MUST DO 100 QUESTIONS

FOR

Class 12th

BOARDS 2024

The partial pressure of ethane over a saturated solution containing 6.56×10^{-2} g of ethane is 1 bar. If the solution were to contain 5.0×10^{-2} g of ethane, then what will be the partial pressure of the gas ? [CBSE Comptt. Delhi 2013]

positive deviation ?

OR

Define azeotropes. What type of azeotrope is formed by positive deviation from Raoult's law ? Give an example. [CBSE Delhi 2015]

A Q. 6. (i) Gas (A) is more soluble in water than Gas (B) at the same temperature. Which one of the two gases will have the higher value of K_H (Henry's constant) and why ?

(ii) In non-ideal solution, what type of deviation shows the formation of maximum boiling azeotropes ?

[CBSE OD 2016]

R + A Q. 1. (a) 30 g of urea ($M = 60\ g\ mol^{-1}$) is dissolved in 846 g of water. Calculate the vapour pressure of water for this solution if vapour pressure of pure water at 298 K is 23.8 mm Hg.

(b) Write two differences between ideal solutions and non-ideal solutions. [CBSE OD Set-1, 2, 3 2017]

A 1.00 molal aqueous solution of trichloroacetic acid (CCl_3COOH) is heated to its boiling point. The solution has the boiling point of 100.18 °C. Determine the van't Hoff factor for trichloroacetic acid. (K_b for water = 0.512 K kg mol^{-1}).

Which of the following solutions has higher freezing point?

0.05 M $Al_2(SO_4)_3$, 0.1 M $K_3[Fe(CN)_6]$ Justify.

Calculate the mass of compound (molar mass = 256 g mol^{-1}) to be dissolved in 75 g of benzene to lower its freezing point by 0.48 K(K_f = 5.12 K kg mol^{-1}). [CBSE Delhi 2014]

A 10% solution (by mass) of sucrose in water has freezing point of 269.15 K. Calculate the freezing point of 10% glucose in water, if freezing point of pure water is 273.15 K.

Given : (molar mass of sucrose $= 342\ g\ mol^{-1}$)

(molar mass of glucose $= 180\ g\ mol^{-1}$)

5.9 g of benzoic acid dissolved in 49 g of benzene shows a depression in freezing point of 1.02 K. Calculate the Van't Hoff factor and predict the nature of solute (associated or dissociated).

(Given : Molar mass of benzoic acid = 122 g mol^{-1}, K_f for benzene = 4.9 K kg mol^{-1}) [CBSE Delhi 2015]

A solution containing 15 g urea (molar mass = 60 g mol^{-1}) per litre of solution in water has the same osmotic pressure (isotonic) as a solution of glucose (molar mass = 180 g mol^{-1}) in water. Calculate the mass of glucose present in one litre of its solution.

(i) The vapour pressure of benzene and toluene at 293 K are 75 mm Hg and 22 mm Hg respectively. 23.4 g of benzene and 64.4 g of toluene are mixed. If the two form an ideal solution, calculate the mole fraction of benzene in the vapour phase assuming that the vapour pressures are in equilibrium with the liquid mixture at this temperature.

Henry's law constant for CO_2 in water is 1.67×10^8 Pa at 298 K. Calculate the number of moles of CO_2 in 500 ml of soda water when packed under 2.53×10^5 Pa at the same temperature.

with dilution ? [CBSE OD 2014]

Given $\lambda^{\circ}(H^{+}) = 349.6\ S\ cm^2\ mol^{-1}$ and $\lambda^{0}(CH_3COO^{-}) = 40.9\ S\ cm^2\ mol^{-1}$. [CBSE Delhi Set-1, 2, 3 2017]

Q. 5. (i) Following reactions occur at cathode during the electrolysis of aqueous silver chloride solution :

$Ag^+(aq) + e^- \rightarrow Ag(s)$ $\quad E^\circ = +0.80\ V$

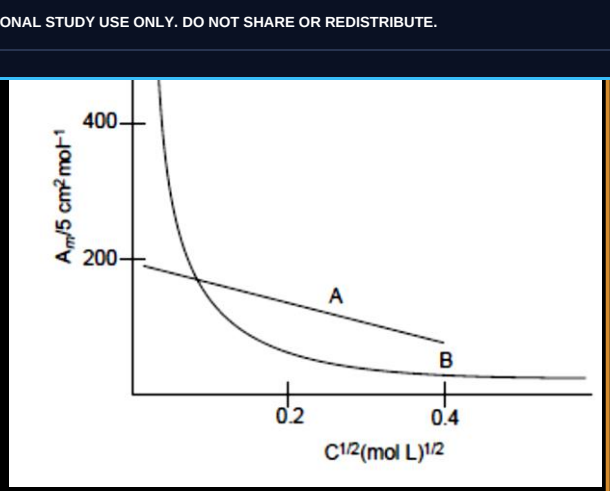
$H^+(aq) + e^- \rightarrow \frac{1}{2}H_2(g)$ $\quad E^\circ = 0.00\ V$

On the basis of their standard reduction electrode potential (E°) values, which reaction is feasible at the cathode and why ?

(ii) Define limiting molar conductivity. Why conductivity of an electrolyte solution decreases with the decrease in concentration ? [CBSE Delhi 2015]

conductivity of the electrolyte A on dilution ?

(ii) As seen from the graph, the value of limiting molar conductivity (Λ°_m) for electrolyte B cannot be obtained graphically. How can this value be obtained ? [CBSE SQP 2016]



Conductivity of $2.5 \times 10^{-}$ M methanoic acid is 5.25×10^{-5} S cm^{-1}.

Calculate its molar conductivity and degree of dissociation.

Given: $\lambda°(H^+) = 349.5$ S cm^2 mol^{-1} and $\lambda°(HCOO^-)$ = 50.5 S cm^2 mol^{-1}. [CBSE OD 2015]

$Cr(s)/Cr^{3+}$ (0.1M)//Fe^{2+} (0.01M)/Fe(s)

[Given: $E^0_{cell} = +0.30$ V]

OR

The conductivity of 10^{-3} mol/L acetic acid at 25°C is 4.1×10^{-5} S cm^{-1}. Calculate its degree of dissociation if Λ^0_m for acetic acid at 25°C is 390.5 S cm^2 mol^{-1}. [CBSE SQP 2017]

reaction at 298 K.

$$2Al_{(s)} + 3Cu^{2+}_{(aq)} \rightarrow 2Al^{3+}_{(aq)} + 3Cu_{(s)}$$

$[(E^{\circ}_{cell} = 2.02\ V),\ IF = 96500C\ mol^{-1}]$

[CBSE Comptt. OD Set-3 2017]

A Q. 5. Calculate e.m.f. of the following cell at 298 K :

$2Cr(s) + 3Fe^{2+}(0.1M) \rightarrow 2Cr^{3+}(0.01M) + 3Fe(s)$

$E^\circ(Cr^{3+} \mid Cr) = -0.74$

$E^\circ(Fe^{2+} \mid Fe) = -0.44$ V. [CBSE Delhi 2016]

A Q. 6. Calculate the emf of the following cell at 25° C :

$Fe \mid Fe^{2+}(0.001\ M) \mid\mid H^+(0.01\ M) \mid H_2(g)\ (1bar) \mid Pt(s)$

$E^\circ(Fe^{2+} \mid Fe) = -0.44$ V $E^\circ(H^+ \mid H_2) = 0.00$ V

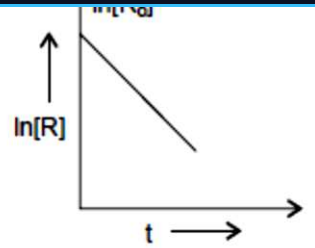
For a reaction, $A + B \rightarrow$ Product, the rate law is given by $r = k[A]^{1/2}[B]^2$. What is the order of the reaction ? [CBSE SQP 2016; DDE]

If the rate constant of a reaction is $k = 3 \times 10^{-4}$ s^{-1}, then identify the order of the reaction.

[CBSE Comptt. OD 2013]

Write two differences between 'order of reaction' and 'molecularity of reaction'.

[CBSE Delhi 2014]

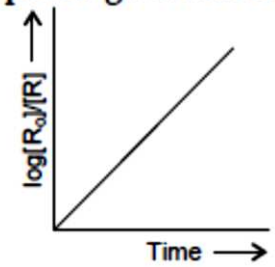


For this reaction :

(i) Predict the order of reaction

(ii) What is the unit of rate constant (k)?

[CBSE Comptt. Delhi Set-1, 2 2017]



For this reaction :

(i) Predict the order of reaction

(ii) What is the unit of rate constant (k)?

[CBSE Comptt. Delhi Set-3 2017]

A first order reaction takes 20 minutes for 25% decomposition. Calculate the time when 75% of the reaction will be completed.

Rate constant k for a first order reaction has been found to be 2.54×10^{-3}, sec^{-1}. Calculate its $3/4^{th}$ life. (log 4 = 0.6020)

The following data were obtained during the first order thermal decomposition of SO_2Cl_2 at a constant volume:

Experiment	Time (s)	Total pressure (atm)
1	0	0.3
2	100	0.5

Calculate rate constant.

[Given: log 6 = 0.7782; log 3 = 0.4771]

Experiment No.	[A]	[B]	Initial rate of formation of D
1	0.1 M	0.1 M	6.0×10^{-3} M min^{-1}
2	0.3 M	0.2 M	7.2×10^{-2} M min^{-1}
3	0.3 M	0.4 M	2.88×10^{-1} M min^{-1}
4	0.4 M	0.1 M	2.40×10^{-2} M min^{-1}

Determine rate law and the rate constant for the reaction.

The decomposition of A into products has a value of k as $4.5 \times 10^3\ s^{-1}$ at 10° C and energy of activation 60 kJ mol^{-1}. At what temperature would k be $1.5 \times 10^{-4}\ s^{-1}$? [CBSE Delhi 2013]

Q. 4. Explain the following :

(i) The enthalpies of atomization of transition metals are quite high.

(ii) The transition metals and many of their compounds act as good catalysts. [CBSE Comptt. Delhi 2012]

Assign the reason for the following :

Copper (I) ion is not known in aqueous solution.

Explain the following observation :
Most of the transition metal ions exhibit characteristic colour in aqueous solution.

Why E° value for Mn, Ni and Zn are more negative than expected ? [NCERT Exemplar]

The transition metals and their compounds are usually paramagnetic.

The transition metals exhibit variable oxidation states. [CBSE Comptt. Delhi 2015]

Mn^{3+}, V^{3+}, Cr^{3+}, Ti^{4+}

(Atomic no: Mn = 25, V = 23, Cr = 24, Ti = 22)

(a) Which ion is most stable in an aqueous solution?

(b) Which ion is the strongest oxidizing agent?

(c) Which ion is colourless?

(d) Which ion has the highest number of unpaired electrons? [CBSE Foreign Set-1, 2, 3 2017]

Q. 3. Complete the following chemical equations :

(i) $MnO_4^-(aq) + S_2O_3^{2-}(aq) + H_2O(l) \rightarrow$

(ii) $Cr_2O_7^-(aq) + Fe^{2+}(aq) + H^+(aq) \rightarrow$

Q. 5. Explain the following observations:

(i) Copper atom has completely filled d orbitals ($3d^{10}$) in its ground state, yet it is regarded as a transition element.

(ii) Cr^{2+} is a stronger reducing agent than Fe^{2+} in aqueous solution.

(i) E^0 for Mn^{3+}/Mn^{2+} couple is more positive than that for Fe^{3+}/Fe^{2+}. (At. Nos. Mn = 25, Fe = 26).

(ii) Ce^{3+} can be easily oxidised to Ce^{4+}. (At. No. Ce = 58). [CBSE OD 2012]

(i) Silver atom has completely filled *d*-orbitals ($4d^{10}$) in its ground state, yet it is regarded as a transition element.

(ii) E^0 value for Mn^{3+}/Mn^{2+} couple is much more positive than Cr^{3+}/Cr^{2+}.

A Q. 2. The magnetic moment of few transition metal ions are given below:

Metal ion	Magnetic moment (BM)
Sc^{3+}	0.00
Cr^{2+}	4.90
Ni^{2+}	2.84
Ti^{3+}	1.73

(at no. Sc = 21, Ti = 22, Cr = 24, Ni = 28)

Which of the given metal ions:

(i) has the maximum number of unpaired electrons?

(ii) force colourless aqueous solution?

(iii) exhibits the most stable +3 oxidation state?

OR

Consider the standard electrode potential values (M^{2+}/M) of the elements of the first transition series.

Ti	V	Cr	Mn	Fe
−1.63	−1.18	−0.90	−1.18	−0.44
Co	Ni	Cu	Zn	
−0.28	−0.25	+0.34	−0.76	

Explain :

(i) E^0 value for copper is positive.

(ii) E^0 value of Mn is more negative as expected from the trend.

What is lanthanoid contraction ? What are its two consequences ?

(i) Eu^{2+} is a strong reducing agent.

(ii) Orange colour of dichromate ion changes to yellow in alkaline medium.

(iii) $E^0(M^{2+}/M)$ values for transition metals show irregular variation. [CBSE Foreign Set-2 2017]

Write IUPAC name of the complex: $[CoCl_2(en)_2]^+$.

Write IUPAC name of the complex $[Co(NH_3)_4Cl(NO_2)]^+$.

Which of the following is more stable complex and why ?
$[Co(NH_3)_6]^{3+}$ and $[Co(en)_3]^{3+}$.

How many ions are produced from the complex, $[CO(NH_3)_6]Cl_2$ in solution ? [CBSE SQP 2016]

When a co-ordination compound $CoCl_3 \cdot 6NH_3$ is mixed with $AgNO_3$, 3 moles of AgCl are precipitated per mole of the compound. Write Structural formula of the complex, IUPAC name of the complex. [CBSE OD 2016]

(i) What type of isomerism is shown by the complex $[Co(NH_3)_6][Cr(CN)_6]$?

Why a solution of $[Ni(H_2O)_6]^{2+}$ is green while a solution of $[Ni(CN)_4]^{2-}$ is colourless? (At. No. of Ni = 28) [KVS]

Write the IUPAC name of the following complex: $[Co(NH_3)_5(CO_3)Cl]$.

complex $[Co(en)_3]Cl_3$?

Write the hybridization and magnetic character of $[Co(C_2O_4)_3]^{2-}$. (At. no. of Co = 27)

Write IUPAC name of the following Complex

$[Cr(NH_3)_3Cl_3]$ [CBSE Delhi Set-3 2017]

Write the hybridization, shape and magnetic character of $[Fe(CN)_6]^{4-}$.

For the complex ion $[CoF_6]^{3-}$ write the hybridization type, magnetic character and spin nature. [Atomic number: Co = 27]

complex compounds.

(b) The lowest oxide of transition metal is basic whereas the highest oxide is amphoteric or acidic.

(c) E^0 value for the Mn^{3+}/Mn^{2+} couple is highly positive (+1.57 V) as compare to Cr^{3+}/Cr^{2+}.

(ii) Write one similarity and one difference between the chemistry of lanthanoid and actinoid elements.

OR

(i) (a) How is the variability in oxidation states of transition metals different from that of the *p*-block elements?

(b) Out of Cu^+ and Cu^{2+}, which ion is unstable in aqueous solution and why?

(c) Orange colour of $Cr_2O_7^{2-}$ ion changes to yellow when treated with an alkali. Why?

(ii) Chemistry of actinoids is complicated as compared to lanthanoids. Give two reasons.

[CBSE Delhi Set-1, 2, 3 2017]

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State reason for each of the following :

CO is stronger complexing reagent than NH_3.

The molecular shape of $Ni(CO)_4$ is not the same as that of $[Ni(CN)_4]^{2-}$.

Explain why $[Co(NH_3)_6]^{3+}$ is an inner complex whereas $[Ni(NH_3)_6]^{2+}$ is an outer orbital complex. (At. no. Co = 27, Ni = 28)

(i) Draw the geometrical isomers of complex $[Pt(NH_3)_2Cl_2]$.

On the basis of crystal field theory, write the electronic configuration for d^4 ion if $\Delta_o < P$.

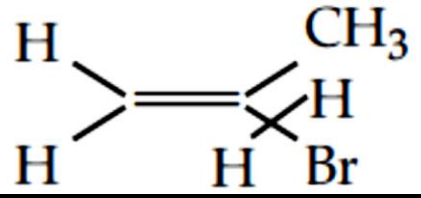
Write the hybridization and magnetic behaviour of the complex $[Ni(CO)_4]$. (At. no. of Ni = 28)

A coordination compound with molecular formula $CrCl_3.4H_2O$ precipitates one mole of AgCl with AgNO3 solution. Its molar conductivity is found to be equivalent to two ions. What is the structural formula and name of the compound?

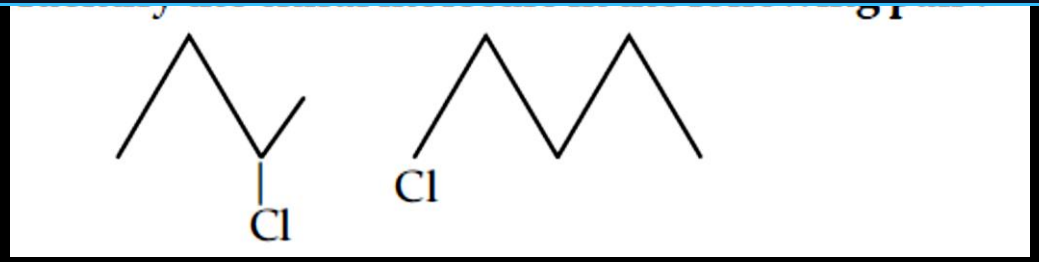
A metal ion M^{n+} having d^4 valence electronic configuration combines with three bidentate ligands to form a complex compound. Assuming $\Delta_o > P$.

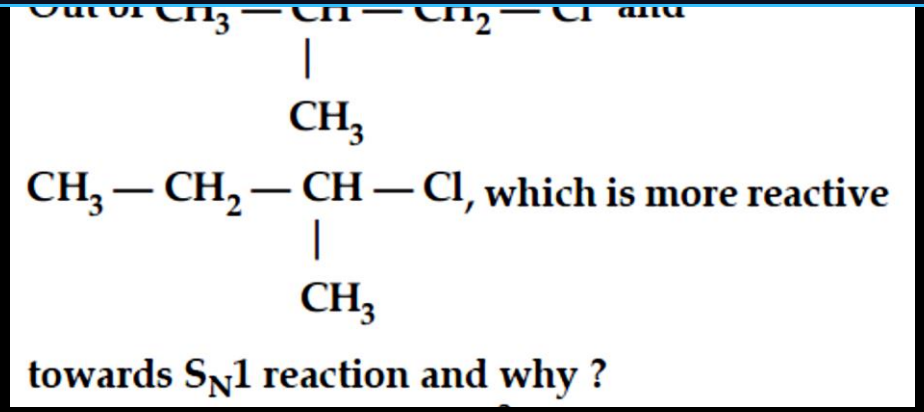
Write the structure of 1-Bromo-4-chlorobut-2-ene. [CBSE Delhi Set-1 2017]

Write the IUPAC name of the following :



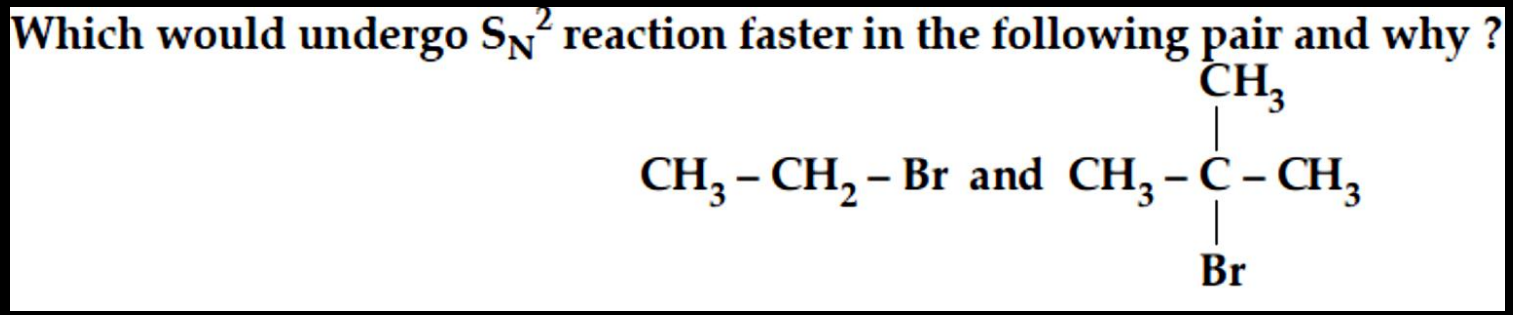
Write the structure of 2,4-dinitrochlorobenzene. [CBSE Delhi Set-2 2017]





towards S_N1 reaction and why ?

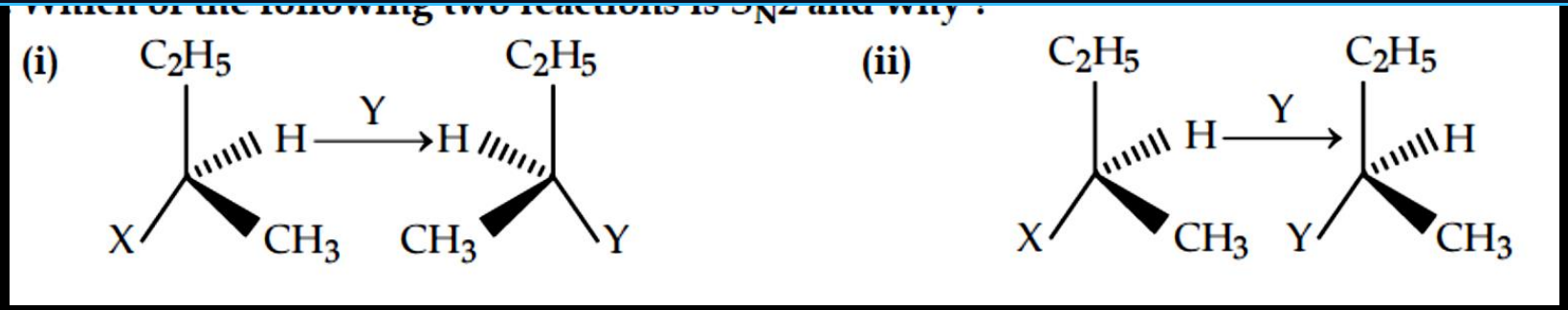
Which would undergo S_N^2 reaction faster in the following pair and why ?



formula C_5H_{12}, identify the one that on photochemical chlorination yields a single monochloride. [CBSE SQP 2016]

How can methyl bromide be preferentially converted to methyl isocyanide ?

which of the following two reactions is S_N2 and why ?



(i) The C—Cl bond length in chlorobenzene is shorter than that in CH_3—Cl.

(ii) Chloroform is stored in closed dark brown bottles.

Chlorobenzene is extremely less reactive towards a nucleophilic substitution reaction. Give two reasons for the same.

Give reasons :

C–Cl bond length in chlorobenzene is shorter than C–Cl bond length in CH_3–Cl.

The dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.

S_N1 reactions are accompanied by racemization in optically active alkyl halides.

2. Following compounds are given to you :

2-Bromopentane, 2-Bromo-2-methylbutane, 1-Bromopentane

(i) Write the compound which is most reactive towards S_N2 reaction.

(ii) Write the compound which is optically active.

(iii) Write the compound which is most reactive towards β-elimination reaction.

[CBSE Delhi/OD, Set-1, 2, 3 2017]

What happens when :

CH_3–Cl is treated with aqueous KOH ?

CH_3–Cl is treated with KCN ?

CH_3–Br is treated with Mg in the presence of dry ether ? [CBSE Delhi 2016]

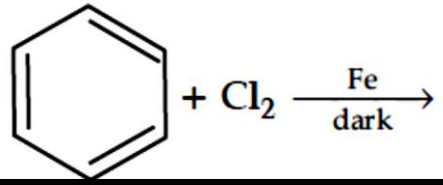
when :

(i) 2-Methyl-1-bromopropane is treated with sodium is the presence of dry ether.

(ii) 1-Methyl cyclohexene is treated with Hl.

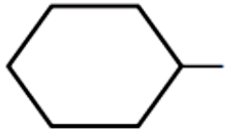
(iii) Chloroethane is treated with silver nitrite.

Draw the structure of major monohalo product in the following reaction :

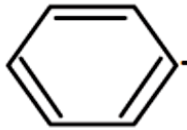


$$+ Cl_2 \xrightarrow[dark]{Fe}$$

Draw the structure of major monohalo product in each of the following reactions :



$$\xrightarrow{SOCl_2}$$



$$— CH_2—CH = CH_2 + HBr \xrightarrow{Peroxide}$$

How will you carry out the following conversion :

(i) 2-Bromopropane to 1-bromopropane

(ii) Benzene to p-chloronitrobenzene

[CBSE Comptt. OD Set-1, 2, 3 2017]

group, yet it is *ortho-*, *para*-directing in electrophilic aromatic substitution reactions. Explain why it is so ? [CBSE Delhi 2012]

What happens when

Chlorobenzene is treated with $Cl_2/FeCl_3$,

Ethyl chloride is treated with $AgNO_2$,

2-bromopentane is treated with alcoholic KOH ?

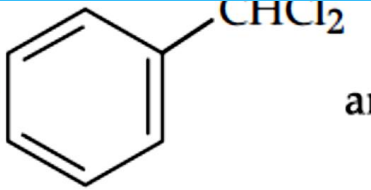
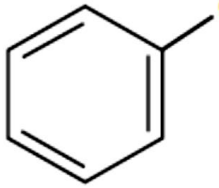
Write the chemical equations in support of your answer.

10. Give reasons :

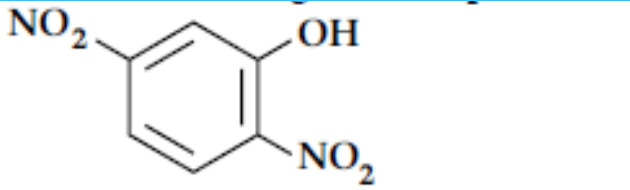
n-Butyl bromide has higher boiling point than t-butyl bromide.

Racemic mixture is optically active.

The presence of nitro group ($-NO_2$)at O/P positions increases the reactivity of haloarenes towards nucleophilic substitution reactions. [CBSE Delhi 2015]

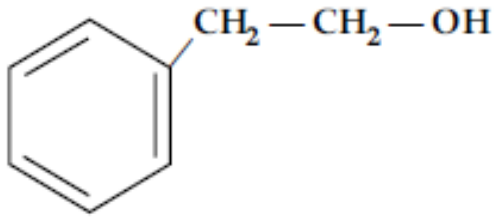
Out of  and  ,

which is an example of benzylic halide?



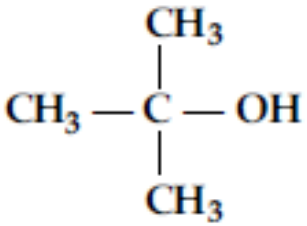
[CBSE Delhi 2015]

Write the IUPAC name of the given compound : 1



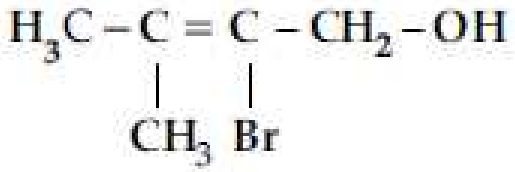
[CBSE OD 2016]

Write the IUPAC name of the following :



[CBSE Comptt. OD 2012]

Write the IUPAC name of the following compound :



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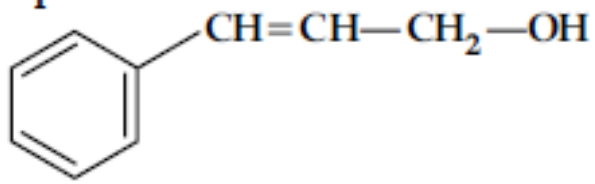
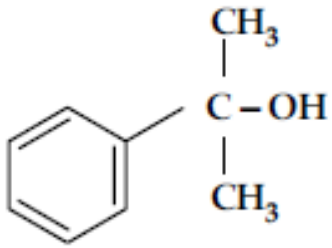


Write the IUPAC name of the following compound :



[CBSE Foreign Set-3 2017]

Draw the structure of hex-1-en-3-ol compound.

[CBSE Delhi 2012]

Which of the following isomers is more volatile :

o-nitrophenol or *p*-nitrophenol ?

[CBSE Delhi 2014]

Out of CH_3OH and 

, which one is more acidic ?

[CBSE Comptt. Delhi 2016]

Write the chemical reaction to explain Kolbe's reaction. [CBSE Comptt. Delhi 2013]

Give a chemical test to distinguish between 2-Pentanol and 3-Pentanol.

[CBSE Comptt. Delhi 2013]

What happens when phenol is oxidized by $Na_2Cr_2O_7 / H_2SO_4$?

[CBSE Comptt. OD Set-1 2017]

Q. 1. (i) Predict the major product of acid catalysed dehydration of 1-Methylcyclohexanol.

(ii) You are given benzene, conc. H_2SO_4, NaOH and dil.HCl. Write the preparation of phenol using these reagents.

(i) Reimer-Tiemann reaction

(ii) Williamson synthesis

CBSE 2014

o-nitro phenol is more acidic than o-methoxy phenol. Explain why. [CBSE Comptt. OD 2013]

Write the mechanism of the following reaction :

$$2CH_3CH_2OH \xrightarrow[413\ K]{conc.\ H_2SO_4} CH_3CH_2{-}O{-}CH_2CH_3$$

[CBSE Delhi 2016]

(i) Alcohols are more soluble in water than the hydrocarbons of comparable molecular masses.

(ii) ortho-nitrophenol is more acidic than ortho-methoxyphenol. [CBSE OD 2012]

Write the structures of the products when Butan-2-ol reacts with the following

(i) CrO_3

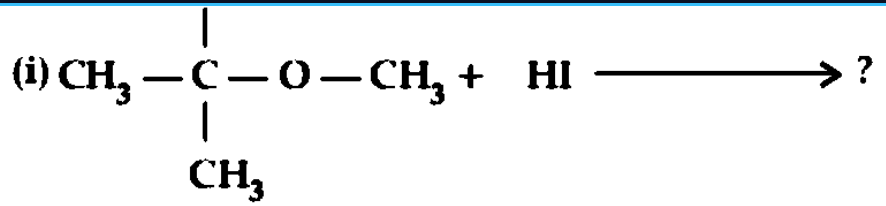
(ii) $SOCl_3$ [CBSE OD Set-1, 2, 3 2017]

How do you convert:

(i) Phenol to toluene

(ii) Formaldehyde to Ethanol

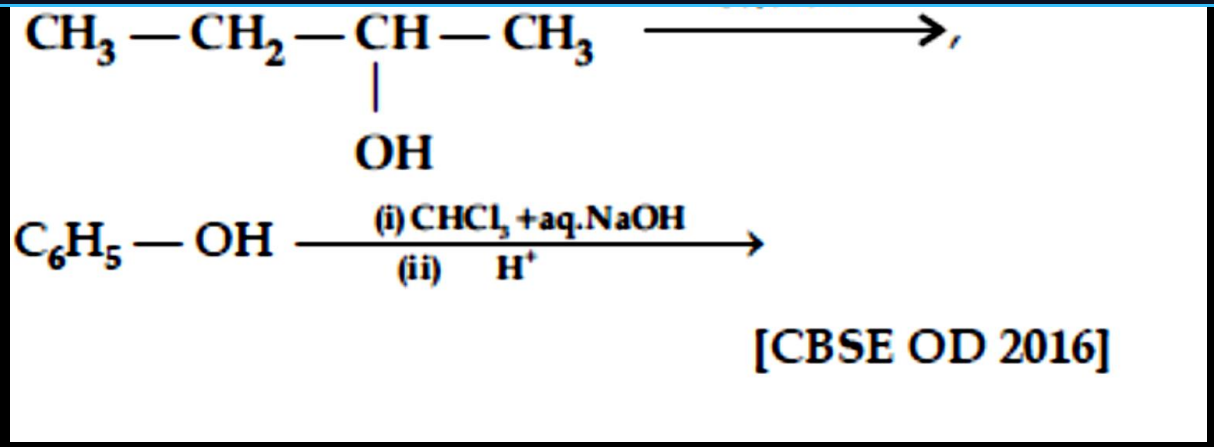
[CBSE OD Set-2 2016]

(i) 

(ii) $CH_3-CH=CH_2 \xrightarrow[(ii)\ 3H_2O_2/OH^-]{(i)\ B_2H_6} ?$

(iii) $C_6H_5-OH \xrightarrow[(ii)\ CO_2, H^+]{(i)\ aq.NaOH} ?$

[CBSE Delhi 2016]



[CBSE OD 2016]

(ii) Ethyl magnesium chloride to Propan-1-ol [CBSE Comptt. Delhi 2015]

(iii) Propene to Propan-2-ol

$(CH_3)_3C–OH$ is treated with Cu at 573 K,

Anisole is treated with CH_3Cl/anhydrous $AlCl_3$,

Phenol is treated with Zn dust?

Write chemical equation in support of your answer. [CBSE Foreign Set-1, 2, 3 2017]

(i) Alcohols are more soluble in water than the hydrocarbons of comparable molecular masses.

(ii) Ortho-nitrophenol is more acidic than ortho-methoxyphenol.

(iii) Cumene is a better starting material for the preparation of phenol. [SQP 2017]

(a) Bromination of phenol to 2,4,6-tribromophenol

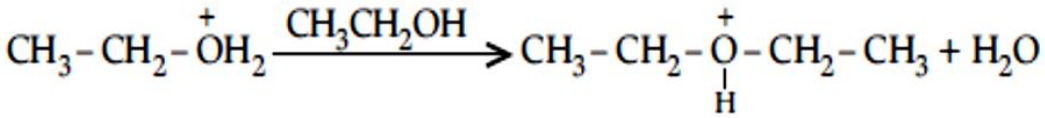
(b) Hydroboration of propene and then oxidation to propanol.

(ii) Arrange the following compound groups in the increasing order of their property indicated:

(a) p-nitrophenol, ethanol, phenol (acidic character)

(b) Propanol, Propane, Propanal (boiling point)

(iii) Write the mechanism (using curved arrow notation) of the following reaction:



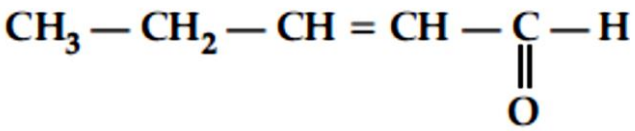
[CBSE Delhi Set-1,2,3 2017]

Write the IUPAC name of the following :

$CH_3 - CH_2 - CHO$ [CBSE Comptt. OD 2015]

Write the structure of 4-chloropentan-2-one.

Write the IUPAC name of :



. Arrange the following compounds in an increasing order of their reactivity in nucleophilic addition reactions :
ethanal, propanal, propanone, butanone. [CBSE Delhi 2012]

$(CH_3)_3C$-CHO does not undergo aldol condensation. Comment [CBSE SQP 2017]

.Give the chemical test to distinguish between the following pairs of compounds.
Propanal and propanone.
Benzaldehyde and Benzoic acid.

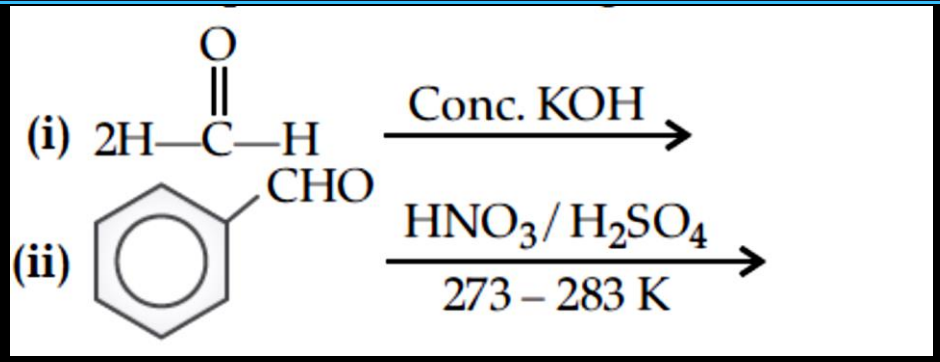
Out of $CH_3CH_2COCH_2CH_3$ and $CH_3CH_2CH_2COCH_3$ which gives iodoform test.

Name the reagents used in the following reactions :

[CBSE Delhi 2015]

$$CH_3 - CO - CH_3 \xrightarrow{?} CH_3 - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_3$$

$$C_6H_5 - CH_2 - CH_3 \xrightarrow{?} C_6H_5 - COO^-K^+$$



Write the reaction involved in the following

(a) Etard reaction

(b) Wolff-Kishner reduction

OR

Write the equations involved in the following reactions:

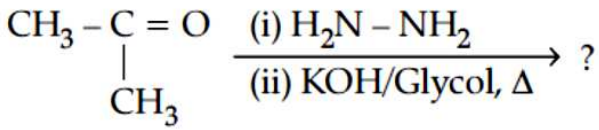
(i) Wolff-Kishner reduction

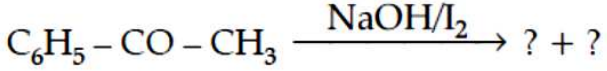
(ii) Etard reaction

Q. 5. Give simple chemical test to distinguish between the following pairs of compounds.

(i) Ethanal and propanal

(ii) Benzoic acid and phenol.





(iii) $CH_3COONa \xrightarrow{\Delta} ?$

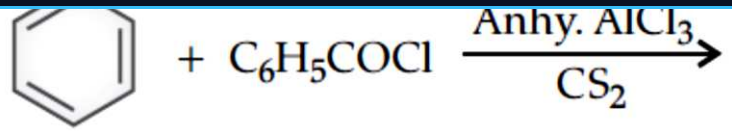
[CBSE Delhi 2015]

Ans. (i) $CH_3CH_2CH_3$ — **1**

(ii) $C_6H_5COONa + CHI_3$ — **½ + ½**

(iii) CH_4 — **1**

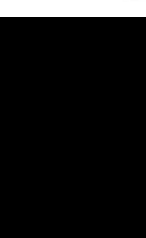
[CBSE Marking Scheme 2015]



$$+ \ C_6H_5COCl \xrightarrow[CS_2]{\text{Anhy. } AlCl_3}$$

$$H_3C - C \equiv C - H \xrightarrow{Hg^{2+}, H_2SO_4}$$

$$\xrightarrow[\text{(ii) } H_3O]{\text{(i) } CrO_2Cl_2}$$



[CBSE Delhi 2012]

How will you bring about the following conversions :

Propanone to propane

Benzoyl chloride to benzaldehyde.

Ethanal to but-2-enal.

(i) How will you convert the following :

(a) Propanone to propan-2-ol

(b) Ethanal to -2-hydroxy propanoic acid

(c) Toluene to benzoic acid

Distinguish the following pairs of compounds :

(a) Pentan-2-one and pentan-3-one

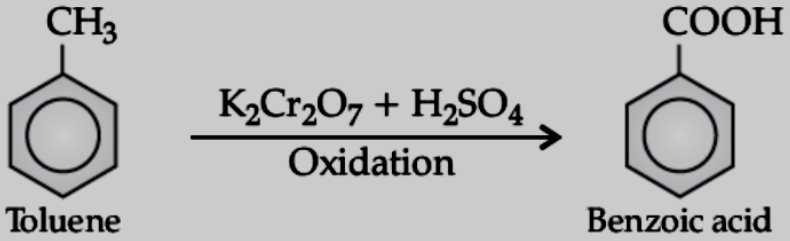
(b) Ethanal and propanal

(a) $CH_3—\overset{\overset{O}{\|}}{C}—CH_3 \xrightarrow[\text{Reduction}]{LiAlH_4} CH_3—\overset{\overset{OH}{|}}{CH}—CH_3$

Propanone → Propan-2-ol

(b) $H_3C\diagdown\!\!\diagup C=O + HCN \longrightarrow H_3C\diagdown\!\!\diagup C(OH)(H)(CN) \xrightarrow[HCl]{H_2O} CH_3\diagdown\!\!\diagup C(OH)(H)(COOH)$

Ethanal → 2-Hydroxy propanoic acid

(c) 

Toluene → Benzoic acid

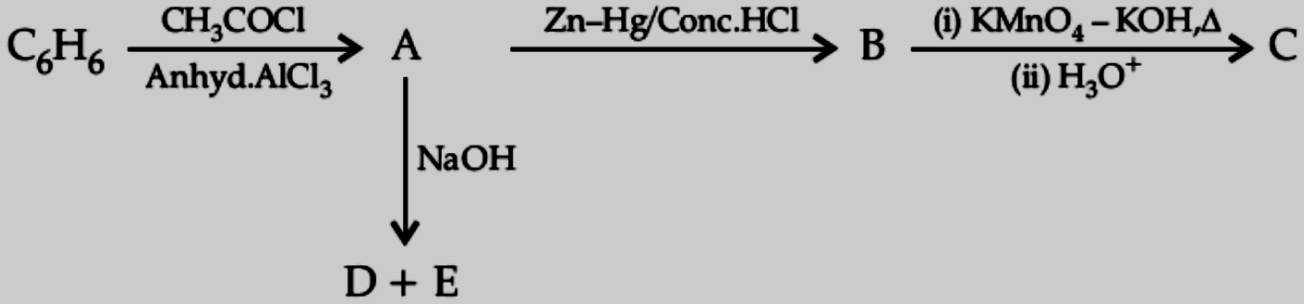
(a) Pentane -2-one gives yellow ppt of iodoform in Iodoform test, while pentane-3-one does not give it.

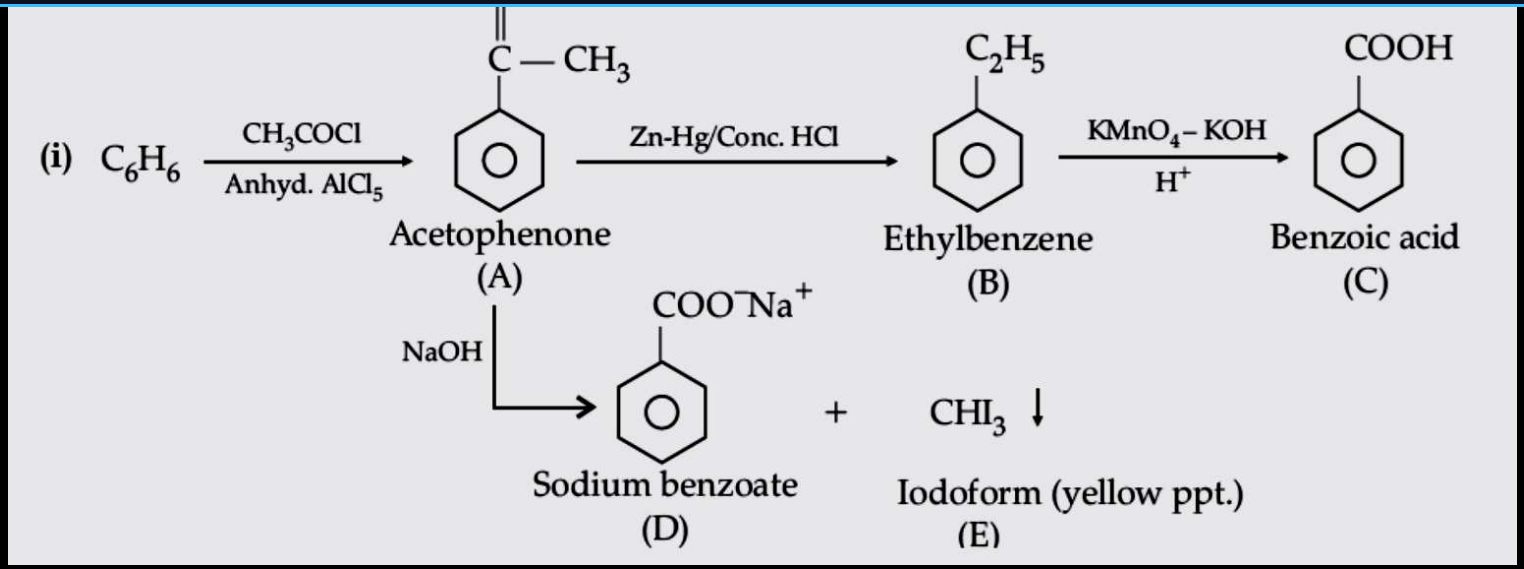
$$CH_3CH_2CH_2—\overset{\overset{O}{\|}}{C}—CH_3 + 3NaOI \longrightarrow \underset{\text{(Yellow ppt)}}{CHI_3\downarrow} + CH_3CH_2CH_2COONa + 2NaOH$$

(b) Ethanal will give iodoform test, while propanal will not give it.

$$CH_3CHO + 3NaOI \longrightarrow \underset{\text{(yellow ppt)}}{CHI_3\downarrow} + HCOONa + 2NaOH$$

(i) Write the structures of A, B, C, D and E in the following reactions:





Write the chemical equation for the reaction involved in Cannizzaro reaction.

Draw the structure of the semicarbazone of ethanal.

Why pK_a of $F - CH_2 - COOH$ is lower than that of $Cl - CH_2 - COOH$?

Write the product in the following reaction

$$CH_3 - CH = CH - CH_2CN \xrightarrow[(ii)\ H_2O]{(i)\ DIBAL\text{-}H} \ ?$$

How can you distinguish between propanal and propanone ?

(i) Write the structures of A and B in the following reactions :

(a) $CH_3COCl \xrightarrow{H_2, Pd - BaSO_4} A \xrightarrow{H_2N - OH} B.$

(b) $CH_3MgBr \xrightarrow[2.\ H_3O^+]{1.\ CO_2} A \xrightarrow{PCl_5} B.$

Distinguish between :

(a) $C_6H_5 - COCH_3$ and $C_6H_5 - CHO$, (b) CH_3COOH and $HCOOH$.

Arrange the following in the increasing order of their boiling points :

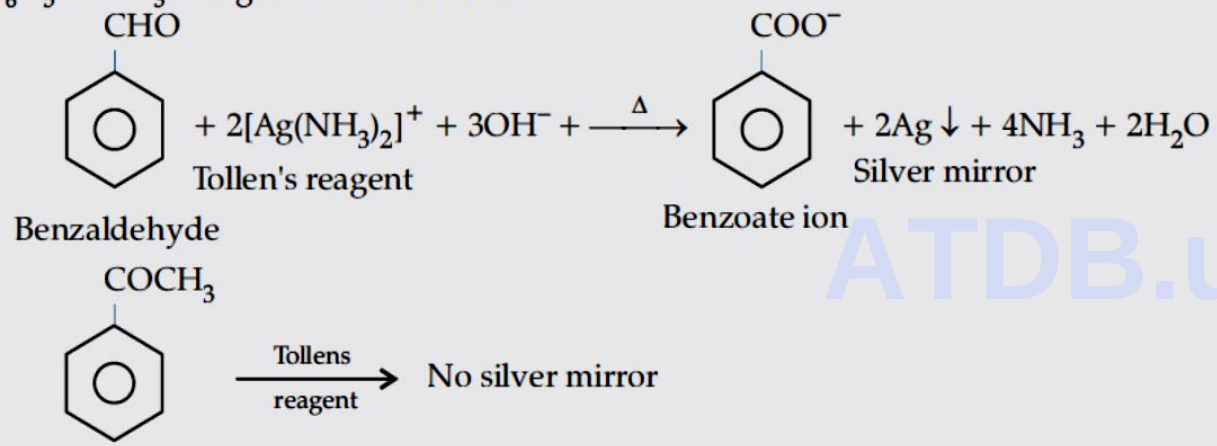
CH_3CHO, CH_3COOH, CH_3CH_2OH.

[A] Acetaldehyde [B] Acetaldoxime

(b) $CH_3MgBr \xrightarrow[2.H_3O^+]{1.\ CO_2} CH_3COOH \xrightarrow{PCl_5} CH_3COCl + HCl + POCl_3$ ½ + ½

[A] Acetic acid [B] Acetyl chloride

(ii) (a) C_6H_5 – CHO being an aldehyde reduces Tollen's reagent to give shining silver mirror whereas $C_6H_5COCH_3$ being a ketone does not.



1

(b) HCOOH gives silver mirror test with Tollen's reagent whereas ethanoic acid does not.

$HCOOH + 2\,[Ag(NH_3)_2]^+ + 2OH^- \longrightarrow 2Ag\downarrow + 2H_2O + CO_2 + 4NH_3$

Silver mirror

$CH_3COOH \xrightarrow[\text{reagent}]{\text{Tollen's}}$ No silver mirror (or any other correct test) 1

$CH_3CHO < CH_3CH_2OH < CH_3COOH$ 1

Arrange the following in the increasing order of their reactivity towards nucleophilic addition reaction :

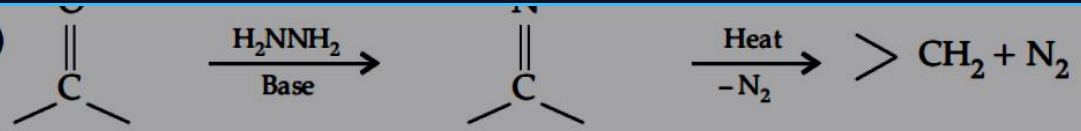
$C_6H_5COCH_3$, $CH_3 - CHO$, CH_3COCH_3

Why carboxylic acid does not give reactions of carbonyl group ?

Write the product in the following reaction

$$CH_3CH_2CH = CH - CH_2CN \xrightarrow[2.\ H_2O]{1.\ (i - Bu)_2AlH} ?$$

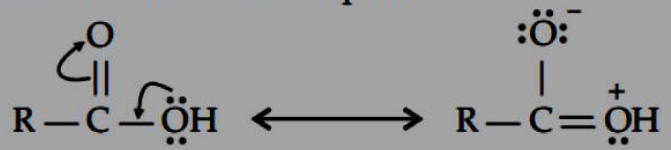
A and B are two functional isomers of compound C_3H_6O. On heating with NaOH and I_2, isomer B forms yellow precipitate of iodoform whereas isomer A does not form any precipitate. Write the formulae of A and B.

(i) 

1

(ii) $C_6H_5COCH_3 < CH_3—COCH_3 < CH_3—CHO$ 1

(iii) Carboxylic acids do not give reactions of carbonyl groups as it enters into resonance with lone pair O of –COOH groups thereby making the carbon atoms less electrophilic. 1



(iv) $CH_3CH_2CH=CH—CH_2CN \xrightarrow[2.H_2O]{1.\ (i\text{–}Bu)_2AlH} CH_3CH_2CH=CH—CH_2—CHO$ 1

Hex–3–enenitrile Hex–3–enal

(v) $CH_3CH_2CHO + NaOH + I_2 \longrightarrow$ No yellow precipitate ½

Propanal

[A]

$CH_3—CO—CH_3 + 3NaOH + 4I_2 \xrightarrow{\Delta} CHI_3 + 3NaI + CH_3COONa + 3H_2O$ ½

Acetone [B] Yellow precipitate

[CBSE Marking Scheme 2016]

Write the reactions involved in the following:

(i) Hell-Volhard Zelinsky reaction

(ii) Decarboxylation reaction

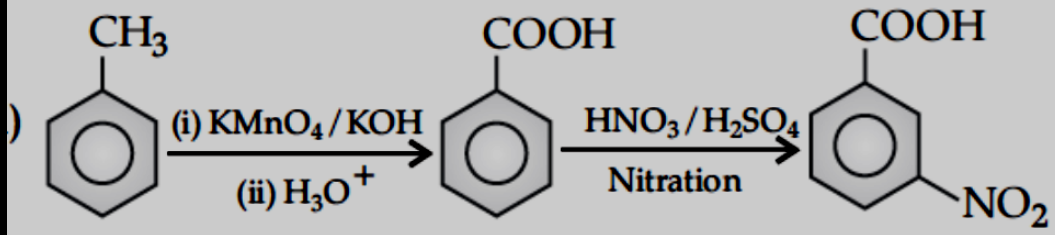
How will you carry out the following conversions?

Acetylene to acetic acid

Toluene to *m*-nitro benzoic acid.

$$CH \equiv CH \xrightarrow[Hg^{2+}]{\text{dil } H_2SO_4} CH_2 = CHOH \xrightarrow{\text{Tautomerisation}} CH_3CHO \xleftarrow[H_2SO_4]{K_2Cr_2O_7} CH_3COOH$$

)



Although phenoxide ion has more number of resonating structures than carboxylate ion carboxylic acid is a stronger acid than phenol. Give two reasons. [CBSE Delhi 2013; NCERT]

[A] Q. 2. (i) Account for the following :

(a) $Cl—CH_2COOH$ is a stronger acid than CH_3COOH.

(b) Carboxylic acids do not give reactions of carbonyl group.

(ii) Write the chemical equations to illustrate the following name reactions :

(a) Rosenmund reduction.

Give reasons :

Propanone is less reactive than ehanal towards nucleophilic addition reactions.

$O_2N - CH_2 - COOH$ has lower pKa value than CH_3COOH.

$(CH_3)_2CH - CHO$ undergos aldol condesation whereas $(CH_3)_3C - CHO$ does not.

Write the chemical equations involved in the following reactions :

Hoffmann-bromamide degradation reaction,

Carbylamine reaction.

Explain the following reactions :

(i) Gabriel phthalimide reaction

(ii) Coupling reaction

Give chemical tests to distinguish between the following pairs of compounds :

(i) Aniline and Ethylamine

(ii) Ethylamine and Dimethylamine

Give reasons :

Aniline is a weaker base than cyclohexyl amine.

It is difficult to prepare pure amines by a ammonolysis of alkyl halides.

Give reasons :

Electrophilic substitution in aromatic amines takes place more readily than benzene.

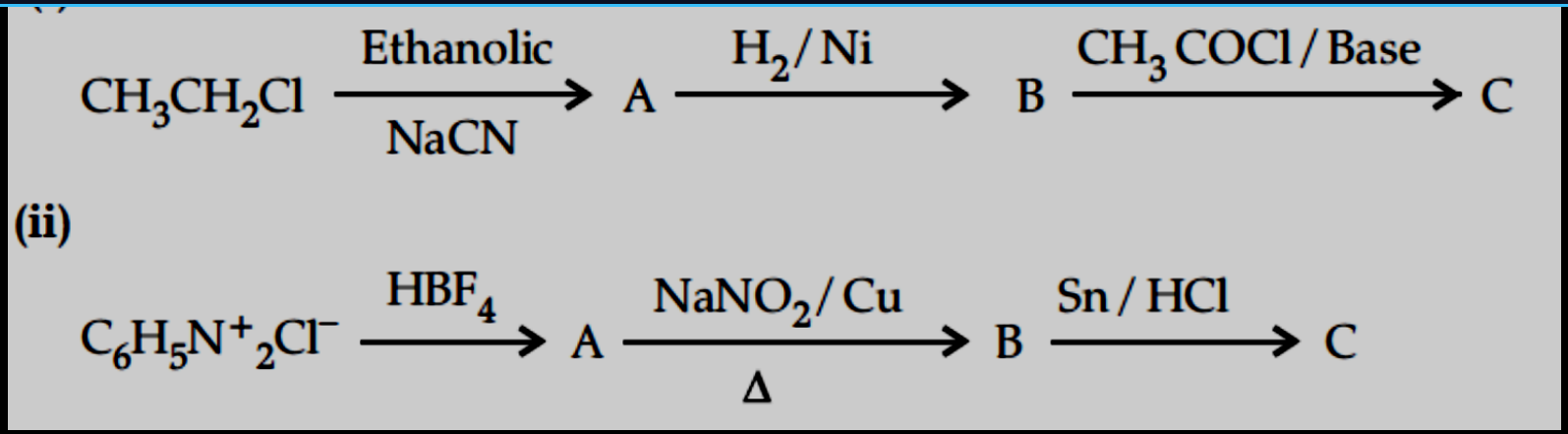
CH_3CONH_2 is a weaker base than $CH_3CH_2.NH_2$.

(i) $CH_3Br \xrightarrow{\quad} A \longrightarrow B \xrightarrow[273\,K]{\quad} C$

(ii) $CH_3COOH \xrightarrow[\Delta]{NH_3} A \xrightarrow{Br_2+KOH} B \xrightarrow{CHCl_3+NaOH} C$

Ans. (i) $CH_3Br \xrightarrow{KCN} \underset{(A)}{CH_3CN} \xrightarrow{LiAlH_4} \underset{(B)}{CH_3CH_2NH_2} \xrightarrow[273\,K]{HNO_2} \underset{(C)}{CH_3CH_2-OH}$

(ii) $CH_3COOH \xrightarrow[\Delta]{NH_3} CH_3CONH_2 \xrightarrow{Br_2+KOH} CH_3NH_2 \xrightarrow{CHCl_3+NaOH} CH_3NC$



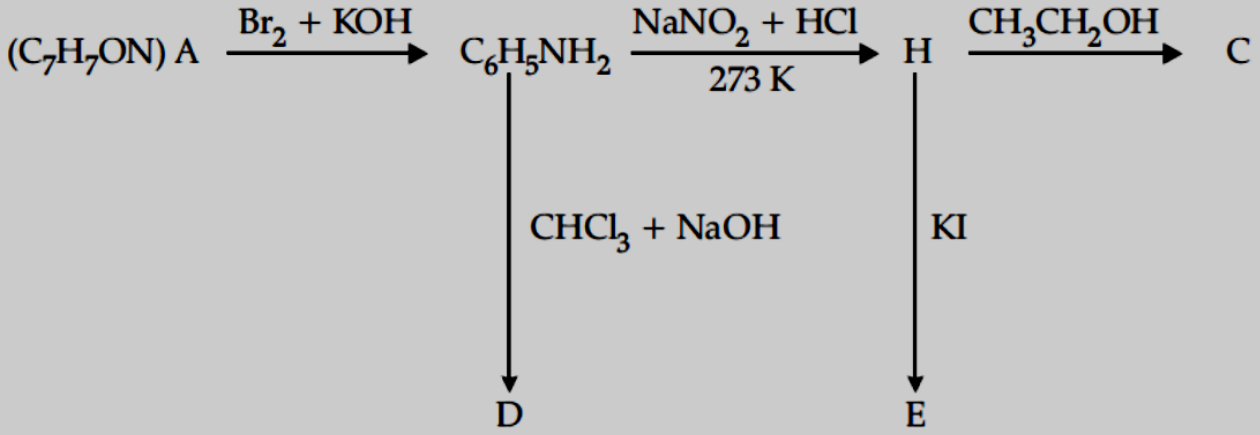
(ii)

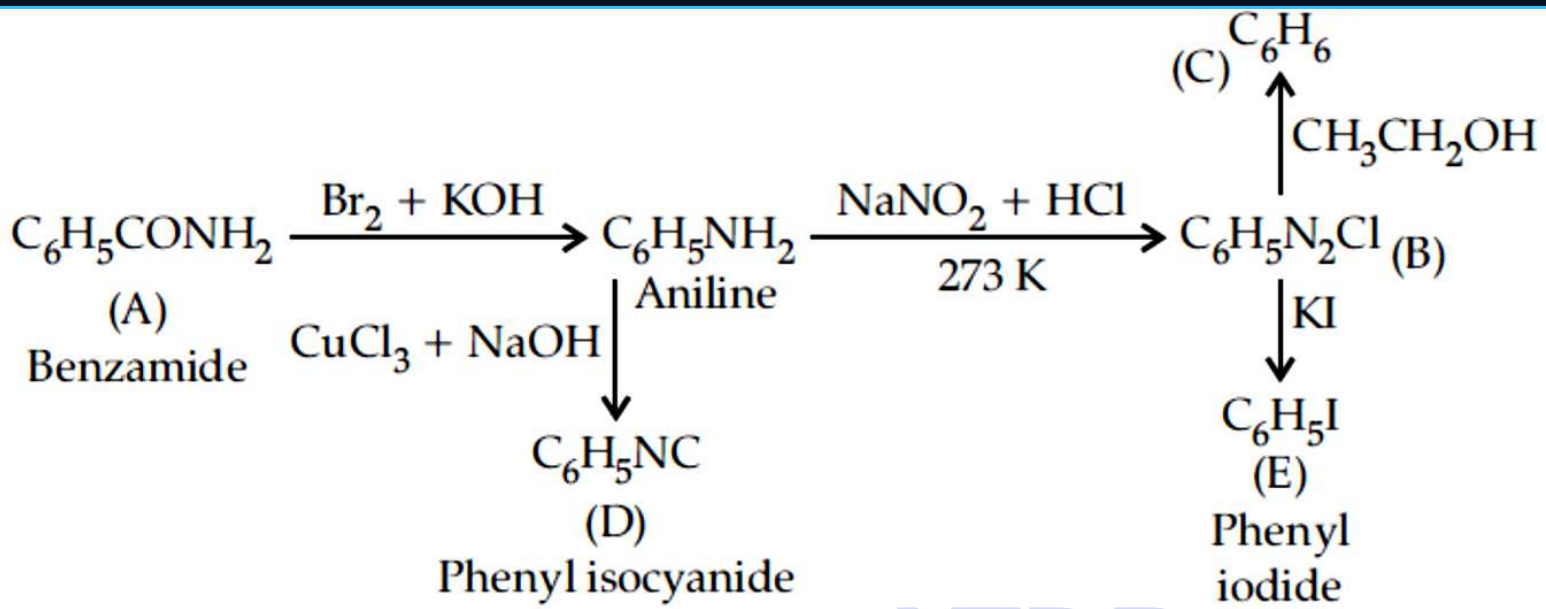
(i) Aniline does not undergo Friedel-Crafts reaction,

(ii) $(CH_3)_2$ NH is more basic than $(CH_3)_3N$ in an aqueous solution,

(iii) Primary amines have higher boiling point than tertiary amines. [CBSE OD 2016; Delhi 2014]

Write the structures of A, B, C, D and E in the following reactions :





Name the components of starch.

Which of the two components of starch are water soluble ? [CBSE Delhi 2014]

Write the products of hydrolysis of maltose ?

What are the products of hydrolysis of lactose ?

Write any two reactions of glucose which cannot be explained by the open chain structure of glucose molecule. [CBSE Delhi 2012]

OR

Enumerate the reactions and facts of D-glucose which cannot be explained by its open chain structure.

Define the following terms :

Glycosidic linkage

Invert sugar

Oligosaccharides.

What type of bonding help in stabilising the α-helix structure of proteins ?

What are the different types of RNA molecules which perform different functions ?

Write the main structural difference between DNA and RNA. Of the two bases, thymine and uracil, which one is present in DNA ?

Q. 2. (i) Write the name of two monosaccharides obtained on hydrolysis of lactose sugar.

Why vitamin C cannot be stored in our body ?

What is the difference between a nucleoside and nucleotide ? [CBSE Delhi 2016; DDE]

Q. 5. (i) Which one of the following is a polysaccharide :

starch, maltose, fructose, glucose

Write one difference between α-helix and β-pleated sheet structures of protein.

Write the name of the disease caused by the deficiency of vitamin B_{12}.

blindness ?

Name the base that is found in nucleotide of RNA only.

Glucose on reaction with HI gives n-hexane. What does it suggest about the structure of glucose ?

Q. 3. (i) Write the structural difference between starch and cellulose.

What type of linkage is present in Nucleic acids ?

Give one example each for fibrous protein and globular protein. [CBSE OD 2016]

) Give one example each of water soluble and fat soluble vitamins.

) Draw pyranose structure of glucose.

ATDB.uno