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

QUESTION ONE (30MARKS)

(a) State the following **(3 marks)**

i. Hund's rule
ii. Aufbau's principle
iii. 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)**

i. Gay Lussac's law
ii. Avogadro's law
iii. Boyles law

(II) Write the electronic configuration of the following atoms using the orbitals (s,p,d,f) **(4 marks)**

i. Boron (5)
ii. Calcium (20)
iii. Copper (29)
iv. 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)**

$Co_{(s)} + Ni^{2+}_{(aq)} \rightarrow Co^{2+}_{(aq)} + Ni_{(s)}$

(d) Explain the effect of the following on the position of the equilibrium

i. Increase in pressure **(2 marks)**
ii. 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) Sate 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)**

$C + 2H_2 \rightarrow CH_4$??kJ/mol

$C + O_2 \rightarrow CO_2\ \Delta H = -394\ kJ/mol$ ..... (a)

$H_2 + ½O_2 \rightarrow H_2O\ \Delta H = -245\ kJ$ ..... (b)

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O = -1187.8kJ/mol$ ..... (c)

(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)**