



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF
EDUCATION (SCIENCE)
1ST YEAR 1ST SEMESTER
MAIN CAMPUS

COURSE CODE: SCH 101

COURSE TITLE: BASIC PHYSICAL CHEMISTRY

EXAM VENUE: STREAM: (BEd. Science)

DATE: EXAM SESSION:

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**

Useful data

$R = 0.0821 \text{ L atm. K}^{-1}\text{mol}^{-1}$

Molar mass of $\text{N}_2 = 28 \text{ g/mol}$

Molar mass of $\text{O}_2 = 32 \text{ g/mol}$

INSTRUCTIONS: Answer Question 1 and any other TWO questions

QUESTION ONE (30 marks)

- a) (a) Define the following terms;
- (i) Effusion
 - (ii) Grahams law of diffusion
 - (iii) Boyles law
 - (iv) Saturated solution
 - (v) Colligative property
 - (vi) Ideal gas [12 marks]
- (b) Identify the half equation that undergoes oxidation and reduction in the following; [4 marks]
- $$\text{MnO}_4^- + \text{I}^- \rightarrow \text{Mn}^{2+} + \text{I}_2$$
- (c) Balance the following chemical equations: [2 marks]
- $$\text{C}_2\text{H}_5\text{OH}_{(aq)} + \text{O}_2_{(s)} \rightarrow \text{CO}_2_{(aq)} + \text{H}_2\text{O}$$
- $$\text{Na} + \text{Cl}_2 \rightarrow \text{NaCl} \quad [2 \text{ marks}]$$
- (d) Discuss any **THREE** factors affecting the rate of dissolution of solids. [6 marks]
- (e) Differentiate between;
- i) Chemical and physical property of matter
 - ii) Unsaturated and saturated solution [4 marks]

QUESTION TWO (20 marks)

2. (a) Derive the expression of density using the ideal gas law. [6 marks]
- (c) 1.0 g of air consists of approximately 0.28 g of nitrogen and 0.72 g of oxygen. Calculate the partial pressures and the total pressure when this sample occupies a 4 L vessel at 20 °C. [7 marks]
- (d) 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]
- (e) One mole of an ideal gas occupies 12 litres at -5 °C. What is the pressure of the gas? [4 marks]

QUESTION THREE (20 marks)

3. (a) The oil produced from eucalyptus leaves has a density of 0.45 g/L at -4 °C at a pressure of 70 Torr. Calculate the molecular mass in g/L of the eucalyptus oil. [5 marks]
- (b) Briefly state the **FOUR** colligative properties. [4 marks]

(d) Hydrogen balloon has a volume of 15 L at a pressure of 1.5 atm. Calculate the volume of the balloon when it rises to a height of 2000 m above the sea level, where the atmospheric pressure is 0.8 atm at the same temperature. [3 marks]

(e) Differentiate between;

i) A voltaic and an electrolytic cell [4 marks]

ii) Cathode and anode [4 marks]

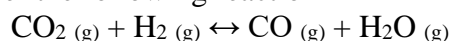
QUESTION FOUR (20 marks)

4. (a) Briefly define an ideal solution. [3 marks]

(b) Briefly show how the ideal gas law can be derived from basic gas laws. [5 marks]

(c) It requires 72 seconds for 1.5 L of an unknown gas to effuse through a porous wall and it takes 84 seconds for the same volume of N₂ gas to effuse at the same temperature and pressure. What is the molar mass of the unknown gas? [6 marks]

(d) Consider the following reaction



Calculate the equilibrium constant, K_c for the above system if 0.8 moles of CO₂, 0.98 moles of H₂, 0.92 moles of CO and 0.36 moles of H₂O were present in a 1.5 L reaction vessel at equilibrium. [6 marks]

QUESTION FIVE (20 marks)

5.

a) Discuss any **THREE** factors that affect the position of a chemical equilibrium. [6 marks]

b) Differentiate between combustion and combination reactions [4 marks]

c) Find the volume of 85 g of oxygen at 25 C and 500 Torr. [4 marks]

d) State the **THREE** main applications of the equation of state. [3 marks]

e) Using an example differentiate between a physical and chemical change. [3 marks]