



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 uncertainty in velocity of the marble [5mks]
- (g) Hemoglobin, [C₂₉₅₂ H₄₆₆₄ N₈₁₂ O₈₃₂ S₈Fe₄], 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 K_{sp} for Cu(OH)_2 is given as 2.2×10^{-20} .
- i. Derive the mathematical expression for the K_{sp} of Cu(OH)_2 [2mks]
 - ii. Find the $[\text{OH}^-]$ 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]

