CHE 110: BASIC CHMISTRY 1   2015/2016 ACADEMIC YEAR

TIME 3 HOURS

INSTRUCTIONS; Answer Question ONE and any other TWO.

QUESTION ONE (30MKS)

a) State three assumptions on which Daltons atomic theory is based.   (3mks)

b) Uranium has atomic number 92 and atomic weight 238.029. Give the number of electrons, protons and neutrons in its atom.   (3mks)

c) State the Hund's rule for maximum multiplicity.   (2mks)

d) Write the full and condensed electronic configuration of potassium (Z = 19) **(4mks).**

e) Explain five characteristics of chemical equilibrium   (5mks).

f) 100 cm^3 of concentrated hydrochloric acid were diluted to 1 dm^3 with distilled water. 26.8 cm^3 of this diluted acid were needed to neutralize 25 cm^3 of 0.5M Sodium carbonate solution, with methyl orange as indicator. What is the concentration in g/dm^3 of the original acid?   **(5mks)**

g) A volume of air occupying 12.0 dm^3 at 98.9 Pa is compressed to a pressure of 119.0 Pa. The temperature remains constant. What is the new volume?   (3mks).

h) Explain ways in which stress can be caused on a chemical equilibrium.   (5mks)

QUESTION TWO (20MKS)

a) Explain conditions affecting the formation of an ionic bond   (8mks)

b) Differentiate between intermolecular and intramolecular hydrogen bond   (4mks)

c) 60 cm^3 of oxygen were added to 10 cm^3 of a gaseous hydrocarbon. After explosion and cooling, the gases occupied 50 cm^3 and after absorption by KOH solution 30 cm^3 of oxygen remained. Calculate the molecular formula of the hydrocarbon (temperature and pressure constant at room values).   (5mks)

d) Differentiate between molarity and molality of a solution   (3mks)

QUESTION THREE (20MKS)

a) The pressure of a gas in a flask is measured to be 797.7 mmHg using a mercury-filled manometer. What is this pressure in Pascal's and atmospheres? (3mks).

b) Explain the kinetic theory of liquids (5mks)

c) Discuss factors influencing rate of chemical reactions (10mks)

d) State Le Chatelier's principle (2mks)

QUESTION FOUR (2OMKS)

(a) What is the equilibrium expression for the reaction (3mks)

$$CH_{4\ (g)} + H_2O_{\ (g)} \rightleftharpoons CO_{\ (g)} + 3H_{2\ (g)}$$

(b) Many gaseous reactions occur in car engines and exhaust systems. One of these is

$$NO_2 + CO \longrightarrow NO + CO_2 \qquad Rate = K\left[NO_2\right]^m \left[CO\right]^n$$
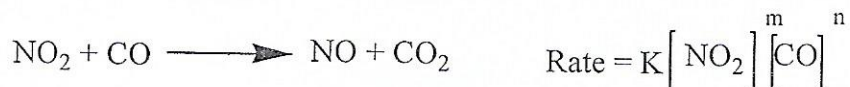
Use the following data to determine the individual and overall reactions orders. (7mks)

Experiment	Initial rate	Initial concentration of NO_2 (mol/L)	Initial concentration of CO (mol/L)
1	0.005	0.10	0.10
2	0.080	0.40	0.10
3	0.005	0.10	0.20

(c) Distinguish between real gases and ideal gases (5mks)

(d) Calculate the Normality of solution containing 3.15 g of hydrated oxalic acid ($H_2C_2O_4.2H_2O$) in 250 ml of solution (Molar mass = 126) (5mks)