



MERU UNIVERSITY COLLEGE OF SCIENCE & TECHNOLOGY

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University Examinations 2010/2011

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

CHE 0100: CHEMISTRY

DATE: APRIL 2011

TIME: 1½ HOURS

INSTRUCTIONS: Answer Question *one* which is Compulsory and any other *two* questions

QUESTION ONE – (30 MARKS)

- (a) Write the electron configuration of the elements whose atomic numbers are indicated below. Use the inert gas notation
- (i) 6
 - (ii) 15
 - (iii) 26 (3 Marks)
 - (iv) In which group does the element whose atomic number is 15 belong? Give your reasons. (3 Marks)
- (b) Calculate the mass in grams of 16.9×10^{23} atoms of Iron (Fe) given that $N_A = 6.02256 \times 10^{23}$ and $Fe = 56$. (4 Marks)
- (c) Give the SI units of (i) Mass (ii) Temperature (3 Marks)
- (d) Draw the shapes of
- (i) p-orbital (2 Marks)
 - (ii) d-orbital (2 Marks)
- (e) In which class (functional group) does each of the following compounds belong? (5 Marks)
- (i) $CH_3CH_2CH_2CH_3$
 - (ii) $CH_3CH=CHCH_3$
 - (iii) $CH_3C \equiv CCH_3$



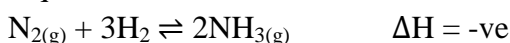
(f) Differentiate between:

(i) Extensive and intensive properties of matter (4 Marks)

(ii) Heat of solution and heat of dilution (4 Marks)

QUESTION TWO – (15 MARKS)

(a) In the Harber process for the manufacture of ammonia, the chemical system concerned requires 200atm. Pressure. The reaction is;



(i) Write the expression for the equilibrium constant K_c , for the reaction shown. (2 Marks)

(ii) How many tons of nitrogen will be required to produce 5 tons of ammonia? (N=14, H=1) (4 Marks)

(b) What is the effect of:

(i) Decrease in pressure and

(ii) Lowering the temperature of the reaction, to the position of the equilibrium?
Explain your answer in each case. (9 Marks)

QUESTION THREE – (15 MARKS)

(a) (i) Briefly discuss J.J Thomson's proposed model of the atom. (4 Marks)

(ii) The e/m ratio for an electron is 1.76×10^8 coulombs per gram, and the electronic charge is 1.6×10^{-19} coulombs. What is the mass of an electron in Kilograms? (4 Marks)

(b) (i) Briefly explain Moseley's experiment that led to the discovery of the Atomic Number of elements. (4 Marks)

(ii) Element Y has electronic configuration: $[\text{Ar}]4s^23d^5$. How many neutrons does it have if the mass number of Y is 56? (NB Ar = 18) (3 Marks)

QUESTION FOUR – (15 MARKS)

(a) What do the following quantum numbers in an atom determine?

(i) The principle quantum number, n

(ii) The subsidiary quantum number, l

(iii) The magnetic quantum number, m (6 Marks)

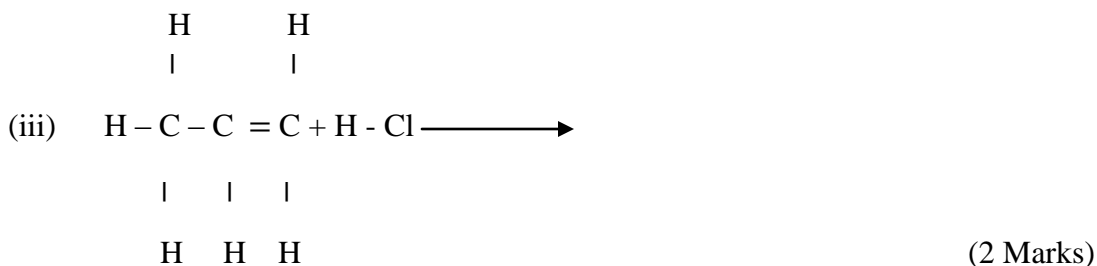
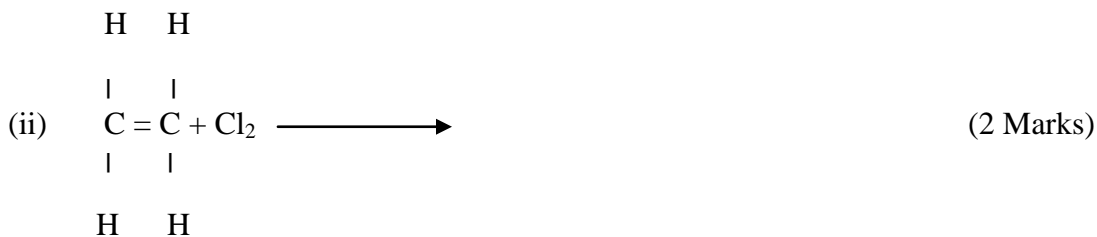
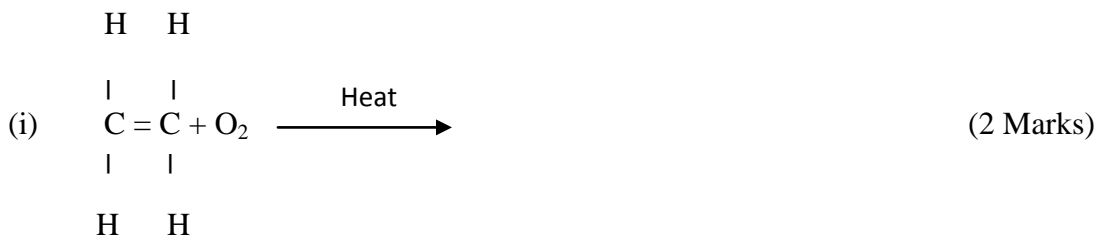
(b) Explain briefly why;

(i) The atomic radii of atoms increase from one atom to the other down any group in the periodic table of elements. (3 Marks)

- (ii) Ionization energies for the group IA elements are lower than for all other elements in any one period. (3 marks)
- (iii) Group VII A elements easily form the anions of the form X^- (3 Marks)

QUESTION FIVE – (15 MARKS)

- (a) Draw all the structures and give the IUPAC names of all the isomers of the hydrocarbon, pentane whose molecular formula is C_5H_{12} (6 Marks)
- (b) Complete the following equations:



- (c) (i) What two factors help carbon form uniquely stable covalent compounds? (2 Marks)
- (ii) How do the melting and boiling points of n-alkanes change with the number of carbon atoms present? (1 Mark)