MAIN REGULAR

COURSE CODE: SCH 201

COURSE TITLE: PHYSICAL CHEMISTRY 1

EXAM VENUE: PHY LAB   **STREAM: (BED SCI)**

DATE: 06/09/16   **EXAM SESSION: 2.00 – 4.00 PM**

TIME: 2:00HRS

_____

Instructions:

1. **Answer question 1 (Compulsory) in Section A and ANY other 2 questions in Section B.**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room**

Answer question ONE and TWO other questions in Section B

SECTION A
QUESTION ONE (Compulsory)   (30 marks)

1. (a) State the following

    (i)   Charles law
    (ii)   Avogadros law
    (iii)   Exothermic process
    (iv)   Isolated system
    (v)   Intensive property
    (vi)   Ideal gas
    (vii)   State functions   [7 marks]

    (b) Two moles of carbon dioxide was found to occupy 1.32 litres at 50 °C and a pressure of 18.40 atms. Calculate the pressure that would have been expected;

    (i) From the equation of state   [3 marks]

    (ii) From the Van der waals equation (a=6.70 L^2 atm.mol^{-2}, b= 5.6 x 10^{-2} L.mol^{-1}, R=0.082 L atm $K^{-1}mol^{-1}$). Comment on the results in question (ii) above.   [6 marks]

    (c) With the help of suitable diagram, differentiate between a system and a surrounding.

                                                                            [4 marks]

    (d)   Differentiate between reversible and irreversible processes.   [2 marks]

    (e) The kinetic energy of a gas increases with increase in temperature. Explain.

                                                                            [2 marks]

    (f) Assuming ideal gas behaviour, determine the pressure of carbon dioxide gas (1.00 mole) at 100 °C occupying 536 mL in atmospheric pressure.   [3 marks]

    (g) A quantity of gas at 10 °C and 1 atm pressure occupied a volume of 200 cm3. What volume will it occupy at -20 °C at constant pressure.   [3 marks]

SECTION B

QUESTION TWO (20 marks)

2. (a) State the first law of thermodynamics   [2 marks]

    (b) For the reaction:

$H_2F_2 \text{ (g)} \rightarrow H_2 \text{ (g)} + F_2 \text{ (g)}$ ΔE = -14.2 Kcal/mole at 25 °C.

Calculate ΔH for the reaction.   [6 marks]

(c) Explain three types of thermodynamic systems   [6 marks]

(d) Calculate the root mean square speeds of Argon atom in m/s at 25 °C. (R = 8.314 J.K^{-1}mol^{-1}, mass of Ar= 39.948 g/mol, 1 J = 1 kgm^{2}s^{-2}).   [6 marks]

QUESTION THREE (20 marks)

3. (a) State the 5 postulates of the Kinetic theory of gases   [10 marks]

(b) From the mathematical statement of the first law of thermodynamics, state any four special forms of first law of thermodynamics.   [4 marks]

(c) A weather balloon has a volume of 1.75 L when filled with hydrogen at a pressure of 1 atm. Calculate the volume of the balloon when it rises to a height of 2000 m, where the atmospheric pressure is 0.80 atm. Assume the temperature is constant.   [3 marks]

(d) Find the volume of 85 g of O_2 at 25 °C and 104.5 kPa in an ideal situation. (1.01325 x 10^5 Pa = 1 atm, Molar mass O_2 = 32 g.mol^{-1})   [3 marks]

QUESTION FOUR (20 marks)

4. (a) Given some values of pressure and volume for 2 g of hydrogen at 0 °C. Show that the data verify Boyles law.   [3 marks]

Pressure (atm)	2.00	1.00	0.90	0.75	0.50
Volume (dm^3)	11.3	22.4	24.7	29.9	44.4

(b) Find ΔE, q and w if 2 moles of hydrogen at 3 atm pressure expand isothermally at 50 °C and reversibly to a presure of 1 atm.   [4 marks]

(c) (i) Write down the Van der Waals equation of a real gas.   [2 marks]

(ii) Explain clearly the meaning of the corrective terms for; Pressure and volume.

[4 marks]

(d) Calculate the density of ammonia in grams per litre at 700 mmHg and 30 °C.

[5 marks]

(e) Differentiate between a homogenous and heteregenous system.   [2 marks]