JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF EDUCATION (SCIENCE)

2ND YEAR 1ST SEMESTER 2013/2014 ACADEMIC YEAR

MAIN

COURSE CODE: SCH 201

COURSE TITLE: PHYSICAL CHEMISTRY I

EXAM VENUE: LAB 1 **STREAM: (BEd science)**

DATE: 24/04/14 **EXAM SESSION: 11.30 – 1.30 PM**

TIME: 2.00 HOURS

Instructions:

1. **Answer ALL Questions in Section A and ANY other 2 questions**
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.**

SECTION A

Q 1(a) State and explain the six assumptions postulates of the kinetic theory of gases (8 marks)

(b) Show that the volume of a given amount of gas held at constant pressure is directly proportional to the Kelvin temperature. (3 marks)

(c) A balloon was filled with about 1300 mole of H_2. If the outside temperature was 21 ^oC and the atmospheric pressure was 750 mm Hg. what was the volume of the balloon? (4 marks)

(d) Derive the Maxwell-Boltzmann distribution law (10 marks)

(e) If the amount of gas in a container is increased, the volume increases. If the amount of gas in a container is decreased, the volume decreases. Show that the above statement is true . (5 marks)

QUESTION TWO

(a). The ideal gas equation (PV=nRT) provides a valuable model of the relations between volume, pressure, temperature and number of particles in a gas. Describe how this idea can fit into the ideal gas equation (PV=nRT) (7 marks)

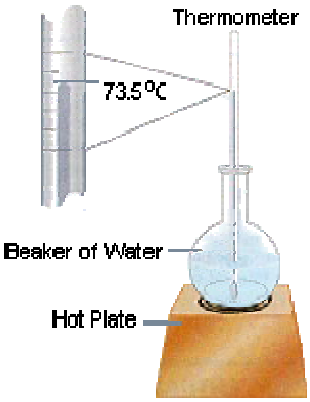
(b) Account for the pressure term is augmented by an attractive force term a/V. (5 marks)

(c) Using the first law of thermodynamics, show how energy can be conserved from one system to the surroundings. (8 marks)

QUESTION THREE

(a) What is Enthalp***y***? Outline the relationship between enthalpy and internal energy of a system. . (8 marks)

b). Assume, for the moment, that a thermometer immersed in a beaker of water on a hot plate reads 73.5^oC, as shown in the figure below



(i) How can this measurement be only described as the state of the system at that moment in time? (4 marks)

(c) The concept of heat capacity in the thermodynamic quantity that is defined as the rate of change of the energy of the given system as a function of temperature. Discuss this quantity and outline its importance in thermodynamics. (7 marks)

QUESTION FOUR

(a) Define a spontaneous Process? By using the entropy of a system explain with examples how the process of spontaneous reaction can be achieved. (8 marks)

(b) What are the common Characteristics to all spontaneous process? (5 marks)

(c) Define the following terms as used in chemical Thermodynamics

(i) Free Energy (2 marks)

(ii) Entropy (3 marks)

(iii) Internal energy (2 marks)

QUESTION FIVE

(a) $CH_4\,(g) + 2O_2\,(g) \rightarrow CO_2\,(g) + 2H_2O\,(g) + \text{Energy}$

The reaction above shows how methane burned in excess oxygen. Explain how the total energy is converted from one form to another and how it is conserved. (9 marks)

(b) State the effects of temperature on spontaneity (4 marks)

(c) (i) One of the basic assumptions of thermodynamics is the idea that we can arbitrarily divide the universe into a system and its surroundings . Describe this concept giving out examples. (2 marks)

ii) Discuss how the system relates to work**.** **(**3 marks)

iii) Name two kinds of work which are normally associated with a chemical reaction . (2 marks)