MERU UNIVERSITY COLLEGE
OF SCIENCE & TECHNOLOGY
P.O. Box 972-60200 Meru - Kenya. Tel: 020-2092048, 020 2069349
Fax: 020-8027449

University Examinations 2011/2012

FIRST YEAR, FIRST SEMESTER EXAMINATION FOR DIPLOMA IN AGRICULTURAL EDUCATION AND EXTENSION/FIRST YEAR, SECOND SEMESTER EXAMINATION FOR CERTIFICATE IN AGRICULTURE

CHE 0100: CHEMISTRY

DATE: DECEMBER 2011 **TIME: 1½ HOURS**

INSTRUCTIONS: *Answer question **one** and any other **two** questions*

QUESTION ONE – (30 MARKS)

(a) You are given that the subsidiary (azimuthal) quantum number l for an electron is 2. Determine:
  (i) The principal quantum number n (2 Mark)
  (ii) The magnetic quantum number m (2 Marks)

(b) Write the electronic configuration for the elements whose atomic number are:
  (i) 15 (2 Marks)
  (ii) 7 (2 Marks)
  (iii)21 (2 Marks)

(c) Using dots and crosses, show the Lewis structures/symbols for
  (i) Carbon dioxide [C = 6, O = 8] (2 Marks)
  (ii) Fluorine molecule [F = 9] (2 Marks)

(d) Define the term, pH of a solution (2 Marks)

(e) Using the molecules C_2H_6 and C_2H_4 examples, explain the difference between an alkene and an alkane. (6 Marks)

(f) Define the following terms as applied to solutions;
  (i) Solute (2 Marks)
  (ii) Solvent (2 Marks)

(g) An element X may be represented symbolically as ${}^{A}_{Z}X$
  (i) What do the letters A and Z represent? (2 Marks)
  (ii) $If\ Z = 8, and\ A = 18$, how many neutrons does X have? (2 Marks)

QUESTION TWO – (15 MARKS)

(a) How do Bronsted and Lowry define:
  (i) An acid and, (2 Marks)
  (ii) A base? (2 Marks)

(b) Use an appropriate chemical equation to show how ammonia (NH_3) reacts with water. In your equation, indicate the conjugate acid/base pairs. (5 Marks)

(c) Given that $Kw = [H_3O^+][OH^-] = 1.0 \times 10^{-14}$, Calculate the pH of $2.5 \times 10^{-4} M\ NaOH$ (6 Marks)

QUESTION THREE – (15 MARKS)

(a) State the law of multiple proportions (2 Marks)

(b) Sulphur dioxide reacts with oxygen as shown $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$ and an equilibrium is established.
  (i) Write the expression for the equilibrium constant K_c for this reaction. (2 Marks)
  (ii) What will be the effect of removing oxygen from the system? (2 Marks)
  (iii) What will be the effect of removing sulphur trioxide from the reaction mixture on the position of the equilibrium and on the quantities of the gases mixture? (4 Marks)

(c) $17.8g\ of\ Na_2SO_4$ was dissolved in water to make a $500cm^3$ solution. Calculate the molarity of the resulting solution. $(Na = 23,\ O = 16,\ S = 32)$ (5 Marks)

QUESTION FOUR – (15 MARKS)

(a) Identify the quantum numbers which describe an electron's property. (4 Marks)

(b) Draw the orbital diagram for the element whose atomic number is 15. (2 Marks)

(c) Calculate the wavelength in nanometer of the **Third Line** in the Bracket series for the hydrogen atom $n_1 = 4, R_H = 10967\ 758m^{-1}$ (5 Marks)

(d) The element lithium whose atomic number is 3 belongs to group IA in the periodic chart of the elements. Lithium however, shows pronounced similarities in properties which resemble those of Magnesium in group IIA. In what ways does lithium show diagonal relationship with Magnesium? (4 Marks)

QUESTION FIVE – (15 MARKS)

(a) Write the structural formulae of the compounds named below

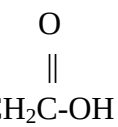
(i) Ethyne
(ii) Prop-2-ene
(iii)Methanamine (6 Marks)

(b) Give the systematic (IUPAC) names of the following compounds: (8 Marks)

(i) $CH_3CH_2CH_2F$

(ii) $CH_3CH = CHCH_3$

(iii)



(iv)

(c) Using an orbital diagram, show the Sp^3 hybridization in the carbon atom (C=6) (1 Mark)