2010

Roll No. | | | | | | |

Answer Sheet No._____

Sig. of Candidate._____

Sig. of Invigilator._____

CHEMISTRY HSSC–I

SECTION – A (Marks 17)

Time allowed: 25 Minutes

NOTE:- Section–A is compulsory and comprises pages 1–2. All parts of this section are to be answered on the question paper itself. It should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q. 1 Circle the correct option i.e. A / B / C / D. Each part carries one mark.

(i) The number of atoms of phosphorous in one mole of Aluminium Phosphate $AlPO_4$ is:

A. 3×10^{23} B. 12×10^{23}

C. 6×10^{23} D. 18×10^{23}

(ii) NH_3 has three bond pairs and one lone pair of election. Its structure will be _____

A. Trigonal Pyramid B. Trigonal Planer

C. Tetrahedral D. Linear

(iii) Positive rays are produced by _____

A. Burning of gas

B. Cooling of gas

C. Ionization of gas

D. From anodes like cathode rays from cathode

(iv) In which of the following set all members are isoelectronic?

A. F^{1-}, Cl^{1-}, Br^{1-} B. O^{+}, O, O^{1-}

C. Ca^{2+}, Mg^{2+}, Al^{3+} D. H, He^{1+}, Be^{3+}

(v) The ideal solvent for the crystallization of a particular compound is one that _____

A. Dissolves a moderately large amount of the compound when hot

B. Does not react with the compound

C. Dissolves only a small amount of compound when cool

D. All of these

(vi) The solubility product values for the following salts are given below:

$PbCl_2 = 1\times10^{-15}$ $NaCl = 1\times10^{25}$

$KCl = 1\times10^{23}$ $ZnCl_2 = 1\times10^{20}$

On passing HCl gas it is observed that:

A. $NaCl$ will precipitate first

B. $ZnCl_2$ will precipitate first

C. $PbCl_2$ will precipitate first

D. KCl will precipitate first

(vii) Radioactive isotope concentrations typically decay by _____

A Zero order kinetics

B. Second order kinetics

C. First order kinetics

D. None of these

(viii) Which of the following is **NOT** a characteristic of an ideal solution?
A. Zero enthalpy of solution
B. No change in intermolecular forces on formation of the solution
C. Zero volume change on solution formation
D. None of these

(ix) Given the reaction:
$Pb_{(s)} + Cu^{2+}_{(aq)} \longrightarrow Pb^{2+}_{(aq)} + Cu_{(s)}$ What is the reducing agent?
A. $Pb^{2+}_{(aq)}$ B. $Cu^{2+}_{(aq)}$
C. $Pb_{(s)}$ D. $Cu_{(s)}$

(x) Crystals of ice are _____
A. Metallic B. Molecular
C. Covalent D. Ionic

(xi) Dissolving 1 mole of KCl in 1000 grams of H_2O affects _____
A. The boiling point of the H_2O only
B. The freezing point of the H_2O only
C. Both the boiling point and the freezing point of the H_2O
D. Neither the boiling point nor the freezing point of the H_2O

(xii) What type of process is represented by the equation given? $\frac{1}{2}Cl_{2(g)} \longrightarrow Cl_{(g)} \quad \Delta H = 121kj/mol$
A. Standard enthalpy of formation B. Ionisation enthalpy
C. Electron affinity D. Enthalpy of atomisation

(xiii) Consider the fictional reaction: $CD(g) + D(g) \rightleftharpoons C(g) + D_2(g)$ Which statement is true?
A. $K_p = K_c$ B. $K_c = K_p(RT)^2$
C. $K_c = K_p(RT)^{-2}$ D. $K_c = K_p(RT)$

(xiv) What is the pH of a buffer containing $2.0M$ HAc and $2.0M$ $NaAc$ if the Ka of the weak acid HAc is 1.0×10^{-4}?
A. 10^{-4} B. -0.3
C. -0.4 D. 4.0

(xv) Greater the value of standard reduction potential, greater will be tendency of _____
A. Oxidation B. Reduction
C. To accept electron D. Both B and C

(xvi) Solution of Na_2SO_4 will be _____
A. Basic B. Acidic
C. Neutral D. More acidic

(xvii) In Endothermic reaction, enthalpy of the _____
A. Product is more than that of reactants
B. Reactant is more than that of products
C. Both A and B
D. Reactants and products are equal

For Examiner's use only:

Total Marks:	17
Marks Obtained:	

2010

CHEMISTRY HSSC–I

Time allowed: 2:35 Hours **Total Marks Sections B and C: 68**

NOTE:- **Sections 'B' and 'C' comprise pages 1–2 and questions therein are to be answered on the separately provided answer book. Answer any fourteen parts from Section 'B' and attempt any two questions from Section 'C'. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.**

SECTION – B (Marks 42)

Q. 2 **Attempt any FOURTEEN parts. The answer to each part should not exceed 5 to 6 lines.**

(14 x 3 = 42)

(i) a. Name the Mobile phase and the Stationary phase in paper chromatography. 01
b. Explain within three lines the retardation factor in chromatography. 02

(ii) Define the following with the help of examples:
a. Gram molecular mass 01
b. Molar value 01
c. Percentage yield 01

(iii) What are Spontaneous and Non-spontaneous processes? Give examples. 03

(iv) The gas-phase reaction between hydrogen and chlorine is very slow at room temperature.
$H_2(g)+Cl_2(g)\longrightarrow 2HCl(g)$
a. Explain why a small increase in temperature can lead to a large increase in the rate of reaction between hydrogen and chlorine. 02
b. Suggest one reason why a solid catalyst for a gas-phase reaction is often in the form of a powder. 01

(v) When a $0.218\,mol$ sample of hydrogen iodide was heated in a flask of volume $V dm^3$, the following equilibrium was established at $700K$:
$2HI(g)\rightleftharpoons H_2(g)+I_2(g)$
The equilibrium mixture was found to contain $0.023mol$ of hydrogen.
Calculate the value of K_c at $700K$? 03

(vi) At $318K$, the value of K_w is $4.02\times10^{-14}\,mol^2dm^{-6}$ and hence the pH of pure water is 6.70 . State why pure water is not acidic at $318K$. 03

(vii) a. What is meant by hydrogen bonding? 01
b. The bond angle in a molecule of water is about 104.5^o. State the bond angle in an ammonia molecule and explain why it is different from that in water. 02

(viii) How does the molecular orbital theory explain the paramagnetic character of O_2? 03

(ix) a. Define Standard reduction potential. 01
b. Write down the cell reaction and calculate the value of E . 02
$H_{2\,Pt},\ H^+(1M)\,||\,Cu^{++}(1M),\ \ Cu \qquad E_{Cu,Cu^{++}}=-0.34V$

(x) Calculate the mole fraction of water in a mixture of $36\,g.\ H_2O$, $60gm.\ CH_3COOH$ and $92gm\ C_2H_5OH$. 03

(xi) Calculate the rate constant of the 1st order decomposition of HI in water at 40^oC .
The half life for the decomposition of HI is 2.16×10^4 sec . 03

(xii) a. Derive the mathematical relationship of de-Broglie. 01
b. What is the wave length associated with an α – particle of mass $6.64\times10^{-7}kg$ travelling at $3\times10^8\,m/s$. 02

(xiii) Name the strongest type of intermolecular force present in the following liquids:
a. Liq. Fluorine 01
b. Fluoromethane 01
c. Hydrogen fluoride 01

(xiv) A $0.150\,mol\,dm^{-3}$ solution of a weak acid, HX, also has a pH of 2.34.
Calcualte the value of K_a. 03

(xv) Prove that $\Delta E = qv$ and $\Delta H = qp$. 03

(xvi) Nitric oxide, an important pollutant in air, is formed from the elements nitrogen and oxygen at high temperature. 03

$$N_2 + O_2 \rightleftharpoons 2NO$$

At 2000^oC, K_c for the reaction is 0.01. Predict the direction in which the system will move to reach equilibrium at 2000^oC if 0.4 moles of N_2, 0.1 moles of O_2 and 0.08 moles of NO are placed in a $1.0-$ liter container.

(xvii) Balance the following equations by oxidation reduction method: 03
a. $HNO_3 + Zn \longrightarrow Zn(NO_3)_2 + N_2O + H_2O$
b. $HI + H_2SO_4 \longrightarrow H_2O + I_2 + SO_2$

(xviii) An organic compound has the following composition by mass:
$C = 49.31\%$, $H = 6.85\%$ and $O = 43.84\%$
Calculate its molecular formula. Molecular Mass $= 146$ 03

(xix) For the distribution of Iodine between two immiscible solvents $(H_2O \quad and \quad CCl_4)$ Iodine reacts with iodide ion to form tri-iodide ion in a reversible reaction.
a. Write the reaction for this process. 01
b. Name and state the law followed. 02

SECTION – C (Marks 26)

Note:- Attempt any TWO questions. All questions carry equal marks. (2 x 13 = 26)

Q. 3 **a.** (i) For the reversible reaction:
$$4HCl(g) + O_2(g) \rightleftharpoons 2H_2O(g) + 2Cl_2(g)$$
Write down the equilibrium constant expression and calculate unit of K_c for the above reaction. 03

(ii) What is solubility product? Derive the solubility product expression for a general, sparingly soluble substance A_mB_n 03

b. (i) What is meant by Buffer solution? Give two examples. 03

(ii) Calculate the pH of buffer solution containing $2.5\,mol\,dm^{-3}$ $HCOONa$ and $1.0\,mol\,dm^{-3}$ $HCOOH$ $(Ka = 1.6 \times 10^{-4}\,mol\,dm^{-3})$. 04

Q. 4 **a.** Predict the geometry of following molecules on the basis of VSEPR theory: 06
(i) BF_3 (ii) NF_3 (iii) SO_2

b. Explain the geometry of H_2O, $BeCl_2$ and C_2H_4 on the basis of hybridization schemes. 07

Q. 5 **a.** (i) What are two faulty assumptions in the kinetic theory of gases? 02

(ii) Derive Van der Waal equation for real gases. 05

b. One mole of CO_2 gas is maintained at $300K$. Its volume is $250cm^3$. Calculate pressure exerted by the gas under the following conditions: 06
(i) When gas is ideal.
(ii) When gas is non ideal. $\left(a = 3.590\,atm\,dm^6\,mol^{-1} \quad b = 0.0428\,dm^3\,mol^{-1}\right)$