TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF MEDICAL SCIENCES

UNIVERSITY EXAMINATION FOR:

BMLS

ACH 4101: FUNDAMENTALS OF INORGANIC CHEMISTRY PAPER II

END OF SEMESTER EXAMINATION

SERIES:APRIL2016

TIME:2HOURS

DATE:3May2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of Choose No questions. AttemptChoose instruction.

Do not write on the question paper.

Question ONE

(a) Differentiate between;

i. Molarity and concentration **[2mks]**

ii. Stoichiometric point and neutralization point **[2mks]**

(b) Calculate the pH of a buffer solution prepared by reacting 10 cm^3 of 0.05M sodium hydroxide with 10 cm^3 of 0.1M acetic acid [CH_3COOH] **[4mks]**

(c) State two reasons that lead to the formulation of Schrödinger wave equation **[2mks]**

(d) The mass number of manganese atom is 55 and has total 30 protons.

i. Write down the electronic configuration of Mn atom **[2mks]**

ii. Determine the four quantum numbers for an electron in the 3d orbital in Mn atom. **[5mks]**

(e) State the mathematical expression of Heisen berg's uncertainty principles and explain all terms used. **[3mks]**

(f) According to Bohr's theory of hydrogen atom, the velocity of an electron in the first orbital is 2.18×10^6 m s^{-1}. If the uncertainty in position of the electron is 5 pm, determine the uncertainty in velocity **[4mks]**

(g) By the use of examples differentiate between qualitative and quantitative techniques in chemical analysis **[4mks]**

(h) Explain how you can confirm the presence of Na^+ ions in urine **[2mks]**

Question TWO

(a) Explain the meaning of the following terms;

i. Resonance **[2mk]**

ii. Hybridization **[2mk]**

(b) Draw and calculate the formal charge for the stable Lewis structure of SO_4^{2-} ion **[6mks]**

(c) Using valence bond theory, predict the type of hybridization present in SBr_6 and PBr_5, hence predict the possible shapes of the structures. **[10mks]**

Question THREE

(a) What is meant by the terms; solubility product? **[2mks]**

(b) The solubility of lead chromate ($PbCrO_4$) is 4.5×10^{-5} g/L. Calculate the solubility and solubility product of this salt in 0.001 of $Pb(NO_3)_2$ **[6mks]**

(c) Calculate the pH of 2 g NaOH present in 250 cm^3 of solution **[4mks]**

(d) The sulphur content of a steel sample is determined by converting it to H_2S gas, absorbing the H_2S in 10.0 mL of 0.050 M I_2, and then back – titrating the excess I_2 with 0.0020 M $Na_2S_2O_3$. If 2.6 mL $Na_2S_2O_3$ is required for titration. Calculate the mass of S present in the sample in milligrams **[8mks]**

$$H_2S + I_2 \rightarrow S + 2I^- + 2H^+$$

Question FOUR

(a) Iron (II) sulphate is oxidized in presence of 2M H_2SO_4 to iron (III) sulphate by potassium permanganate. Write down;

i. Half equations for the redox reaction. **[2mks]**

ii. The overall equation **[2mks]**

(b) State two failures of Bohr's atomic model **[2mks]**

(c) State the Hund's rule **[2mks]**

(d) Write down the abbreviated electronic configuration for the following chemical species;

i. Mn

ii. Cu

iii. Cr

iv. K

v. Mg

vi. Cl **[5mks]**

(e) Classify the above elements in question 5 (d) above into their respective blocks in the periodic table **[3mks]**

Explain how radiochemistry has been applied in medicine **[4mks]**

Question FIVE

(a) What is meant by the term quantum? **[1mk]**

(b) State a mathematical expression obtaining energy of a quantum, hence define all the terms used **[3mks]**

(c) Determine the wave length of a photon in nanometers emitted during a transition from $n_i = 5$ to $n_f = 2$ state in hydrogen atom. **[6mks]**

(d) By the use of examples differentiate between;

(i) Dipole-dipole force and Hydrogen bonding **[5mks]**

(ii) Van deer Waal forces and London dispersion forces **[5mks]**