TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

DES 17S, DEHS 17S & DFQA 17S

ACH 2101: FUNDAMENTALS OF CHEMISTRY

END OF SEMESTER EXAMINATION

SERIES: SEPTEMBER 2018

TIME: 2HOURS

DATE: Pick DateSep2018

Instructions to Candidates

You should have the following for this examination

Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attemptquestion ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE

(a) Define the following terms

(i) Empirical formula **(1 mark)**

(ii) Molecular formular **(1 mark)**

(iii) Molar volume **(1 mark)**

(iv) Oxidising agent **(1 mark)**

(v) Reducing agent **(1 mark)**

(b) Using a well labeled diagram outline the structure of an atom **(5 marks)**

(c) Write the chemical formula of the following compounds

(i) Potassium dichromate **(1 mark)**

(ii) Silver chromate **(1 mark)**

(iii) Magnessium bicarbonate **(1 mark)**

(iv) Potassium permanganate **(1 mark)**

(d) Discuss the principles and rule governing the distribution of electrons in an orbital **(5 marks)**

(e) Explain the relationship between the atomic size and the ionisation energy **4 marks)**

(f) State any four precautions that should be taken against corrosive liquids **(4 Marks)**

(g) The ionization value IE_1 of magnesium is 737 $kJmol^{-1}$ higher than that of its counterpart Sodium 496 kJ mol^{-1} explain **(3 marks)**

Question TWO

(a) Define the term oxidation number **(2 marks)**
(b) Determine the oxidation number of the following
(i) Chlorine in ClO_3^- **(2 marks)**
(ii) Vanadium in VO_4^{3-} **(2 marks)**
(iii) Chromium in $K_2Cr_2O_7$ **(2 marks)**
(iv) Mn in $KMnO_4$ **(2 marks)**
(v) Sulphur in H_2SO_3 **(2 marks)**
(c) Differentiate between chemical changes and physical changes **(3 marks)**

Question THREE

(a) 1.32g of magnesium were dissolved in dilute hydrochloric acid and the solution was the heated in a stream of hydrogen chloride. 5.26g of anhydrous magnesium chloride remained. Find the simplest formula for magnesium chloride. (Mg=24, Cl=35.5) **(5 mark)**
(b) Define isotope and give three ways in which they are used in the medical field **(6 mark)**
(c) Using spd notation write the electronic configuration of the elements having the following atomic numbers
(i) 9 **(1 mark)**
(ii) 17 **(1 mark)**
(iii) 19 **(1 mark)**
(iv) 4 **(1 mark)**

Question FOUR

(a) 4.90g of pure sulphuric acid was dissolved in water the resulting total volume was $250cm^3$ $20.7cm^3$ of thus solution was found on titration, to completely neutralize $10.0cm^3$ of sodium hydroxide solution. (S = 32, O = 16, H = 1)
(i) Write the equation for the titration reaction. **(2 marks)**
(ii) Calculate the molarity of the sulphuric acid solution. **(2 marks)**
(iii) Calculate the moles of sodium hydroxide neutralized. **(2 marks)**
(iv) Calculate the molarity of sodium hydroxide. **(2 marks)**

(b) a buffer solution containing 0.10 mol dm^{-3} of ethanoic acid and 0.20 mol dm^{-3} of sodium ethanoate calculate its pH given K_a for ethanoic acid is 1.74×10^{-5} mol dm^{-3} **(7 marks)**

Question FIVE

(a) Nitrogen gas combine with hydrogen gas to form ammonia. Explain how changes in temperature, pressure and concentration affect equilibrium constant **(9 marks)**

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) \quad \Delta H\ -1024KJmol^{-1}$$

(b) Determine the pH of 0.15 M ammonia (NH_3) with a $Kb=1.8x10^{-5}$ **(6 marks)**