THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

Faculty of Engineering and Technology

DEPARTMENT OF MECHANICAL AND AUTOMOTIVE ENGINEERING

DIPLOMA IN CHEMICAL ENGINEERING
PRODUCTION ENGINEERING
PLANT ENGINEERING
AUTOMATIVE ENGINEERING

ECH 2101 : CHEMISTRY I

SUPPLEMENTARY/SPECIAL EXAMINATIONS

SERIES: MAY 2011

TIME: 2 HOURS

Instructions to Candidates:

1. The candidate should have the following:
   - Scientific calculator
   - Answer booklet
   - Drawing instruments

2. This paper consists of **FIVE** Questions in **TWO** Sections **A & B.**
3. **Answer** Question **ONE (COMPULSORY)** and any other **TWO** Questions in **Section B.**

SECTION A

Question ONE

(a) Using a diagram show how Goldstein established the charge on a proton. (5 Marks)

(b) List the results of Crookes investigation on electrons. (6 Marks)

(c) Natural Silicon – containing ores contains 92% Silicon – 28, 5% Silicon – 29 and 3%.

(i) What is the atomic number of Silicon? (1 Marks)
(ii) What are the relative isotopic masses of the 3 Silicon isotopes? (3 Marks)
(iii) What is the relative atomic mass of Silicon? (6 Marks)

(d) What do you understand by the terms "oxidation" and "reduction"? In each of the following reactions say what has been reduced and what has been oxidized.

(a) $2FeCl_2 + Cl_2$ $2FeCl_3$

(b) $AgNO_3 + NaCl$ $AgCl + NaNO_3$

(7 Marks)

(e) How many moles of Cl_2 are there in 7.1g of chlorine? (2 Marks)

SECTION B

Question TWO

(a) Define the following terms:

(i) Molality
(ii) Molarity
(iii) R.A.M

(3 Marks)

(b) 5.34g of a salt of formula M_2SO_4 (where M is a metal) were dissolved in water. The Sulphate was precipitated by adding on excess barium Chloride solution when 4.66g of barium Sulphate were obtained:

(i) How many moles of Sulphate were precipitated as Barium Sulphate? (2 Marks)
(ii) How many moles of M_2SO_4 were in solution? (2 Marks)
(iii) What is the formula mass of M_2SO_4 (3 Marks)
(iv) What is the R.A.M of M? (2 Marks)
(v) Identify M. (1 Marks)

(c) Calculate the number of H atoms present in 25.6g of urea $(NH_2)_2CO$.

(Atomic mass of H = 1, C = 12, O = 16, N = 14). (7 Marks)

Question THREE

(a) With the aid of a diagram explain how the following bonds are formed:
- (i) Electrovalent (ionic) bond.
- (ii) Co-ordative (dative) bonding.
- (iii) Van der Waal's
- (iv) Hydrogen bonds

(12 Marks)

(b) Use "dot/cross" diagram to show the bonding between the following:
- (i) Phosphorus and hydrogen
- (ii) Calcium and Oxygen
- (iii) BCl_3 and NH_3

(8 Marks)

Question FOUR

(a) A compound X containing only C, H, and O was subjected to combustion Analysis. 0.1g of the compound on complete combustion gave 0.228g, Co_2 and 0.0931g H_2O. Calculate the empirical formula of compound X. (RAM, C = 12, H = 1, 0 = 16). (10 Marks)

(b) $20cm^3$ of H_2SO_4 and solution is neutralised by $40cm^3$ of 0.3M NaOH. Calculate the molarity of H_2SO_4 acid solution. (5 Marks)

(c) An organic compound contains 47.43%C, 2.56%H and 50.01% Chlorine. If the molecular mass of Chlorine is 360 determine the formula mass of the compound. (5 Marks)

Question FIVE

(a) Balance the following equation using their oxidation numbers.

(i)

(ii)

(iii)

(11 Marks)

(b) State and explain the three rates used to determine the exact ground state electronic configuration of an element. (9 Marks)