CBSE 12th Chemistry 2013 Solved Paper Outside Delhi

CBSE 12th Physics 2013 Solved Paper Outside Delhi

TIME - 3HR. | QUESTIONS - 30

THE MARKS ARE MENTIONED ON EACH QUESTION

SECTION – A

Q. 1. Of physisorption or chemisorption, which has a higher enthalpy of adsorption? *1 mark*

Ans. Chemisorption.

Q. 2. Name the method used for refining of copper metal. *1 mark*

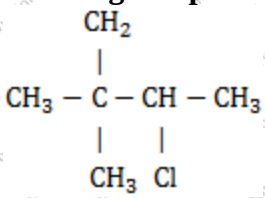
Ans. Electrolysis.

Q. 3. Name two poisonous gases which can be prepared from chlorine gas. *1 mark*

Ans. (i) Phosgen $COCl_2$

(ii) ($ClCH_2CH_2SCH_2CH_2Cl$) Mustard gas.

Q. 4. Write the IUPAC name of the following compound.



Ans. 3-Chloro, 2-dimethylbutane.

Q. 5. Rearrange the following compounds in the increasing order of their boiling points: *1 mark*

$\boldsymbol{CH_3 - CHO, CH_3 - CH_2 - OH, . CH_3 - CH_2 - CH_3}$

Ans. $CH_3 - CH_2 - CH_3 < CH_3 - CHO < CH_3 - CH_2 - OH$

Q. 6. Write the structure of n-methy-lethanamine. *1 mark*

Ans. $CH_3 - NH - C_2H_5$

N- Methylethanamine.

Q. 7. What are the products of hydrolysis of sucrose? *1 mark*

Ans. The products of hydrolysis of sucrose are glucose and fructose.

Q. 8. Is $(-CH_2 - CH -)_n$ a homopolymer or a copolymer. *1 mark*

Ans. It is homopolymer.

SECTION - B

Q. 9. Account for the following: *2 marks*

(i) Schottky defects lower the density of related solids.

(ii) Conductivity of silicon increases on doping it with phosphorus.

Ans. (i) As equal no. of cationic and anionic sites are found vacant. Hence density decreases.

(ii) Pure silicon's resistance is quite high. It is an extremely important semiconductor. It is doped with boron, phosphorus, or arsenic, to increases its conductivity. Conductivity increases due to extra free delocalized electrons.

Q. 10. Aluminum crystallizes in an fcc structure. Atomic radius of the metal is 125 pm. What is the length of the side of the unit cell of metal? *2 marks*

Ans. For an fcc unit cell

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

$$a = 2\sqrt{2}r = 2\times1.414\times125 = 353.5 \text{ pm}$$

Q. 11. Calculate the equilibrium constant, K for the reaction at 298 K, $Zn(s) + Cu^{2+}(aq) \rightleftharpoons Zn^{2+}(aq) + Cu$(s) Given: $E^0_{Zn^{2+}/Zn} = -0.76\,V$ $E^0_{Cu^{2+}/Cu} = +0.34\,V$. *2 marks*

Ans. $\Delta G^0 = -RT\,In\,Kc = -2.303\,RT\,log\,Kc$

$\therefore \quad -212300 = -2.303\times8.314\times298\times\log Kc$

Or $\log Kc = \frac{212300}{2.303\times8.314\times298} = 37.2074$

$$Kc = Antilog\ 37.2074 = 1.6\times10^{37}$$

Q. 12. (a) For a reaction $A + B \longrightarrow P$, the rate law is given by, $r = k[A]^{1/2}[B]^2$ What is the order of this reaction.

(b) A first order reaction is found to have a rate constant $k = 5.5\times10^{-14}S^{-1}$ Find the half-life of the reaction. *2 marks*

Ans. (a) 0.5 + 2 = 2.5

(b) For the first order reaction,

$$t_{1/2} = \frac{0.693}{K} = \frac{0.693}{5.5\times10^{-14}S^{-1}} = 1.26\times10^{13}S.$$

Q. 13. (a) Name the method used for removing gangue for sulphide ores.
(b) How is wrought iron different from steel. *2 marks*

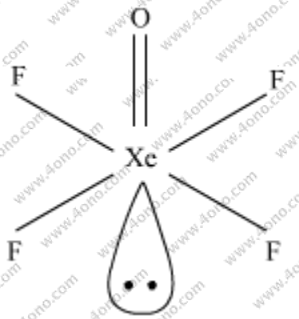
Ans. (a) This method is known as froth-floating method.

(b) Wrought iron and steel may seem similar on the surface, but these two metal alloys possess different raw materials, properties and industrial and decorative applications. Wrought iron is the purest form of commercial Iren. It contains about 0.2 – 0.5% carbon besides traces of P and Si tin the form of slag. When wrought iron is heated with 0.5% carbon it gives steel. Hence steel is less pure than wrought iron.

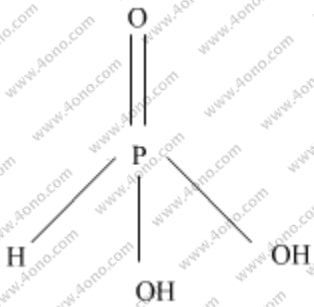
Q. 14. Draw the structures of the following molecules:
(i) $XeOF_4$(ii) H_3PO_3 . *2 marks*

Ans.

i. $XeOF_4$



ii. H_3PO_3



Q. 15. How are interhalogen compounds formed? What general compositions can be assigned to them? *2 marks*

Ans. They can be prepared by direct combination between the halogens or by the action of

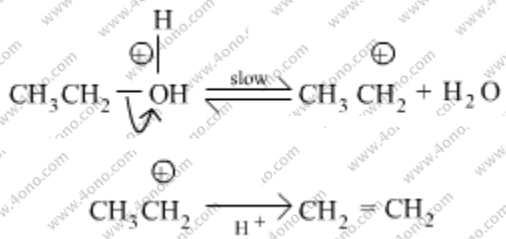
helogen on a lower inter halogen (i) $Cl_2 + F_2 \xrightarrow{473k} 2ClF$ (ii) $Cl_2 + 3F_2 \xrightarrow{573K} 2ClF_3$

General composition can be assigned to them are XX' XX'3XX'5, XX'7.

Q. 16. Explain the mechanism of the following reaction: *2 marks*

$$CH_3 - CH_2 - OH \xrightarrow[443K]{H^+} CH_2 = CH_2 + H_2O$$

Ans. Mechanism (i) $CH_3CH_2 - OH + H^+ \rightleftharpoons CH_3CH_2 - \overset{\overset{H}{|}}{\underset{\oplus}{O}} - H$

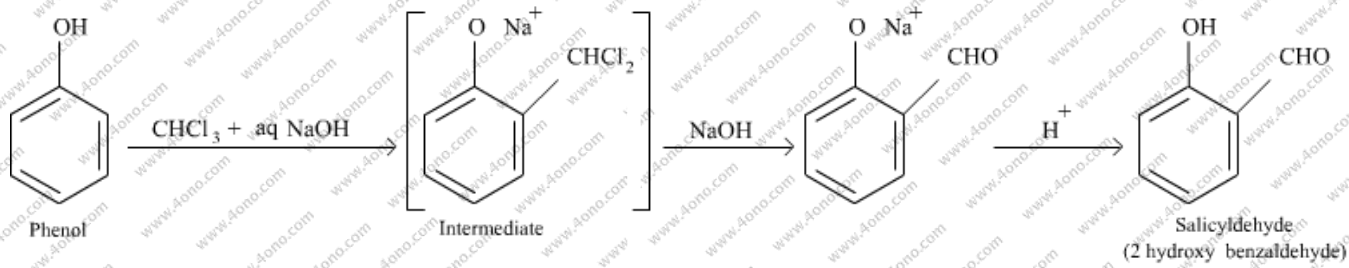


Q. 17. Write the equation involved in the following reactions: *2 marks*

(i) Reimer - Tiemann reaction

(ii) Williamson's ether synthesis

Ans. (i) Reimer-Thiemann reaction: Chloroform reacts with phenol in aqueous sodium hydroxide at 340 K to give salicyldehyde



(ii) $R - X + R'\ ONa \longrightarrow ROR' + NaX$

Alkyl halide Sodium alk oxide ether

Ex. $CH_3I + C_2H_5ONA \longrightarrow CH_3OC_2 + H_5 + NaI$

Q. 18. Define thermoplastic and thermosetting polymers. Give one example of each. *2 marks*

Ans. Thermoplastic Polymers: These are polymers which can be molding on heating. These These polymers posses intermolecular forces of attraction intermediate between elastomers and fibers. E.g. Polythene

OR

What is a biodegradable polymer? Give an example of a biodegradable aliphatic polyester.

Ans. The natural polymer, which disintegrates by itself or by micro-organism with in certain period of time. Ex PHBV (Poly $\beta-$ hydroxy but y rate. $-$co $-\ \beta-$ hydroxy valerate.)

SECTION - C

Q. 19. The rate of a reaction becomes four times when the temperature changes from 293 K to 313 K. Calculate the energy of activation (E_a)of the reaction assuming that it does not changes with temperature. [$R = 8.314 JK^{-1}mol^{-1}, log4 = 0.6021$]. *3 marks*

Ans. $T_1 = 293K, T_2 = 313K$

$$\text{Log}\frac{K_1}{K_2} = \frac{E_a}{2.303K}\left(\frac{T_2 - T_1}{T_1 \times T_2}\right)$$

$$\text{Log}4 = \frac{E_a}{2.303 \times 8.314} \times \left(\frac{313 - 293}{313 \times 293}\right)$$

$$E_a = \frac{0.6020 \times 2.303 \times 8.314 \times 313 \times 293}{20} = 52854.6J\ mol^{-1}$$

$$E_a = 52854.6J\ mol^{-1}$$

Q. 20. What are the characteristics of the following colloids? Give one example of each. *3 marks*

(i) Multimolecular colloids
(ii) Lyophobic sols
(iii) Emulsions

Ans. (i) Multimolecular colloids: When large no of small molecules or atoms (diameter <1 mm) of a substance combine together in a dispersion medium to form aggregate, which have size in the colloidal range, e.g. gold sol, Sulphur sol etc.

(ii) Lyophobic sols: Substances which do not form colloidal sols on simply, mixing them with the dispersion medium are known as lyophobic colloids. They are unstable in nature and also known as irreversible sols. Eg. Metals their suphides etc.

(iii) Emulsions. Emulsions are liquid colloidal systems eg. Milk.

Q. 21. Give reasons for the following:

(i) Where R is an alkyl group, $R_3P = 0$ exists but $R_3N = O$ does not

(ii) $PbCl_4$ is more covalent than $PbCl_2$

(iii) At room temperature, N_2 is much less reactive. *3 marks*

Ans. (i) N due to the absence of d- orbitals, cannot form pp – dp multiple bonds. Thus, N cannot expend its covalency beyond four but in $R_2N = 0, N$ has a covalency of 5. So, the compound

$R_3N = 0$ does not exit. On the other hand, P due to the presence of d – orbitals forms pp – dp multiple bonds and hence can expand its covalency beyond 4. Therefore, P forms $R_3P = O$ in which the covalency of P is 5.

(ii) $PbCl_4$ is more covalent than $PbCl_2$, due to inert pair effect the higher oxidation state is stable. Therefore 4+ state is stable and so 2+ state losses 2 electrons and gets converted to 4+ state. This process is called oxidation $PbCl_2$ oxides itself. Therefore it's a reducing agent. So this is also the reason for $PbCl_4$ not being an oxidizing agent.

(iii) N_2 is less reactive at room temperature because of strong pπ-pπ overlap resulting in to the triple bond, (N = N), consequently high bond enthalpy.

Q. 22. For the complex $[NiCl_4]^{2-}$, write . *3 mark*

(i) the IUPAC name.

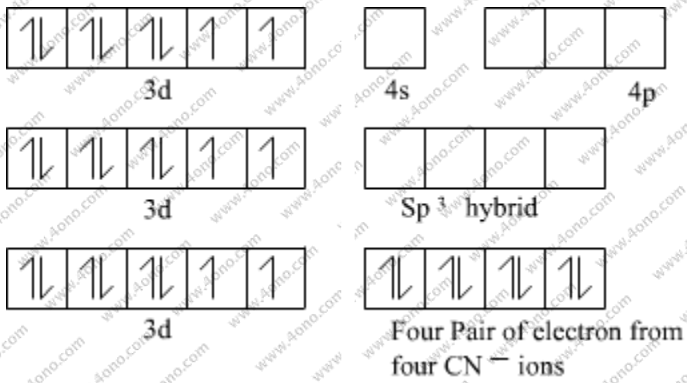
(ii) the hybridization type.

(iii) the shape of the complex. (Atomic no. of Ni = 28)

Ans.

Orbitals of Ni^{2+} ions

Sp^3 hybridized orbitals of $[Ni(Cl)_4]^{2-}$



OR

What is meant by crystal field splitting energy? On the basis of crystal field theory, write the electronic configuration of d^4 terms of t_{2g} and e_g in an octahedral field when

(i)$\Delta_0 > P$

(ii) $\Delta_0 > P$

Ans. The splitting energy of the degenerate orbitals due to the presence of ligands in a definite geometry is known as crystal field splitting and the difference of energy between two sets of degenerate orbitals.

(i) If $\Delta_0 > P$, it becomes more energetically favorable for the fourth electron to occupy as t_{2g} orbital with configuration $t_{2g}^4 e_g$. Thus ligands for which $\Delta_0 >$ P are known as strong field ligands and form low spin complex.

(ii) If $\Delta_0 < P$, the fourth electron enters one of the e_g, orbital giving the configuration $t_{2g}^4 e_g$, ligands for which $\Delta_0 < P$ are known as weak field ligands and from high spin complexes.

Q. 23. Give reasons for the following: *3 marks*

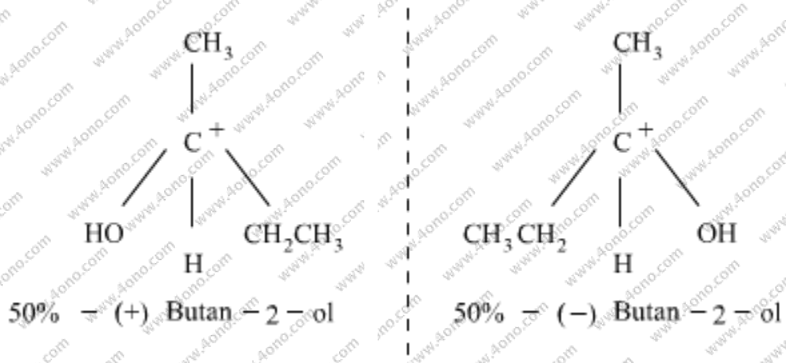
(i) Ethyl iodide undergoes S_N2 reaction faster than ethyl bromide.

(ii) $(\pm)$2-Butanol is optically inactive.

(iii) C-X bond length in halobenzene is smaller than C-X bond length in $CH_3 - X$.

Ans. (i) Ethyl iodide I^- ion is better leaving group than Br^- ion, therefore, ethyl iodide reacts faster than ethyl bromide in S_N2 reaction with OH^-ion.

(ii) The $(\pm) - \text{Butan} - 2 - \text{ol}$ is optically inactive because it exist in two enantiomeric forms which are non-superimposable mirror images of each other. Both the isomers are present in equal amounts therefore, it does not rotate the plane of polarized light and is optically inactive.



(iii) This is due to partial double bond character of C – X bond in chlorobenzene due to resonating structures.

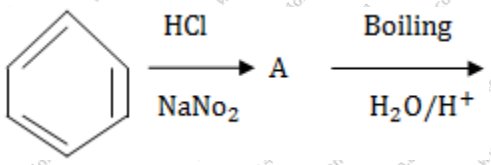
Q. 24. Complete the following reactions: *3 marks*

(i) $CH_3\ CH_2\ NH_2 + CHCl_3$ **+alc. KOH⟶**

(II)

$$C_6H_5N_2^+Cl^- \xrightarrow[\text{(Room temp.)}]{H_2O}$$

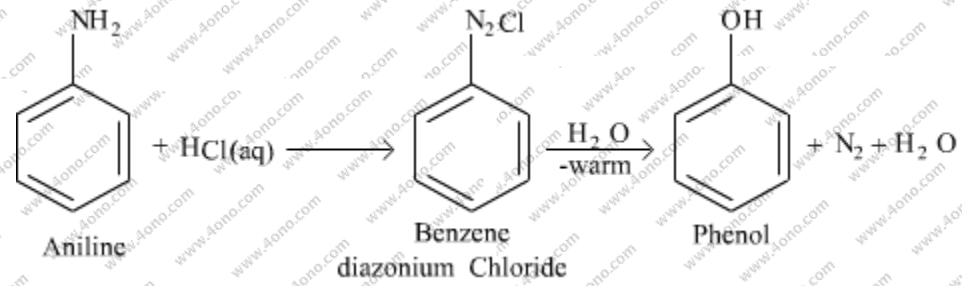
(III)



Ans. (i) $CH_3CH_2NH_2 + CHCl_3 + 3KOH \longrightarrow CH_3CH_2NC + 3KCl + 3H_2O$

(ii) $C_6H_5N_2^+Cl^- \xrightarrow[(Room\ temp.)]{H_2O} C_6H_5OH + N_2 + HCl$

(iii)



Q. 25. (i) What class of drug is Ranitidine.

(ii) If water contains dissolved Ca^{2+} ions, out of soaps and synthetic detergents, which will you use for cleaning clothes.

(iii) Which of the following is an antiseptic. 0.2% phenol, 1% phenol. *3 marks*

Ans. (i) Ranitidine is antacid an oral drug that blocks the production of acid by acid – producing cells in the stomach.

(ii) Ca^{2+} Makes water hard. Therefore, soap cannot be used as it gets precipitated in hard water. In contrast, a synthetic detergent does not precipitate in hard water because its calcium salt is also soluble in water. Hence, synthetic detergents can be used for cleaning clothes in hard water.

(iii) 0.2 % phenol is an antiseptic.

Q. 26. Calculate the emf of the following cell at. *3 marks*

$25^0C: Ag(s)|Ag^+(10^{-3}M||Cu^{2+}(10^{-1}\ M)|Cu(s)$ Give

$E^0{}_{Cell} = -0.46\ V$ and $log\ 10^n = n$

Ans. $2Ag^+Cu^{2+} \longrightarrow 2Ag^+Cu(s)$

$$= E^0{}_{cell} = E^0{}_{cell} - \frac{0.059}{2} log\ \frac{[10^{-3}]^2}{[10^{-1}]}$$

$$= -0.46 - \frac{0.059}{2} log 10^{-5} = -0.46 - \frac{0.059}{2} \times (-5) = -0.46 + 0.1475$$

$E^0{}_{cell} = -0.3125\ V.$

Q. 27. Shanti, a domestic helper of Mrs. Anuradha, fainted while mopping the floor. Mrs. Anuradha immediately took her to the nearby hospital where she was diagnosed to be severely 'anemic'. The doctor prescribed an iron rich diet and multivitamins supplement to her. Mrs. Anuradha supported her financially to get the medicines. After a month, Shanti was diagnosed to be normal. After reading the above passage, answer the following question.

(i) What values are displayed by Mrs. Anuradha?
(ii) Name the vitamin whose deficiency causes 'pernicious anemia'.
(iii) Give an example of a water soluble vitamin. *3 marks*

Ans. (i) Mrs. Anuradha displayed value like concern, care and help being with domestic helper in her unfortunate moments.
(ii) Vitamin B_{12}
(iii) B-complex and Vitamin - C

SECTION - D

Q. 28. (a) State Raoult's law for a solution containing volatile components. How does Raoult's law become a special case of Henry's law. *5 marks*
(b) 1.00 g of a non-electrolyte solute dissolved in 50 g of benzene lowered the freezing point of benzene by 0.40 K. Find the molar mass of the solute. (K_f for benzene = 5.12kg mol^{-1}).

Ans. (a) Raoult's law states that for a solution of voltage liquids the partial vapour pressure of each component is directly proportional to it mole fraction.

The relative lowering of vapour pressure is equal to mole fraction of solute in case of nonvolatile solute.

Because, Henry's law also states that" the partial pressure of the gas in vapour phase (P) is proportional to the mole fraction of the gas (x) in the solution".

(b) Substituting the values of various terms involved in equation,

$$M_B = \frac{K_F \times W_B \times 1000}{\Delta T_F \times W_A}$$

We get.

$$M_2 = \frac{5.12\ kg\ mol^{-1} \times 1.00g \times 1000g\ kg^{-1}}{0.40 \times 50g} = 256\ g\ mol^{-2}$$

Thus, molar mass of the solute = $256g\ mol^{-1}$

Or

(a) Define the following terms:
(i) Ideal solution
(ii) Azeotrope
(iii) Osmotic pressure

(b) A solution of glucose ($C_6H_{12}O_6$) in water is labelled as 10% by weight. What would be the molality of the solution? (Molar mass of glucose = 180 g mol^{-1})

(a) (i) Ideal Solution: The solutions which obey raoult's law over the entire range of concentration are known as ideal solution. eg-n-hexane and n-heptane.

$\Delta H(mix) = 0, \Delta V\ (mix) = 0$

(ii) Azeotrope: a mixture of two liquids which has a constant boiling point and composition throughout distillation.

eg. Ethanol and water.

(iii) Osmotic pressure: It is extra pressure which is applied on the solution to just prevent the flow of solvent into the solution through a semi permeable membrane.

(b) 10% by weight: 10gm of glucose in 100 gm of solution

$\therefore \quad WB = 10gm, WA = 90gm, ws = 100g$

$MB(C_6H_{12}O_6) = 180g.$

$$\text{Molality (m)} = \frac{WB}{MB \times WA\ (kg)} = \frac{10 \times 1000}{180 \times 90} = 0.617m$$

Q. 29. (a) Give reasons for the following: *5 marks*

(i) Mn^{3+} **is a good oxidising agent.**

(ii) $E^0_{M2+/M}$ **value is not regular for first row transition metals (3d series).**

(iii) Although 'F' is more electronegative than 'O', the highest Mn fluoride is MnF_4**, whereas the highest oxide is** Mn_2O_7**.**

(b) Complete the following equations:

(i) $2CrO_4^{2-} + 2H^+ \longrightarrow$

(ii) $2KMnO_4 \xrightarrow{Heat}$

Ans. (i) Mn^{3+}/Mn^{2+} has large E^0 (positive) value Mn^{+2} has half-filled electronic configuration hence it is more stable then Mn^{3+}

(ii) $E^0(Mn^{2+}/M)$ values are not regular. This can be explained due to irregular variation of ionization energies ($IE_1 + IE_2$) and also the sublimation energies. Stability of +2 oxidation state decreases from left to right (except Mn and Zn)

(iii) The electronic configuration in manganese fluoride is MnF_4 highest oxidation state of manages in fluoride is + 4 but highest oxidation state is +7 in Mn_2O_7 because oxygen can from multiple bond. Whereas fluorine can from single bond with metal.

(a) (i) $2CrO_4^{2-} + 2H^+ \longrightarrow Cr_2O_7^{2-} + H_2O$

(ii) $2KMnO_4 \xrightarrow{Heat} K_2MnO_4 + MnO_2 + O_2$

OR

(b) Why do transition elements show variable oxidation state.

(i). Name the element showing maximum number of oxidation states among the first series of transition metals form Sc (Z = 21) to Zn (Z = 30).

(ii) Name the element which shows only + 3 oxidation state.

(b) What is lanthanoid contraction? Name an important alloy which contains some of the lanthanoid metals.

Ans. (a). The transition metals have their valence electrons (n - 1) d and n s orbitals. Since, there is very little energy difference between these orbitals, both energy levels can be used for bond formation. Thus transition elements exhibit variable oxidation states.

(i) Manganese

(ii) Boron, aluminum, scandium, gallium, yttrium, indium, Lanthanum, are shows only +3 oxidation state.

(a) The overall decrease in atomic and ionic ratio from lanthanum to lutetium due to the imperfect shielding of one electron by another in the same subshell is known as lanthanoid contraction.

An important alloy containing lanthanoid metals is misch metal which contains 95% lanthanoid metals and 5% iron along with traces of S, C, Ca and A1. It is used in Mg-based alloy to produce bullets, shells and lighter flints.

Q. 30. (a) How will you convert the following: *5 marks*

(i) Propanone to Propan-2-ol

(ii) Ethanal to 2-hydroxy propanoic acid

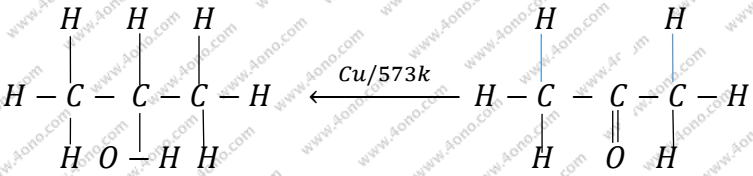
(iii) Toluene to benzoic acid

(b) Give simple chemical test to distinguish between:

(i) Pentan-2-one and Pentan-3-one

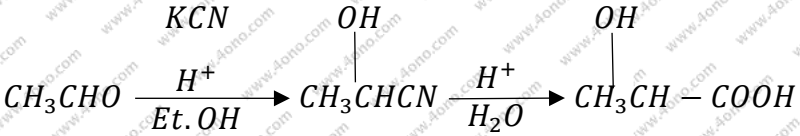
(ii) Ethanal and Propanal

Ans. (a) (i) Propanone to propan – 2 – ol



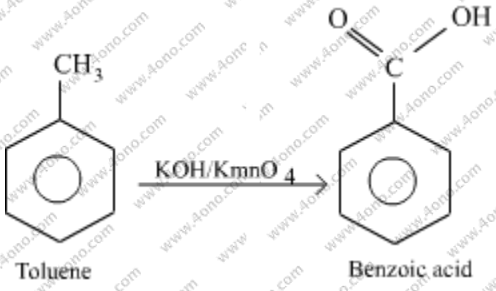
Propan-2-ol Propanone

(ii) Ethanal 2-hycdroxy propanoic acid



Ethanal 2-hydroxy propanoic acid

(iii) Toluene to benzoic acid



(b) (i) Pentan – 2 – one and pentan – 3 -one

But Pentan -3-one + NaOI⟶ No reaction

$$CH_3 - \overset{\overset{O}{\|}}{C} - CH_2 - CH_2 - CH_3 + 3\,NaOI \xrightarrow[\substack{I_2 \\ Heat}]{NaOH} CHI_3 + CH_3CH_2CH_2COONa + 2NaOH$$

Sodium hypoiodite — Yellow ppt.(iodoform)

(ii) Ethanal and propanal

$$CH_3CH_2CHO + 3\,NaOI \longrightarrow \text{no reaction}$$

Or

a. Write the products of the following reactions:

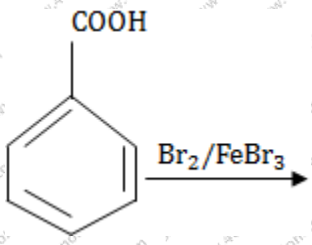
(i)

$$CH_3 - \overset{\overset{O}{\|}}{C} - CH_3 \xrightarrow[\text{conc. HCl}]{Zn - Hg}$$

(ii)

$$CH_3 - \overset{\overset{O}{\|}}{C} - CH_3 + H_2 \xrightarrow{Pb - BaSO_4}$$

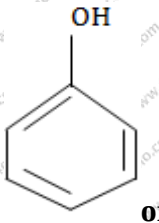
(iii)



Ans. (a).Which acid of each pair shown here would you expect to be stronger.

(i) $F - CH_2 - COOH \quad or \quad Cl - CH_2 - COOH$

(ii)



or $\boldsymbol{CH_3COOH}$

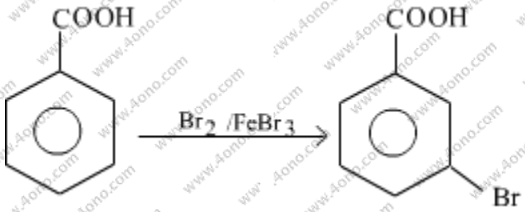
$$CH_3CHO + 3NaOI \xrightarrow[\Delta]{NaOH/I_2} CHI_3 + HCOONa + 2NaOH$$

Ethanol (yellow ppt.)

(a) (i) $CH_3 - \underset{\underset{O}{\|}}{C} - CH_3 \xrightarrow[Conc.HCl]{Zn - Hg} CH_3CH_2CH_3$

(a) (ii) $CH_3 - \underset{\underset{O}{\|}}{C} - Cl + H_2 \xrightarrow[boiling\ xylene]{Pd - BasO_4} CH_3CHO + HCI$

(iii)



(b) (i) $F - CH_2\ COOH$ is stronger acid as higher (-I effect), stronger is the acid. Order of (-I) effect = I < Br < Cl < F.

(ii) acetic acid is stronger acid than phenol.