KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER
Supplementary/special EXAMINATIONS

FOR THE DEGREE OF B.ED (SCIENCE)

COURSE CODE: SCH 117

COURSE TITLE: Fundamentals of CHEMISTRY

DATE: 19/7/2022   **TIME: 2:00PM-4:00PM**

INSTRUCTIONS TO CANDIDATES:

TIME: 2 Hours

Answer **QUESTION ONE** AND **ANY TWO** OF THE REMAINING

QUESTION ONE (30MARKS)   **(3 marks)**
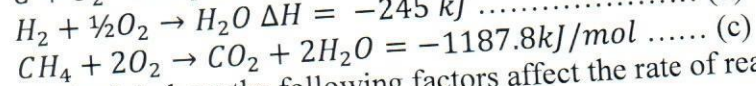(a) Define the following
   i.   Quantum numbers
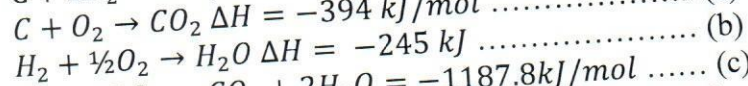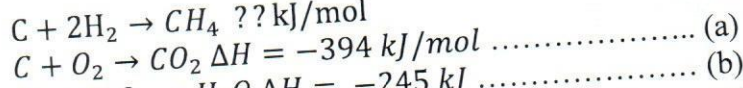   ii.   Electronic configuration
   iii.   Hydrogen bonding   **(2 marks)**
(b) Briefly explain how cathode rays are formed   **(3 marks)**
(c) State the three types of electrical discharges found in cold cathode tubes   **(1 mark)**
(d) i) Define the term isotope   **(3 marks)**
ii) State any three uses of isotopes
(e) Below are the isotopes of chlorine and their percent abundance. Calculate the RAM Chlorine
Chlorine- 35 (75%), Chlorine- 37 (25%)   **(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) (I) State the following principles and rule
   i.   Hund's rule
   ii.   Aufbau's principle
   iii.   Pauli's exclusion principle   **(3 marks)**
(II) Write the electronic configuration of the following atoms using the orbitals (s,p,d,f)
                                                                                (4 marks)

   i.   Boron (5)
   ii.   Chlorine (17)
   iii.   Copper (29)
   iv.   Calcium (20)   **(2 marks)**
(i) Distinguish between Intramolecular bond and intermolecular bond   **(3 marks)**
(j) State the three examples of intramolecular bonds

QUESTION TWO (20 MARKS)   **(5 marks)**
(a) Briefly describe the Bohr's Atomic model experiment   **(3 marks)**
(b) State the three limitations of Bohr's model
(c) State the four postulates of the Bohr's atomic model based on observations and conclusions
                                                                                (4 marks)
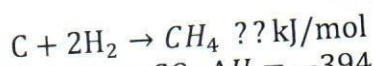   **(1 mark)**
(d) State the modern periodic Law
(e) What is the basic difference in approach between the Mendeleev's and the Modern Periodic
Law?   **(2 marks)**
(f) Using alkali metals as an example explain the cause of periodicity in the modern periodic
table   **(3 marks)**
(g) Name all the blocks contained in the modern periodic table   **(2 marks)**

QUESTION THREE (20 MARKS)   **(4 marks)**
(a) State the three basic tenets/principles of valence bond (VB) theory   **(2 marks)**
(b) Distinguish between molality and molarity
(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)

$H_2 + \frac{1}{2}O_2 \rightarrow H_2O \; \Delta H = -245 \; kJ$ .... (b)

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O = -1187.8 kJ/mol$ ...... (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)Solids are classified into two categories: Name the two categories   **(2 marks)**

(ii) Explain the characteristics of the two categories named in (i) above giving examples   **(4 marks)**
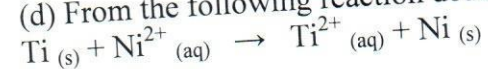
(b) (i) State the kinetic molecular theory   **(1 mark)**

(ii) (a) what is a redox reaction   **(1 mark)**

(c) (i) State Lechatelier's principle   **(2 marks)**

(ii) State and explain the four factors that affect the position of the equilibrium   **(8 marks)**

(d) From the following reaction deduce the two half-cell reactions   **(2 marks)**

$Ti_{(s)} + Ni^{2+}_{(aq)} \rightarrow Ti^{2+}_{(aq)} + Ni_{(s)}$

QUESTION FIVE (20 MARKS)

(a) (i) Assume gases are ideal deduce the relationship between K_P and K_C **(5 marks)**

(ii) The equilibrium constant (K_c) for the reaction $H_2 + Cl_2 \leftrightarrow 2HCl$ is 45 at 270 °C. Calculate the number of moles of HCl in equilibrium with 2 moles of hydrogen and 0.3 moles of Cl at 270 °C.   **(5 marks)**

(b) 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)**

(c) State the following laws   **(3 marks)**

   i.   Boyles law

   ii.   Avogadro's law

   iii.   Charles law