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 I

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: 3 May 2016

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. Attempt Choose instruction.

Do not write on the question paper.

Question ONE

(a) Define the following terms:
   i. pH **[1mk]**
   ii. Buffer solution **[1mk]**

(b) Calculate the pH of a buffer solution that will be formed when 4 g of sodium hydroxide pellets is added to a liter of 0.2M methanoic acid [HCOOH] and 0.1 M methanoate [$HCOO^-$] **[5mks]**

(c) By the use of examples, differentiate between an orbital and a shell **[3mks]**

(d) Determine the total number of orbitals associated with the principal quantum number n = 4 **[4mks]**

(e) Determine the four quantum numbers for an electron in 4d orbital **[4mks]**

(f) A marble weighs 150 g. if the uncertainty in its position is 5 pm, calculate the uncertainity in velocity of the marble **[5mks]**

(g) Hemoglobin, [C_{2952} H_{4664} N_{812} O_{832} S_8Fe_4], is oxygen carrier in blood in blood.
   i. Calculate the molar mass of hemoglobin. **[3mks]**
   ii. An average adult has about 6.0 L of blood. Every milliliter of blood has approximately 5.5×10^9 erythrocytes or red blood cells, and every blood cell have about 3.8×10^8 hemoglobin molecules. Calculate the mass of hemoglobin molecules in grams in an average adult. **[6mks]**
   iii. If the oxidation number of iron in hemoglobin is positive two, write down the electronic configuration of iron in the hemoglobin **[2mk]**

iv. Using your answer in (g) (iii) above suggest block into which iron belong in the periodic table **[1mk]**

Question TWO

(a) Define the following terms:
- **i.** Steric number **[2mks]**
- **ii.** Hybridization **[2mks]**

(b) Draw the stable Lewis structure for CH_4 and O_3 **[4mks]**

(c) Using valence bond theory, determine the type of hybridization in PCl_5, hence predict its possible shape **[6mks]**

(d) State three properties of ionic and covalent compounds **[6mks]**

Question THREE

(a) By the use of examples, state the difference between; a Lewis acid and Bronsted acid **[4mks]**

(b) Briefly explain how you can prepare a standard solution of sulphuric acid whose concentration is 0.1M, from a stock solution whose density is 1.813 g cm^{-3} and its percentage purity is 94%. **[5mks]**

(c) State the difference between gravimetric and volumetric method of chemical analysis [2mks]

(d) An organic pesticide with molar mass of 183.7 g mol^{-1} which was found to be an excellent killer of mosquito larvae with no effect on the environment was found to contain 8.43 % chlorine. A 0.627 g sample containing no chloride was decomposed with sodium alcohol. The liberated chloride ion was precipitated as AgCl and it weighed 0.0831 g. Calculate the % of the pesticide in the sample **[9mks]**

Question FOUR

(a) Differentiate between molar solubility and solubility product of salt. **[2mks]**

(b) Calculate the solubility of AgBr in pure water and in 0.05M of $AgNO_3$ **[8mks]**

(c) The ksp for $Cu(OH)_2$ is given as 2.2×10^{-20}.
- i. Derive the mathematical expression for the ksp of $Cu(OH)_2$ **[2mks]**
- ii. Find the $[OH^-]$ ions **[3mks]**
- iii. Find the solubility of $Cu(OH)_2$ in g/L **[3mks]**

(d) State two factors that affect solubility of a salt **[2mks]**

Question FIVE

(a) State contribution of radiochemistry to modern society **[4mks]**

(b) Differentiate between qualitative and quantitative techniques in chemical analysis **[4mks]**

(c) A water sample drawn from a village bore hole was suspected to have the following ions; Ba^{2+}, OH^-, NH_4^+, Zn^{2+} and Al^{3+}. Using ionic equations explain how you could confirm the presence of the state ion in the water sample **[10mks]**

(d) Explain how you can prepare a molar solution of sodium hydroxide **[2mks]**