

1800



KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR**

**FIRST YEAR FIRST SEMESTER
MAIN EXAMINATIONS**

FOR THE DEGREE OF B.ED (SCIENCE)

COURSE CODE: SCH 117

COURSE TITLE: FUNDAMENTALS OF CHEMISTRY

DATE: 22/12/2022

TIME: 9:00AM-11:00AM

INSTRUCTIONS TO CANDIDATES:

TIME: 2 HOURS

ANSWER QUESTION ONE AND ANY TWO OF THE REMAINING

KIBU OBSERVES ZERO TOLERANCE TO examination cheating

QUESTION ONE (30MARKS)

- (a) State the following (3 marks)
- Hund's rule
 - Aufbau's principle
 - Kinetic theory of matter
- (b) Briefly explain how cathode rays are formed (2 marks)
- (c) State the three types of electrical discharges found in cold cathode tubes (3 marks)
- (d) (i) Define the term isotope (1 mark)
- (ii) State any three uses of isotopes (3 marks)
- (iii) Below are the isotopes of Silver and their percent abundance. Calculate the average atomic mass of silver. Silver- 107 (32.50%), Silver- 108 (63.30%), Silver- 109 (2 marks)
- (f) What experiment proved a small dense positively charged nucleus? (2 marks)
- (g) State any two postulates of Rutherford's atomic model (2 marks)
- (h) State the following laws (3 marks)
- Gay Lussac's law
 - Avogadro's law
 - Boyles law
- (II) Write the electronic configuration of the following atoms using the orbitals (s,p,d,f) (4 marks)
- Boron (5)
 - Calcium (20)
 - Copper (29)
 - Platinum (78)
- (i) Determine the oxidation number of I in H_4IO_6 (2 marks)
- (j) State the three examples of intramolecular bonds (3 marks)

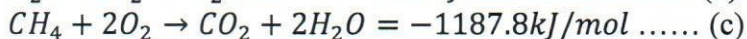
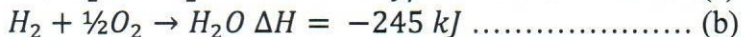
QUESTION TWO (20 MARKS)

- (a) (i) A careful examination of several thousand crystals of various substances reveals that there are only seven possible crystal symmetries exhibited by solids. State the seven systems and explains what they entail (7 marks)
- (ii) Solids are classified into two categories: Name the two categories (2 marks)
- (iii) Explain the characteristics of the two categories named in (ii) above giving examples (4 marks)
- (b) What is a redox reaction (1 mark)
- (c) From the following reaction deduce the two half-cell reactions (2 marks)
- $$\text{Co}_{(s)} + \text{Ni}^{2+}_{(aq)} \rightarrow \text{Co}^{2+}_{(aq)} + \text{Ni}_{(s)}$$
- (d) Explain the effect of the following on the position of the equilibrium
- Increase in pressure (2 marks)
 - Decrease in temperature (2 marks)

QUESTION THREE (20 MARKS)

- (a) State the three basic tenets/principles of valence bond (VB) theory (4 marks)
- (b) Distinguish between molality and molarity (2 marks)
- (c) A sulfuric acid solution containing 571.4 g of H_2SO_4 per liter of the solution has a density of 1.329 g/cm^3 . Calculate the molality of H_2SO_4 in this solution (3 marks)
- (d) (i) State Hess's law of constant heat summation (2marks)

(ii) Using the information given in equations *a*, *b*, and *c* below, calculate the enthalpy of the following reaction (3Marks)



(e) Explain how the following factors affect the rate of reaction

- i. Concentration (2marks)
- ii. Surface area (2marks)
- iii. Pressure (2marks)

QUESTION FOUR (20 MARKS)

(a) (i) Assume gases are ideal deduce the relationship between K_P and K_C (7marks)

(ii) The equilibrium constant (K_c) for the reaction $H_2 + I_2 \leftrightarrow 2HI$ is 60 at 450°C. Calculate the number of moles of HI in equilibrium with 2 moles of hydrogen and 0.3 moles of I at 450°C. (5marks)

(b) What are intermolecular forces? (2 mark)

(c) Briefly describe the following intermolecular forces of attraction (6marks)

- i. Dipole-dipole attraction
- ii. Hydrogen bonding
- iii. Ion-dipole attraction

QUESTION FIVE (20 MARKS)

(a) What is atomic model (2Marks)

(b) Briefly describe the Thomson's Atomic model (3 Marks)

(c) State the three draw backs of Thomson's model (3 Marks)

(d) State the four applications of the Thomson's atomic model (4 Marks)

(e) State the Mendeleev's periodic Law (1 Mark)

(f) What is the basic difference in approach between the Mendeleev's and the Modern Periodic Law? (2 Marks)

(g) Using alkali metals as an example explain the cause of periodicity in the modern periodic table (3 Marks)

(h) Name all the blocks contained in the modern periodic table (2 Marks)