CBSE Class 12 Chemistry Question Paper Solution 2011

QUESTION PAPER CODE 56/1/1

EXPECTED ANSWERS/VALUE POINTS

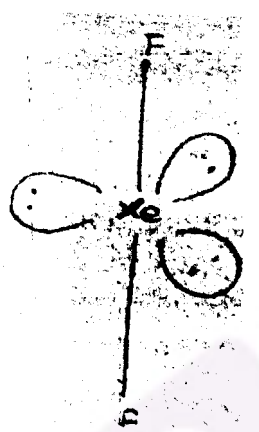
1 It means that some of their physical properties show different values when measured along different directions in the same crystal. 1

2 $\Lambda_m = \kappa / c$ 1

where Λm is molar conductivity, κ is conductivity, c is concentration in mol L^{-1}

3 The movement of colloidal particles under an applied electric potential towards oppositely charged electrodes is called electrophoresis. 1

4



5 1-bromo-2, 2 - dimethyl propane 1

6 CH_3 -CH CH_3 -CH_2-CHO 1

7 $C_6H_5NH_2 < (C_2H_5)_2NH < C_2H_5NH_2$ 1

8 Polymers which undergo bacterial degradation in the environment and are thus eco-friendly. 1

9 oxidation: $Fe(s) \rightarrow Fe^{2+}(aq) + 2e^+$ 1

Reduction: $O_2(g) + 4H^+(aq) + 4c^- \rightarrow 2H_2O(1)$

Atmospheric oxidation: $2Fe^{2+}(aq) + 2H_2O(l) + \frac{1}{2} O_2(g) \rightarrow Fe_2O_3(s) + 4H^+(aq)$

10 $\Delta rG^0 = -n\ FE^0_{cell}$

$= -2 \times (96500 C mor1^{-1}) \times 1.05V$ 1

$= -202650 J\ mol^{-1}$ or $-202.6 kJ\ mor^{-1}$

$$\log Kc = \frac{nE^0}{0.0591}$$

$$= \frac{2 \times 1.05V}{0.0591}$$

$= 35.53$

$K_c = 3.412 \times 10^{35}$ 1

[Marks to be given if substitution is done with proper units]

11 Rate Law is the expression in which reaction rate is given in terms of molar concentration of reactants with each term raised to some power which may or may not be same as the stoichiometric coeffcient of the reacting species in a balanced chemical equation, whereas the rate constant is defined as the rate of reaction when the concentration of the reactant(s) is unity. 1 1

(or properly explained in any other way)

12 i) In the resonance structure of these two species, in NO_2^-, 2 bonds are sharing a double bond while in NO_3^-, 3 bonds are sharing a double bond which means that bond in NO_2 will be shorter than in NO_3^-.

Or

In NO_2^-, bond order is 1.5 while in NO_3^-, bond order is 1.33

ii) Because SF_6 is sterically protected by six F atoms / co-ordinatively saturated.

OR

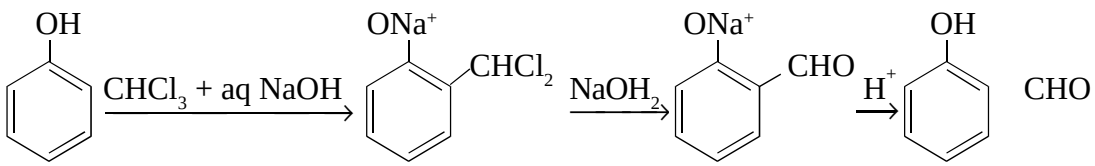
i) Because PCl_5 has a trigonal bipyramidal structure in which three P-Cl bonds are equatorial and two P-Cl bonds are axial. 1+1

ii) Because S-S single bond is stronger than O-O single bond

13 i) Because copper(I) ion is unstable in aqueous solution and undergoes, dis-proportionation. 1+1

ii) Because of comparable energies of Sf; 6d and 7s orbitals in actinoids.

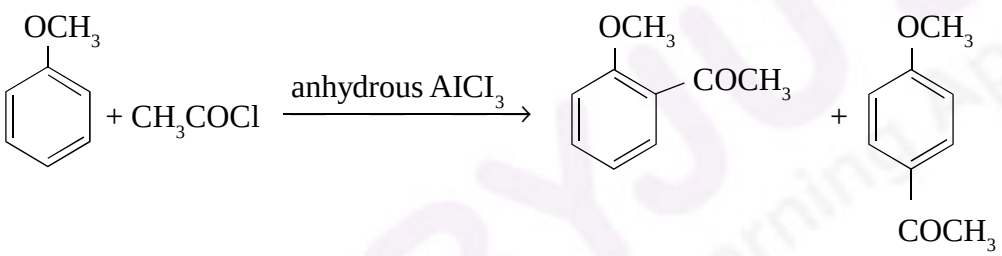
14 (i) Reimer-Tiemann Reaction



Internediate Salicylaldehyde

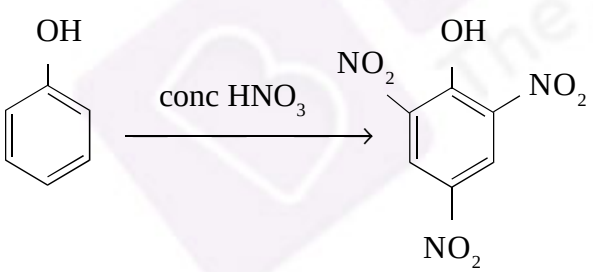
(or any other example)

ii) Friedal-Craft's acetylation of anisole



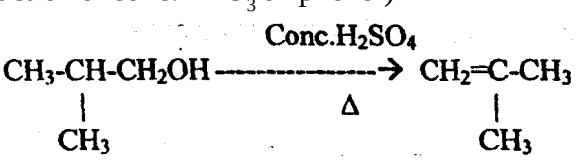
(or any other example)

15 i)



(or by action of conc.HNO_3 on phenol)

(ii)



(or by action of hot conc. H_2SO_4)

16 α - form of glucose and β - form of glucose differ only in the configuration of the hydroxyl group at C_1 in cvclic structure of glucose/hemiacetal form of glucose/ pyranose structure of glucose. (or structure drawn) 2

17 **Primary structure of proteins:**

The protein in which amino acids are linked with each other in a specific sequence is said to be the primary structure of that protein. 1

Secondary structure of proteins:

It refers to the shape in which a long polypeptide chain can exist i.e. α - helix and β-pleated structure. 1

18 **i) Bakelite**

For making combs, electrical switches, handles of utensils, computer discs (or any other use) any two ½+½

ii) Nylon-6

For making tyre cords, fabrics, ropes(or any other use) any two ½+½

19 For fcc unit cell

$$r = \frac{a}{2\sqrt{2}}$$ 1

Given a = 400 pm

$\therefore$ r = 400 / 2$\sqrt{2}$ pm

r =141.4 pm 1

20 a) $k = \frac{2.303}{t} \log \frac{[A_0]}{[A]}$

$k = \frac{2.303}{20 \text{ min}} \log \frac{0.400}{0.289}$

$k = 0.0163 \text{min}^{-1}$ 1

b) $k = \frac{2.303}{t} \log \frac{[A_0]}{[A]}$

$0.0163 = \frac{2.303}{100} \log \frac{0.400}{[A]}$

[A] = 0.078M 1

c) Initial rate $R = k [N_2O_5]$

$= 0.0163 \text{ min}^{-1} \times (0.400 \text{ M})$

$= 0.00652 \text{ M min}^{-1}$ 1

21 **i) Production of vacuum:**

The remaining traces of air can be adsorbed by charcoal from a vessel to create a vacuum.

ii) Heterogeneous catalysis:

Adsorption of reactants on the solid surface of the catalysts increases the rate of reaction.

iii) Froth floatation process:

In this process, sulphide ore is concentrated by using pine oil which adsorbs the ore particles and imurities are wetted by water which settle at the bottom. 1x3 = 3

OR

i) Micelles:

Micelles are associated colloids which show colloidal behaviour at high concentration and act as strong electrolytes at low concentration.

ii) Peptization:

The process of converting a precipitate into colloidal sol by shaking it with dispersion medium in the presence of a small amount of electrolyte is called Peptization.

iii) Desorption:

The process of removing an adsorbed substance from a surface on which it is adsorbed is called desorption. 1x3 = 3

22 **i) Vapour phase refining of a metal:** 1

In this method the metal is converted into its volatile compound which is then decomposed to give pure metal.

ii) Electrolytic refiniing of a metal: 1

In this method, the impure metal is made to act as anode and metal in pure form is used as cathode. They are put in a suitable electrolytic bath containing soluble salt of the same metal. The more basic metal goes to the anode and the less basic metal gets deposited at the cathode.

iii) Recovery of silver after silver ore was leached with NaCN:

More basic and cheaper zinc can displace silver from the complex and silver metal can be recovered. 1

$$2\,[Ag(CN)_2]^-(aq) + Zn(s) \longrightarrow [Zn(CN)_4]^{2-}_{(aq)} + 2Ag(s)$$

23 i) $5C_2O_4^{2-} + 2MnO_4^- + 16H^4 \longrightarrow 2Mn^{2+} + 8H_2O + 10CO_2$ 1

ii) $2KMnO_4 \xrightarrow{heat} K_2MnO_4 + MnO_2 + O_2$ 1

iii) $Cr_2O_7^{2-} + 3H_2S + 8H^+ \rightarrow 2Cr^{3+} + 3S + 7H_2O$ 1

24 i) $K_4[Mn(CN)_2]$: Potassium hexacyanomanganate (II), Octahedral / paramagnetic.

ii) $[Co(NH_3)_5Cl]Cl_2$: pentaamminechloridocobalt(III) chloride, octahederal/ diamagnetic.

iii) $K_2[Ni(CN)_4)$: potassium tetracyanonickelate(II), square planar / diamagnetic. ½+½=1

(½ mark for the nomenclature and ½ mark for the property in each part)

25 (i) Because the new intermolecular attractions between haloalkanes and solvent molecules have about the same strength or stronger than the existing ones in the molecules. 1

(ii) A mixture containing two enantiomers in equal proportions is known as a racemic mixture. e.g. (±) butan-2-ol (or any other example) ½+½=1

(iii) $C_6H_5CH(C_6H_5)Br$, because it forms more stable carbocation.

26 a) Due to +1 effect / electron donating character of alkyl group, alkylamine is more basic than ammonia. 1

b) i) $C_6H_5NH_2 \xrightarrow[273\ K]{NaNO_2+HCl} C_6H_5N_2^+Cl^- \xrightarrow[ii)\ NaNO_2/Cu,\ \Delta]{i)\ HBF_4} C_6H_5NO_2$ 1

ii) $C_6H_5NH_2 \xrightarrow[273\ K]{NaNO_2+HCl} C_6H_5N_2^+Cl^- \xrightarrow{KI} C_6H_5I$ 1

27 (i) Detergents are sodium salts of long chain alkyl sulphonates or benzene sulphonates. eg: Sodium Lauryl sulphate. ½+½=1

(ii) Food preservatives: are the compounds which prevent spoilage of food due to microbial growth. eg: sodium benzoate, vinegar (or anyone example) ½+½=1

(iii) Antacids: are the drugs used to prevent the overproduction of acid in the stomach. e.g. Sodium hydrogen carbonate / or any other suitable example0 ½+½=1

28 a) Molality (m) is the number of moles of the solute per kilogram (kg) of the solvent whereas Molarity is the number of moles of solute present in one litre (or one cubic decimeter) of solution at a particular temperature. 1

Molality is independent of temperature whereas Molarity is function. of temperature because volume depends on temperature and the mass does not or Molarity decreases with increase of temperature. 1

b) $\Delta T_f = 7.5^0C$

$\Delta T_f = iK_f m$

$T_f^0 - T_f = 3 \times 1.86^0C \text{ kg mol}^{-1} \times \frac{10.50g}{184 \text{ gmol-1}} \times \frac{1000}{200kg}$ 2

$0^0C - T_f = 1.59^0C$

$T_f = -1.59^0C$ or 271.41 K 1

OR

a) The flow of solvent motecutes from solution of low concentration to higher concentration through semipermeable membrane is called osmosis. ½

The hydrostatic pressure that has to be applied on the solution to prevent the entry of the solvent into the solution through the semipermeable membrane is called the Osmotic Pressure. ½

Yes osmotic pressure is a colligative property as it depends upon the number of particles of the solute in a solution. 1

b) $\Delta T_b = iK_b m$

$T_b - T_b^0 = 2 \times 0.512K \text{ kg mol}^{-1} \times \frac{15 \text{ g}}{58.44 \text{ gmol}-1} \times \frac{1000}{250kg}$ 2

$T_b - 373 \text{ K} = 1.05 \text{ K}$

$T_b = 374.05K$ or 101.05^0C 1

29 (a) (i) Propanal and Propanone

Iodoform lest. Warm each compound with iodine and sodium hydroxide on a water bath With.

Propanal (CH_3CH_2CHO) : No yellow ppt is formed with

Propanone (CH_3COCH_3) : Yellow crystals of Iodoform are formed.

(Other relevant test can be accepted)

(ii) Benzaldehyde and Actopbenone

Iodoform test. Warm each organic compound with I_2 and NaOH solution. 1+1=2

Acetophenone ($C_6H_5COCH_3$) Yellow precipitates of iodoform are formed with Benzaldehyde does not respond to this test.

(Other relevent test can be accepted)

(b)

i) $CH_3\text{-}CHO \xrightarrow{\text{dil. NaOH}} CH_3\text{-}CH(OH)\text{-}CH_2\text{-}CHO \xrightarrow[-H_2O]{\Delta} CH_3\text{-}CH{=}CH\text{-}CHO$

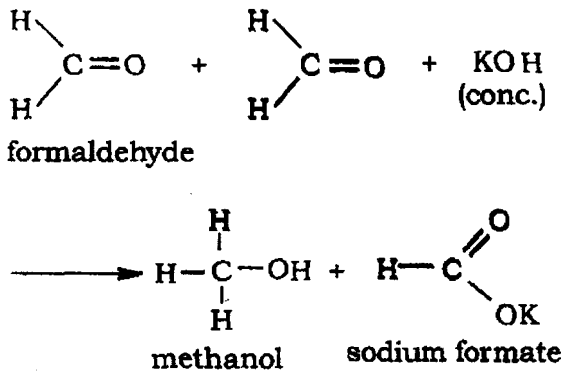
ii) $CH_3\text{-}CH_2\text{-}CH_2\text{-}CHO \xrightarrow{KMnO_4} CH_3\text{-}CH_2\text{-}CH_2\text{-}COOH$

iii) $C_6H_5\text{-}CH_2\text{-}CH_3 \xrightarrow[ii)\ H^+]{i)\ KMnO_4,\ KOH} C_6H_5\text{-}COOH$

(Or by any other suitable method) 1x3=3

OR

i) Cannizzaro reaction: Aldehydes which do not have an a-hydrogen atom, undergo self oxidation and reduction reaction on treament with concentrated alkali 1

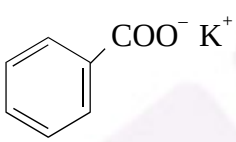


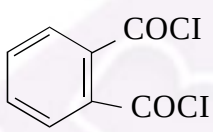
(or any other correct equation)

ii) Decarboxylation: Carboxylic acids lose carbon dioxide to form hydrocarbons when their sodium salts are heated with sodalime. The reaction is known as decarboxylation. 1

$$R\text{-}COONa \xrightarrow[Heat]{NaOH,\ CaO} R\text{-}H + Na_2CO_3$$

(Note: Award full marks for correct chemical equation; award ½ mark if only statement is written)

b) (i) 

(ii) 

1x3=3

(iii) C_6H_5COOH

30 (a)

i) Becuase bond energy of F_2 is lower than that of Cl_2 and N-F bond is smaller & stronger than N-Cl bond. 1

ii) Because of low bond dissociation enthalpy of F-F bond. 1

b)

i) $C+2H_2SO_4(conc) \longrightarrow CO_2 + 2SO_2 + 2H_2O$

ii) $P_4 + 3NaOH + 3H_2O \longrightarrow PH_3 + 3NaH_2PO_2$

iii) $Cl_2 + 3F_2 \longrightarrow 2C1F_3$ 1x3=3

OR

i) Because of increase in bond dissociation enthalpy from H-Cl bond to H-P bond / Because of decrease in electronegativity from to Cl to P.

ii) Because of the energy factor (inert pair effect) , stability of + 3 oxidation state increases than that of +5 oxidation state.

b)

i) $P_2 + 10SO_2Cl_2 \longrightarrow 4PCl_5 + 10SO_2$ 1 + 1

or

$P_4 + 8SO_2Cl_2 \longrightarrow 4PCl_3 + 4SO_2 + 2S_2Cl_2$

ii) $XeF_2 - 2H_2O \rightarrow 2Xe + 4HF + O_2$ 1x3=3

iii) $I_2 + 10\ HNO_3\ (conc) \rightarrow 2HIO_3 + 10\ NO_2 + 4H_2O$