JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCE

DEPARTMENT OF PHYSICAL SCIENCE

UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF EDUCATION SCIENCE

2RD YEAR 2nd SEMESTER 2024/2025ACADEMIC YEAR

REGULAR

COURSE CODE: SPB 9212

COURSE TITLE BASIC KINECTICS AND THERMODYNAMICS

EXAM VENUE: **STREAM: (Bed. SCI.)**

DATE: **EXAM SESSION:**

TIME: 2.00 HOURS

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.**

SECTION A

Attempt all questions

QUESTION 1

(a) **(i)** Why is the study of chemical kinetics an important subject in the application of chemistry? 3 Marks

(ii) Define the term rate of a chemical reaction 2 Marks

(iii) What are the importance olf k and n in a chemical reactions 3 Marks

(iv) Name the two major factors that must be considered in applying the k ? 2 Marks

(v) Why the study the rate laws 2 Marks.

(b) (i) Show that the volume of a given amount of gas held at constant pressure is directly proportional to the Kelvin temperature. 2 Marks

(ii) State the four quantities needed to define the state of gas 4 Marks

(iii) A sample of gaseous CO_2 has a pressure of 75 mm Hg in a 125-ML flask. If this sample is transferred to a 250-ML flask, what is the expected pressure of the gas? [3 marks]

(vi) 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. Outline the importance of this statement in the study of gases. [4 marks]

(c)Describe the relationship between enthalpy and internal energy of a system [5 marks]

SECTION

QUESTION 2

(i) Write notes on each of the following

(a) Pressure

(b) Boyles law

(c) Gay Lussac law

(d) Avogadros law [*4marks*]

(ii Differentiate between a real gas and an ideal gas? [3 marks]

(iii) Name the postulates of the Kinetic Molecular Theory of gases. [*5 marks*]

(iv) Describe the relationship between the following units of measurement

Torr,Atm,Pa and mmHg give examples to support your answer [8 marks]

QUESTION THREE

(a) Derive the Ideal gas law. [*8 marks*]

(b) What is a barometer? Show how a barometer can be constructed [*4 marks*]

(c) The partial pressure of oxygen was observed to be 256 torr in air with a total atmospheric pressure of 843 torr. Calculate the mole fraction of O_2 present. *[3 marks]*

(d) The ideal gas equation (PV=nRT) provides a valuable model of the relations between volume, pressure, temperature and number of particles in a gas. Outline the importance of this equation *[5 marks]*

QUESTION FOUR

(a). State the first law of thermodynamics, show how energy can be conserved from one system to the surroundings *[8 marks]*

(b) Account for the pressure term Van der Waals equation in the study of non-ideal gases *[5 marks]*

(c) What is a system? Discuss how the system relates to work *[5 marks]*

(d) What is a spontaneous? *[2 marks]*

QUESTION FIVE

{a} What are the two kinds of work which are associated with a chemical reaction **?** *[2 marks]*

7 Marks

(b) Derive Charles Law and show how it is usefull to solve the gas laws related problems *[4marks]*

(c) Discuss the common Characteristics to all spontaneous process? *[5 marks]*

(d) Define the following terms as used in Thermodynamics

(i) Free Energy *[2 marks]*

(ii) Entropy *[2 marks]*

(e) State the effects of temperature on spontaneity *[5 marks]*