CHEMISTRY 2015

Time: 20 Minutes Max. Marks: 17

SECTION A (MULTIPLE CHOICE QUESTIONS)

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

(i) This one of the following pairs has the same number of molecules:

• $10gH_2$ & $10gCH_4$ • $10gH_2$ & $50gCH_4$

• $10gH_2$ & $80\ gCH_4$ • $10gH_2$ & $16gCH_4$

(ii) If a = b = c and $\alpha = \beta = \gamma = 90^\circ$ then the shape of the crystal is:

• Cubic • Tetragonal • Hexagonal • Orthorhombic

(iii) The following pair of ions is isoelectronic:

• Na^+ & Ng^{2+} • F^- & O^- • Li^+ & Na^+ • S^{2-} & O^{2-}

(iv) This one of the following colours has the shortest wavelength:

• Red • Blue • Violet • Orange

(v) The S.I. unit of Dipole moment is:

• dyne/cm • poise • Debye • Coulomb-metre

(vi) 1 Cal. Is equal to:

• 0.239J • 1.98J • 4.184J • 8.314J

(vii) When 2 moles of solute are present in $2dm^3$ of solution, then the concentration of the solution is:

• 0.5 M • 1 M • 2 M • 3 M

(viii) With an increase in temperature, a system involving exothermic reaction will:

• move in the forward direction • remain at equilibrium

• move in the reverse direction • none of these

(ix) The oxidation number of Sulphur in $NaHSO_4$ is:

• −2 • 0 • +4 • +6

(x) This not a primary bond:

• Ionic bond • Covalent bond

• Dative bond • Hydrogen bond

(xi) For the reaction $2NH_3 ===== N_2 + 3H_2$, the relationship between K_c and K_p is:

• $K_p = K_c$ • $K_p > K_c$ • $K_p < k_c$ • $K_p \leq K_c$

(xii) Conduction in metals is due to the movement of:

• ions • electrons • protons • atoms

(xiii) The (n + l) value for 5d orbital is:

• 4 • 5 • 6 • 7

(xiv) Dipole moment of CS_2 is zero. Hence, the bond angle is:

• 90° • 109.5° • 120° • 180°

(xv) The most favourable conditions of temperature and pressure for oxidation of SO_2 into SO_3 are:

• low temperature and high pressure

• low temperature and low pressure

• high temperature and high pressure

• high temperature and low pressure

(xvi) The volume of 0.2M , H_2SO_4 required for the neutralization of $10cm^3$ of 0.1M NaOH is:

• $2.5cm^3$ • $5cm^3$ • $10cm^3$ • $15cm^3$

(xvii) Photochemical reactions, which proceed only under the influence of light, are of the order:

• Zero • First • Second • Third

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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) Exponential Notation (b) Unit Cell

(c) Common ion effect (d) Normal boiling point

(ii) The empirical formula of compound is CO_2H. 1.8g of this compound in gaseous state occupies 448 cm^3 at S.T.P. Find its molecular formula.

(iii) Differentiate any two of the following:

(a) Amorphous and Crystalline solids

(b) Sigma and Pi bond (c) Orbit and Orbital

(iv) A gaseous mixture contains 0.2 mole of O_2 and 0.3 mole of CO_2. If the partial pressure of oxygen is 60 torr, calculate the partial pressure of CO_2.

(v) Calculate the heat of formation of CH_3OH from the following data:

* $C + 2H_2 + \frac{1}{2} O_2 \rightarrow CH_3OH$ $\Delta H_f = ?$

* $C + \frac{1}{2} O_2 \rightarrow CO$ $\Delta H_f = -111$ KJ/mole

* $H_2 + \frac{1}{2} O_2 \rightarrow H_2O$ $\Delta H_f = -286$ KJ/mole

* $CH_3OH + O_2 \rightarrow CO + 2H_2O$ $\Delta H_f = -561$ KJ/mole

(vi) What is the ionic concentrations of Ag^+ and CrO_4^{-2} in a saturated solution of Ag_2CrO_4 at 25° C? K_{sp} of Ag_2CrO_4 is $1.9 \times 10^{-12} \frac{mole^3}{dm^9}$

(vii) H_2 gas effuses from a $10dm^3$ vessel in 10 sec. Calculate the time for effusion of O_2 gas from 20 dm^3 vessel.

(viii) In the reaction $H_2 + I_2 ====== 2HI$, when equilibrium was attained, the concentration were $[H_2] = [I_2] = [HI] = 4$ moles/dm3. Calculate the equilibrium constant and the initial concentration of H_2 and I_2.

(ix) State the main postulates of Electron pair repulsion theory & explain shape of NH_3 according to this theory.

(x) Balance the following equation by Ion-electron method:

$Fe^{+2} + Cr_2O_7^{-2} + H^+ \rightarrow Fe^{+3} + Cr^{+3} + H_2O$

(xi) Define pH. What is the pH of 0.002M NaOH solution at 25°C?

(xii)(a) Write the electronic configuration of the following:

* Cu (Z = 29) * Ag(Z = 47)

(b) Which rule of principle is violated in the following electronic configurations?

* $Is^2 2s^3$ * $2s^2 2p^6 3s^2$

* $Is^2 2s^2 3s^2 2p^6$ * $Is^3 2s^2 2p_x^2$

(xiii) Give scientific reasons for the following:

* Li^+ ions is more hydrated than Cs^+ ion.

* Water expands when cooled below 4°C.

* Surface tension of water is greater than that of Ethyl alcohol.

* Glycerine is distilled at reduced pressure.

(xiv) Write any four postulates of Arrhenius theory of ionization.

(xv) What 4000 J of heat is added to a gaseous system at a constant pressure of 101300 $\frac{N}{m^2}$, its internal energy increases by 500 J. Calculate the change in the volume of the system.

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

NOTE: Answer 2 questions from this section.

3.(a) Define Orbital Hybridization. Explain sp^2 hybridization with example.

(b) Distinguish between:

* Atomic orbital and Molecular orbital

* Covalent bond and Co-ordinate Covalent bond

(c) Define Thermochemistry. State and explain Hess's law of constant heat summation with its applications.

4.(a) How was the presence of electron and proton in the atom discovered in the discharge tube experiment?

(b) Give the defects of Rutherford's Atomic Theory. Write the postulate of Bohr's Atomic Theory.

(c) How did Bohr's theory explain the formation of the line spectrum of hydrogen atom? Write the names and formulae of each series.

5.(a) State le-Chatelier's principle. Apply this principle to the manufacture of NH_3 by Haber's process.

(b) What is Standard electrode potential? How is the electrode potential of copper determined? Explain.

(c) Write the postulates of Kinetic molecular theory of gases.

OR For the chemical reaction: $F_2 + 2ClO_2 \rightarrow 2FClO_2$

Calculate the:

(i) Rate expression (ii) Order of reaction

(iii) rate constant when the initial concentration of F_2 is 0.1 $mole/dm^3$, ClO_2 is 0.01 $mole/dm^3$ and rate of reaction is 1.2×10^{-3} $mole/dm^3$.sec.