Half Yearly Examination 2016-2017

Std. : XII **Full Marks : 70**

Subject : CHEMISTRY Time : 3 Hrs.+15mins.

Part I [20 marks]
(Answer all questions)

1.a) Fill in the blanks by choosing the appropriate word/words from those given in the brackets : [5]

(Benzoic acid, benzoin, dependent, second, increased, potassium cyanide, potassium hydroxide, independent, decreased, first, common ion effect, salt hydrolysis, paramagnetic, diamagnetic, ammonium formate, ammonium acetate, propanamide, acetamide).

(i) Solubility of calcium oxalate is_____in the presence of ammonium oxalate because of_____.

(ii) Half-life period of a_____order reaction is_____of the concentration of the reactant.

(iii) Benzaldehyde forms_____when treated with an alcoholic solution of_____.

(iv) _____behaviour is shown by the transition metals because of the presence of unpaired electrons and Cu^+ is_____because its electronic configuration is $[Ar]3d^{10}$.

(v) Acetic acid forms_____with ammonia which on heating gives_____.

1.b) Complete the following statement by selecting the correct alternatives from the choices given below: [5]

(i) Which ion gives coloured solution ?

1) Zn^{2+} 2) Fe^{2+} 3) Ag^+ 4) Cd^{2+}

(ii) Hydrolysis of methyl cyanide gives :—

1) acetic acid 2) oxalic acid 3) acetaldehyde 4) Formic acid.

(iii) Copper has f.c.c. structure. The coordination number of each ion is —

1) 4 2) 8 3) 12 4) 14

(iv) The salt remains unhydrolysed in aqueous solution of :

1) Sodium carbonate 2) Copper sulphate 3) Potassium cyanide
4) Sodium sulphate

(v) The product formed when aniline is warmed with chloroform and potassium hydroxide is

1. Phenyl chloride 2. Methyl isocyanide
3. Phenyl isocyanide 4. Nitro phenol.

c) Answer the following questions :—

(i) Arrange the following acids in increasing order of strength : $ClCH_2COOH$, $(CH_3)_2CH\ COOH$, and CH_3COOH. Justify your answer. [1½]

(ii) Can a reaction have zero activation energy ? Explain. [1]

(iii) Zinc sulphide is precipitation from an ammoniacal solution but not from and acid solution, by hydrogen sulphide, — explain. [1½]

(iv) Give balance equation for the reaction when acetanide is heated with sodium hydroxide. [1]

d) Match the following : [5]

Column A		**Column B**	
(i)	Acetaldehyde	a)	Condensation polymer
(ii)	Ostwald's dilution law	b)	Addition polymer
(iii)	Rate constant	c)	Mol l^{-1} sec^{-1}
(iv)	Molal depression constant	d)	weak electrolyte
(v)	Bakelite	e)	$mole^{-1}$ l^{-1} sec.
		f)	KKg mol^{-1}
		g)	Iodoform

Part II [50 marks]
Section A [20 marks]
[Answer any two questions]

2. a) The freezing point of a solution containing 0.2 g of acetic acid in 20 g benzene is lowered by 0.45°C. Calculate the degree of association of acetic acid, in benzene. [Assume that acetic acid dimerises in benzene. K_f for benzene = 5.12 k mol^{-1} kg.] [3]

b) When ammonium chloride and ammonium hydroxide are added to a solution containing both Al^{3+} and Ca^{2+} ions, which ion is precipitated ? Why ? [2]

c) 1 g of strontium — 90 was reduced to 0.953 g after two years. Calculate the half-life period of strontium — 90. [2]

d) Calculate the hydrolysis constant and pH of a 0.5 M sodium acetate solution at 25°C. Ka for CH_3COOH = 1.75 x 10^{-5}. [3]

3) a) Define Frenkel defects of an ionic crystal. [1]

b) Iron has an edge length 288 pm. Its density is 7.86 g/cm^3. Find the type of cubic lattice to which the crystal belongs. (At mass of iron = 56) [3]

c) Give one example of heterogeneous catalyst. How does it function ? [1½]

d) In a reaction if the concentration of reactant A is tripled, the rate of reaction becomes twenty seven times. What is the order of the reaction ? [1½]

e) Calculate the pH of a buffer solution containing 0.45 moles of NH_4OH and 0.75 moles of NH_4Cl. Kb for NH_4OH is 1.8 x 10^{-5}. [2]

f) The ratio of weights of solutes A and B is 2:3 in two isotonic solutions. What is the ratio of their molecular weights ? [1]

4. a) A catalyst lowers the activation energy for a reaction from 75 to 20 KJ $mole^{-1}$. What will be the effect on the rate of the reaction at $20^{o}C$? [2]

b) What is the effect on equilibrium of the following reaction : $PCl_3 + Cl_2 \rightleftharpoons PCl_5$ if

i) Pressure is increased (ii) inert gas is added at constant pressure

(iii) PCl_5 is removed. [1½]

c) 450 ml of 0.001 (M) solution of $AgNO_3$ is added to 50 ml of 0.001 M solution of HCl. Will there be formation of precipitate of Ag Cl ? [K_{sp} (Ag Cl) = 1.8×10^{-10}] [2]

d) The vapour pressure of pure benzene at a certain temperature is 640 mm of Hg. When a non volatile and non-electrolyte solid weighing 2.175 g is added to 39.0 g of benzene, the vapour pressure of the solution is 600 mm Hg. What is the molecular mass of the solid ? [2]

e) A unit cell consists of a cube in which there are anions Y at each corner and cations X at the centres of alternate faces of unit cell. Write the simplest formula of the compound. [1½]

f) To precipitate group III cations, NH_4Cl should be added to the solution before the addition of ammonium hydroxide. Explain. [1]

Section - B [10 marks]
[Answer any two questions]

5. a) For the compound $[CO(NH_3)_6]^{3+}$ state :-

(i) hybridisation of central metal ion.

(ii) Geometrical shape of the complex.

(iii) Magnetic behaviour of the complex. [CO = 27]. [1½]

b) Transition metals have high tendency to form complex compounds — explain. Out of Mn^{2+} and Cr^{3+} which one is more paramagnetic ? (Mn = 25, Cr = 24)

c) Write balanced equations for the following reactions :— [2]

(i) Potassium dichromate is reacted with acidified ferrous sulphate solution.

(ii) Ozone is reacted with lead sulphide.

6. a) Write IUPAC names of the following complexes :— [2]

(i) $[C_oCl_2(en)_2]_2SO_4$ (ii) $K_2[Ni(CN)_4]$.

(iii) $Na_3[Fe(C_2O_4)_3]$ (iv) $[Mn(H_2O)_6]^{2+}$

b) What happens when (write balanced equatons) :— [3]

(i) Chlorine is reacted with hot concentrated NaOH.

(ii) Potassium permanganate reacts with potassium iodide in neutral solution.

(iii) Dilute nitric acid is treated with silver metal.

7. a) State the types of isomerism for the following pairs of compounds :— [2]

(i) $[Cr(NH_3)_6][Cr(NCS)_6]$ and $[Cr(NH_3)_4(NCS)_2][Cr(NH_3)_2(NCS)_4]$

(ii) $[Pt(NH_3)_4Cl_2]Br_2$ and $[Pt(NH3)_4Br_2]Cl_2$.

b) Draw the structure of chromate ion (CrO_4^{2-}) [1]

c) Related to group 17 elements, name : [2]

(i) the element which does not form polyhalides.

(ii) the strongest haloacid [out of HF, HCl, HI, HBr]

(iii) the element which does not form positive oxidation state.

(iv) the element having highest ionisation potential.

Section C [20 marks]
[Answer any two questions]

8. a) Write balanced equations for the following named reactions : [4]

(i) HVZ reaction (ii) Clemmensen reduction

(iii) Friedel-Craft's acylation (iv) Hof mann's bromamide reaction.

b) Give one chemical test to distinguish between the following pair of compounds :— [3]

(i) Oxalic acid and urea.

(ii) Ethanol and 2 propanol.

(iii) Benzoic acid and phenol.

c) Name the monomers and types of polymerisation in (i) natural rubber (ii) Nylon 6. [2]

d) Why is benzoic acid less soluble in water than acetic acid. [1]

9. a) How will you convert the following ?

(i) Benzene to acetanilide [1]

(ii) Phenol to benzoic acid. [1½]

(iii) Ethyl chloride to acetamide. [1½]

(iv) Ethyl alcohol to acetylene. [1]

b) What is biuret test ? Write balanced equation for the formation of biuret. [2]

c) Identify the following compounds (A, B, C, D) [2]

(i) $C_6H_5COOH \longrightarrow C_6H_5COCl \xrightarrow{NH_3} B \xrightarrow{C} C_6H_5CN$

$C_6H_5COCl \xrightarrow{C_2H_5OH} D$

d) Give an example each of semi synthetic and linear polymers. [1]

10. a) Account for the following :— [3]

(i) In the preparation of ester by the reaction of carboxylic acid and alcohol, the ester is distilled as soon as it is formed.

(ii) Boiling point of the ethanol is higher than ethyl chloride.

(iii) Lower members of alcohols are soluble in water while the higher members are not.

b) What do you observe when :- [3]

(i) Phenol is treated with bromine water.

(ii) Formic acid is reacted with mercuric chloride.

(iii) Chloroform is treated with methyl amine and alcoholic KOH. solution.

c) An organic compound (A) on treatment with acetic acid in presence of conc. H_2SO_4 produces an ester (B). (A) on mild oxidation gives (C). (C) reduces Tollen's reagent to give silver mirror and (D). (D) on reacting with phosphorus pentachloride followed by NH_3 gives (E). (E) on dehydration produces methyl cyanide. Identify A,B,C,D,E and write relevant equations. [4]