CHEMISTRY 2014

Time: 20 Minutes Max. Marks: 17

SECTION A (MULTIPLE CHOICE QUESTIONS)

1. Choose the correct answer for each from the given options.

i. If absolute temperature is doubled and pressure increased to 4 times, the volume:
* is halved * is doubled
* becomes four times * remains unchanged

ii. Additions of KCL to AgCl solutions causes:
* Increase in the ionization of AgCl
* Decreases in the ionization of AgCl
* No effects on the ionization of AgCl
* Increases in the concentration of Ag^+ ion

iii. Metals placed above hydrogen in the Electrochemical series: * Are reducing agents * are oxidizing agents
* Serve as cathode in comparison cell
* have positive electrode potential

iv. During experiment, average of several replicate measurements is taken because:
* It has no negative error * it shows positive error
* it has no systematic error * It is more reliable

v. The basis of motor oil grading is:
* Viscosity * Surface Tension
* Vapour pressure * Boiling point

vi. Diamond is very hard because of:
* sp^2-hybridization * van der Waal's forces
* Close packing of carbon atoms and large number of covalent bonds
* Large amount of energy required to break the bonds

vii. The colour of the universal indicator in basic solution is:
* Yellow * Green * Orange * Deep blue

viii. In Pi-bond, electron density lies:
* only above the nodal plane
* only below the nodal plane * on the nodal plane
* both above and below the nodal plane

ix. When the product of ionic concentrations of sparingly soluble salt is equal to its solubility product (K_{sp}), the solution is said to be a:
* dilute solution * saturated solution
* super saturated solution * Very dilute solution

x. The presences of Hydrogen bonding in a liquid:
* Decrease the vapour pressure
* decreases the boiling point
* decreases the viscosity * causes no effects on the physical properties of the liquid

xi. The presence of Hydrogen bond is in between:
* 10-20 KJ/mole * 20-40 KJ/mole
* 40-50 KJ/mole * 50-60 KJ/mole

xii. The oxidation number of Mn in $KMno_4$ is:
* +3 * +5 * +7 * +4

xiii. When $\alpha \neq b \neq c, \alpha = y = 90^0$, the crystal structure is:
* Tetragonal * Monoclinic * Triclinic * Hexagonal

xiv. Any real or imaginary line or wall, which separates a system from its surroundings, is called the:
* System * Boundary * State * Surrounding

xv. The value of Plank's constant 'h' is:
* 4.803×10^{-10} e.s.u * 9.1×10^{-31} kg
* 6.625×10^{-34} J.S * 1.602×10^{-34} kg

xvi. The pH of Milk of Magnesia is:
* 10.5 * 10.0 * 10.8 * 11.0

xvii. The percentage dissociation of NH_4OH is:
* 1.2% * 1.4% * 1.9% * 2.1%

CHEMISTRY 2014

Time: 2 Hours 40 Minutes Marks: 68

SECTION 'B' (SHORT-ANSWER QUESTIONS)

NOTE: Answer any Ten part questions. (40)

2.(i) Define the following:
a. Limiting Reactant b. Stoichiomerty
c. Molar volume d. Latent heat of fusion

(ii) $ZnCl_2$ is prepared by the reaction $Zn + 2HCl \rightarrow ZnCl_2 + H_2$ 6.54 gram of Zn reacts with 73 grams of HCl. Find the limiting reactant and the mass of $ZnCl_2$ produced.

(iii) (a) The mass of a substance is 18.8865 grams and its volume is 7.9 cm^3. What will be its density considering significance figure and rounding of the above obtained?
(b) Calculate the morality of the solution prepared by dissolving 4.5 gm of NaOH in 500 cm^3 of water.

(iv) Give reasons for the following:
(a) Mg^{+2} ion is smaller than Mg atom. (b) Rate of reaction is increased by increased in temperature
(c) s-s sigma is weaker than s-p sigma bond.
(d) Some solid change directly to vapours on heating with out passing through the liquid phase.

(v) a. Write the electronic configuration of the following:
* Cr(z = 24) * M_o(z = 24)

b. Calculate the solubility product of $PbCrO_4$ when the solubility of $PbCrO_4$ is 1.0×10^{-3} grams /dm^3.

(vi) Calculate the volume of Nitrogen gas produced by heating 800grams of Ammonia at 21°C and 823 torr pressure:

$$2NH_3 \rightleftharpoons N_2 + 3H_2$$

(vii) Calculate the heat of formation from the following data:
* $4AX_3 + 5Y_2 \longrightarrow 4AY + 6X_2Y$ $\Delta Hf = ?$
* $\frac{1}{2}A_2 + \frac{3}{2}X_2 \longrightarrow AX_3$ $\Delta H = -11.0$ KJ /mole
* $X_2 + \frac{1}{2}Y_2 \longrightarrow X_2Y$ $\Delta H = -57.8$ KJ/mole
* $\frac{1}{2}A_2 + \frac{1}{2}Y_2 \longrightarrow AY$ $\Delta H = + 21.6$ KJ/mole

(viii) Explain Rutherford's Atomic model with its conclusion.

(ix) Balance the following equations by Ion-electron method:
(i) $C\ell_2 + OH^- \rightarrow C\ell^- + C\ell O_3^- + H_2O$
(ii) $HNO_3 + H_2S \rightarrow NO + S + H_2O$

(x) 5.88 moles of Nitrogen and 16.2 moles of Oxygen are mixed and heated at 2000°C until the equilibrium is established, 11.28 moles of Nitric oxide are formed. Calculate the value of equilibrium constant.

$$N_2 + O_2 \rightleftharpoons 2NO$$

(xi) What is an Ideal gas? What are the causes of derivations of the real gases from ideal behavior?

(xii) State the law of Equilibrium. Derive the expression of K_c for the following reaction:
$mA + nB \rightleftharpoons xC + yD$

(xiii) (a) Define Activation energy. Give its relation with the speed of reaction.
(b) For the reaction A → product, threshold energy is 40 KJ/mole. The average internal energy of the reactants is 10 KJ/mole. Calculate its activation energy.

(xiv) How are the nature and surface area of the reactant related to the rate of reaction?

(xv) State and explain Dalton's Law of Principal pressures with its applications.

SECTION'C' (DETAILED- ANSWER QUESTIONS)(28)

NOTE: Answer 2 questions from this section.

3.(a) What is chemical bond? Give its types. Explain the formation of $NaCl_{(s)}$ by the reaction between $Na_{(s)}$ and $Cl_{2(g)}$ using all the energy changes involved.

(b) What is meant by Electrolysis? Explain the electrolysis of $CuCl_2$ solution giving all the necessary electrode reactions.

(c) Predict the effects of change in temperature and pressure on the following equilibria:

$PCl_5 \rightleftharpoons PCl_3 + Cl_2$ ΔH = positive

$N_2 + 3H_2 \rightleftharpoons 2NH_3$ ΔH = negative

4.(a) Explain the shapes of BF_3 and H_2O on the basis of: Hybrid orbital model and Electron pair repulsion model

(b) State and explain the First Law of Thermodynamics. Also prove that $q_p = \Delta E + P\Delta V = \Delta H$

(c) Combustion of 0.5 gm of a Hydrocarbon produced 1.515 gm CO_2 and 0.77 gm of H_2O. If the molecular mass of the compound is 58 a.m.u., determine its Molecular formula.

5.(a) Starting from $\Delta E = E_2 - E_1$, derive the expression for the wave number for the hydrogen atom.

(b) Differentiate between the following:
* Valance Bond Theory & Molecular Orbital Theory
* Electro negativity and Electron affinity
* Intensive properties and Extensive properties

(c) The density of a certain gas is 1.43 gram/dm^3 at 608 and 27°C. Find the molecular mass of the gas.