry. (2 marks)

QUESTION TWO (20 MARKS)

(a) With reasons state three characteristics of gaseous state of matter. (6 marks)

(b) Enumerate four assumptions of kinetic molecular theory of gases. (4 marks)

(c) Write the van der Waals equations by real gases and explain each term. (4 marks)

(d) A cylinder at and 715 mmHg pressure contains 108 ml of butane. Calculate the mass of the gas (given that C=12.01, H=1.008, R=62.4 . (6 marks)

QUESTION THREE (20 MARKS)

(a) An electrochemical cell containing zinc and copper plates each dipped in a solution its salt was prepared under standard conditions.

(i) Draw a well labeled diagram of this cell and write the cell notation. (6 marks)

(ii) Write the half reaction equations specifying which of them is oxidation and reduction and then write the overall equation. (3 marks)

(iii) Given that standard half-cell reactions for the Daniel cell are

Calculate the emf of the cell. (2 marks)

(b) (i) Using electron dot structures, show how carbon react with oxygen (atomic number 6 and 8 respectively) and name the type of bond formed. (2 marks)

(ii) State three properties of ionic compounds. (3 marks)

(c) Briefly discuss trends of ionization energies of elements in the periodic table. (4 marks)

QUESTION FOUR (20 MARKS)

(a) Mevalonic acid involved in biosynthesis of cholesterol contains 48.64% carbon, 8.16% hydrogen and the rest is oxygen. If the acid has a molar mass of 148, determine its molecular formula (C=12, H=1, 0=16). (7 marks)

(b) (i) What percent by volume of ethanol is in a solution when 42.5 ml of ethanol is diluted to 200 ml of water. (2 marks)

(ii) A mass of 5 g silver nitrate was dissolved in sufficient water to make 50 ml solution. Determine the weight volume percent of silver nitrate in this solution. (2 marks)

(iii) You are given 2500 ppm stock solution of nitrogen and are required to make 200 ml 500 ppm. What volume of the stock solution do you require? (2 marks)

(c) Discuss the factors that affect position of equilibrium in a reversible reaction. (7 marks)
