KASIDIH HIGH SCHOOL

POST: SAKCHI, JAMSHEDPUR

(Affiliated up to +2 level to C.B.S.E., New Delhi)

Affiliation No. - 3430143

XII-CHEMISTRY

Chapterwise Topicwise Worksheets with Solution

Session : 2016-17

Website: www.jemfoundation.com; E-mail: principal.khs@jemfoundtion.in

Ph. 0657-2428165

An initiative of KHS Equip team : MAGIC BOX

KASIDIH HIGH SCHOOL

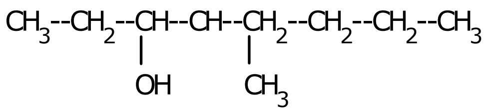
CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Alcohols, phenols and Ethers)

Topic:- Nomenclature.

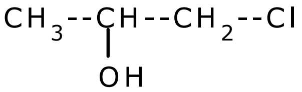
1. **Write IUPAC names of :-**

i.



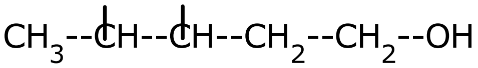
$CH_3{-}{-}CH_2{-}{-}\underset{OH}{CH}{-}{-}\underset{CH_3}{CH}{-}{-}CH_2{-}{-}CH_2{-}{-}CH_2{-}{-}CH_3$

ii.



$CH_3{-}{-}\underset{OH}{CH}{-}{-}CH_2{-}{-}Cl$

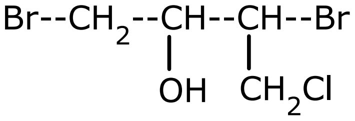
iii.



$CH_3{-}{-}CH{-}{-}CH{-}{-}CH_2{-}{-}CH_2{-}{-}OH$

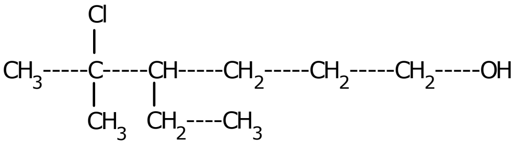
iv. $(CH_3)_3COH$

v.



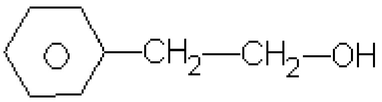
$Br{-}{-}CH_2{-}{-}\underset{OH}{CH}{-}{-}\underset{CH_2Cl}{CH}{-}{-}Br$

vi.

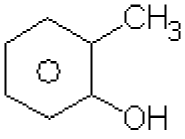


$CH_3{-}{-}{-}{-}{-}\overset{Cl}{\underset{CH_3}{C}}{-}{-}{-}{-}{-}\underset{CH_2{-}{-}{-}{-}CH_3}{CH}{-}{-}{-}{-}{-}CH_2{-}{-}{-}{-}{-}CH_2{-}{-}{-}{-}{-}CH_2{-}{-}{-}{-}{-}OH$

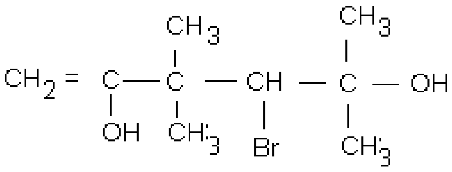
vii.



viii.

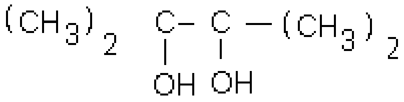


ix.



$CH_2 = \underset{OH}{C}{-}\overset{CH_3}{\underset{CH_3}{C}} - \underset{Br}{CH} - \overset{CH_3}{\underset{CH_3}{C}} - OH$

x.



$(CH_3)_2\ \underset{OH}{C}{-}\ \underset{OH}{C} - (CH_3)_2$

2. **Write structural formula and give IUPAC names** :-

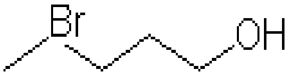
i. Benzyl Alcohol

ii. Ethylene Glycol

iii. Glycerol

iv. m- cresol

v.



vi. Ethylphenylether

vii. Methylpropylether

viii. Anisole

ix. Isopropyl methylether

x. Phenetole

CBSE TEST PAPER-01

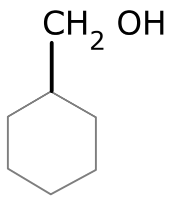
CLASS - XII CHEMISTRY (Alcohols, phenols and Ethers)

Topic:- Nomenclature.

[ANSWERS]

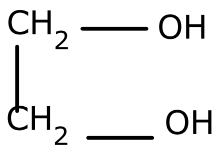
Ans 1 (i)	4 – Methyloctan-3-ol
Ans 1 (ii)	1-Chloro propan-2-ol
Ans 1 (iii)	Pentan – 1,3,4 – triol
Ans 1 (iv)	2 – Methylpropan -2-ol
Ans 1 (v)	1,3 – Dibromo – 4- chloro – 2- butanol
Ans 1 (vi)	4 – Chloro – 3 – ethyl – 4- methyl hexanol.
Ans 1 (vii)	2 – Phenyl ethanol
Ans 1 (viii)	2- Methyl phenol.
Ans 1 (ix)	4- Bromo -3, 3,5 – trimethyl – hex -1-ene- 2,5- diol
Ans 1 (x)	2,3 – Dimethylbutan – 2,3 –diol

Ans 2 (i)



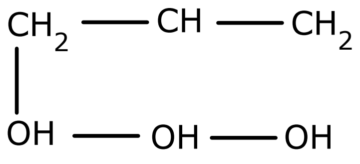
1- Phenyl methanol

Ans 2 (ii)



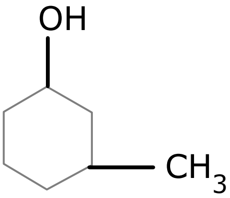
Ethane - 1,2 - diol

Ans 2 (iii)



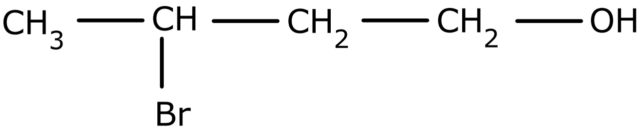
Propane - 1,2,3 - triol

Ans 2 (iv)



3- Methyl phenol

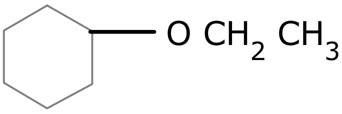
Ans 2 (v)



$CH_3-\underset{\underset{\displaystyle Br}{|}}{CH}-CH_2-CH_2-OH$

3 - Bromobutanol

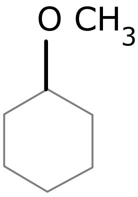
Ans 2 (vi)



Ethoxybenzene

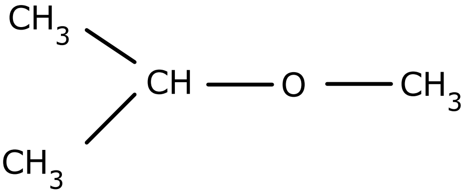
Ans 2 (vii) $CH_3-CH_2-CH_2-O-CH_3$ Methoxypropane

Ans 2 (viii)



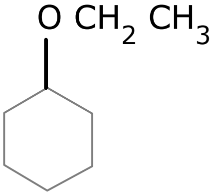
Methoxybenzene

Ans 2 (ix)



2 - Methoxy propane

Ans 2 (x)



Ethoxybenzene

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (Alcohols, phenols and Ethers)

Topic:-Reasoning Questions

Give Reasons for the followings :-

1. Phenol is acidic in nature.

2. Phenol has a smaller dipole moment than methanol.

3. o- nitrophenol has lower boiling point (is more volatile) than p – nitrophenol.

4. Methanol is miscible with water while iodomethane is not.

5. Alcohols have higher boiling points than isomeric ethers.

6. Ethers are soluble in water alkanes are not.

7. The order of acidic strength in alcohols is $R\,CH_2OH > R_2\,CHOH > R_3\,COH$

8. During preparation of ester from alcohol and acid, water has to be removed as soon as it is formed.

9. Ethers can not be prepared by dehydration of secondary or tertiary alcohols.

10. Reaction of anisole with HI gives methyl iodide and phenol.

KASIDIH HIGH SCHOOL

CBSE TEST PAPER-02

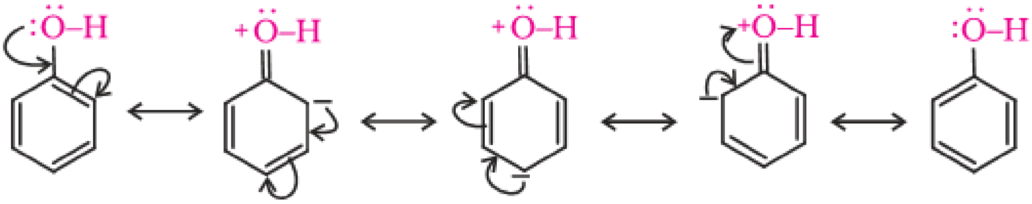
CLASS - XII CHEMISTRY (Alcohols, phenols and Ethers)

Topic:-Reasoning Questions

[ANSWERS]

1. Phenol is acidic in nature because

a) phenol , due to resonance, the positive charge rests on oxygen making the shared pair of electrons more towards oxygen and hydrogen as H$^+$

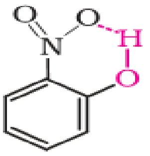


b) The carbon attached to OH is SP^2 hybridize and is more electronegative, this decreases the electron density on oxygen, increasing the polarity of O-H bond and ionization of phenol.

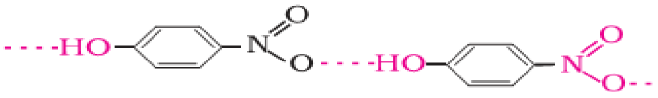
c) The phenoxide ion formed by loss of H$^+$ is more resonance stabilized than phenol itself.

2. In phenol due to electron rich benzene ring the C-O bond is less polar whereas in methanol the C-O bond is highly polar. Therefore the dipole moment of methanol is higher than phenol.

3. P- nitrophenol has intermolecular hydrogen bonding which increases the boiling point while in o- nitro phenol due to presence of intra molecular hydrogen bonding, there is a decrease in boiling point and increase in volatility.

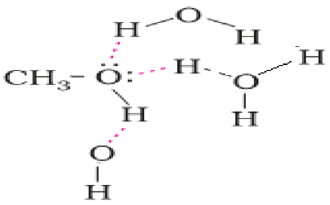


o-Nitrophenol
(Intramolecular
H-bonding)

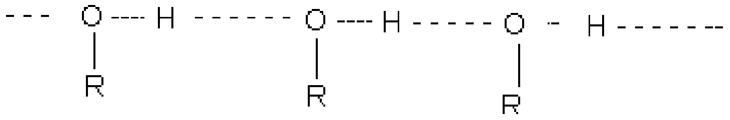


p-Nitrophenol
(Intermolecular
H-bonding)

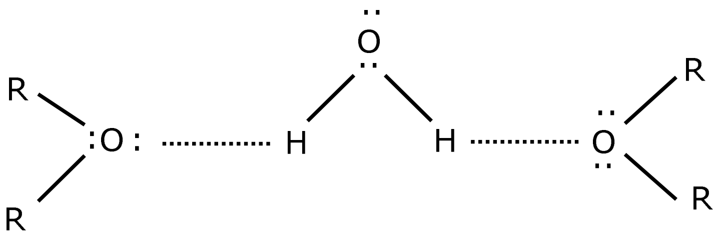
4. Methanol can form intermolecular hydrogen bonding with water but there is no hydrogen bonding in iodomethane and water. Therefore methanol in miscible in water.



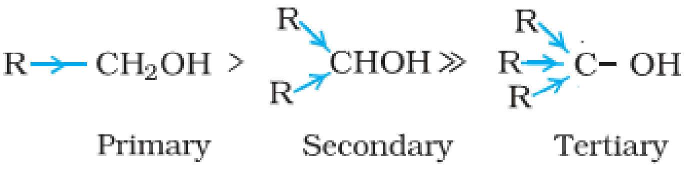
5. Alcohols can form intermolecular hydrogen bonds due to their high polarity whereas, ether cannot. Therefore alcohols have higher boiling points than isomeric ethers.



6. Ethers can form H- bonding with water molecule whereas alkenes cannot. Therefore ethers are soluble in water and alkanes are not.



7. In alcohols, the acidic strength is due to polar nature of O-H bond. An electron releasing group e.g., alkyl groups, increases electron density on oxygen tending to decrease the polarity of O-H bond. This decreases the acid strength. Therefore the order of acid strength is

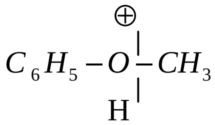


$$R\rightarrow CH_2OH > R_2\rightarrow CHOH \gg R_3\rightarrow C-OH$$

8. The reaction between alcohol and carboxylic acid is reversible and goes in backward direction if water is not removed as soon as it is formed.

$$ROH + RCOOH \overset{H^+}{\rightleftharpoons} RCOOR' + H_2O$$

9. For secondary and tertiary alcohols, elimination competes over substitution and alkenes are formed on acidic dehydration as the reaction follows Sn1 mechanism. Therefore the acidic dehydration of secondary or tertiary alcohols does not give ethers.

10. In case of anisole, methyl phenyl oxonium ion,  $C_6H_5-\overset{\oplus}{\underset{H}{O}}-CH_3$ is formed by protonation of ethers during reaction with HI. The bond between O- CH_3 is weaker than the bond between O-C_6H_5 because carbon of phenyl group is SP^2 hybridised and there is a partial double bond character. Therefore the attack by I^- ion breaks O-CH_3 bond to form CH_3I.

$$C_6H_5\ \ OCH_3 + HI \rightarrow \mathrm{C_6H_5OH + CH_3I}$$

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Alcohols, phenols and Ethers)

Topic:- Conversions

Do the following conversions :-

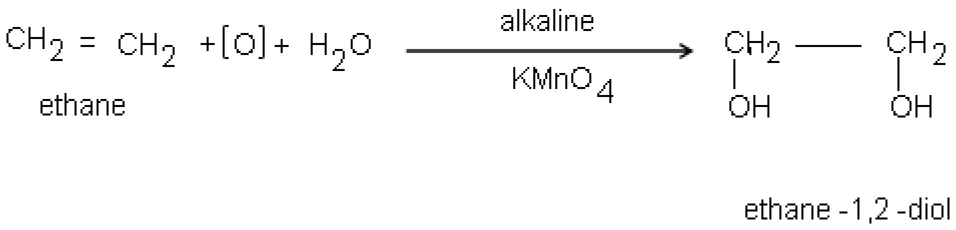
1. Ethene to 1,2 -ethanediol
2. Phenol to Salicyldehyde
3. Butanol to Butanoic acid
4. Ethanol to propanone
5. Phenol to salicylic acid
6. Methanol to Ethanol
7. Ethanol to propanol
8. Phenol to Benzyl Alcohol
9. Ethanal to propan -2- ol
10. l – propanol to 2 – bromo propane

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Alcohols, phenols and Ethers)

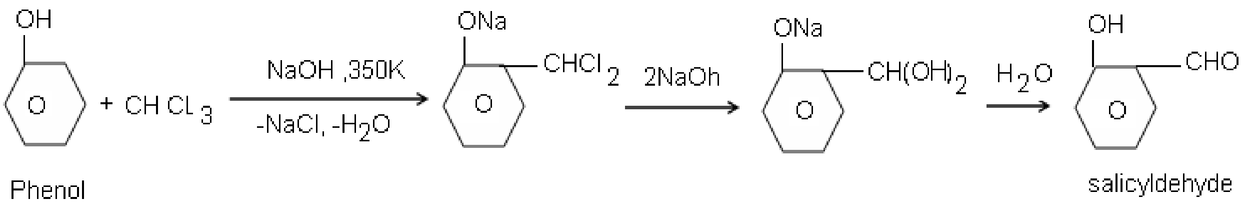
Topic:- Conversions.

Ans 1.



$$CH_2 = CH_2 + [O] + H_2O \xrightarrow[KMnO_4]{alkaline} \underset{OH}{CH_2} - \underset{OH}{CH_2}$$

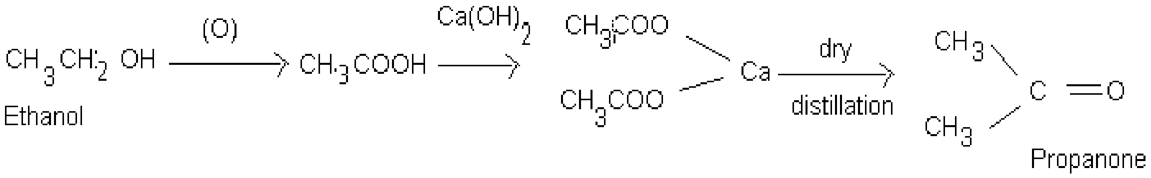
Ans 2.



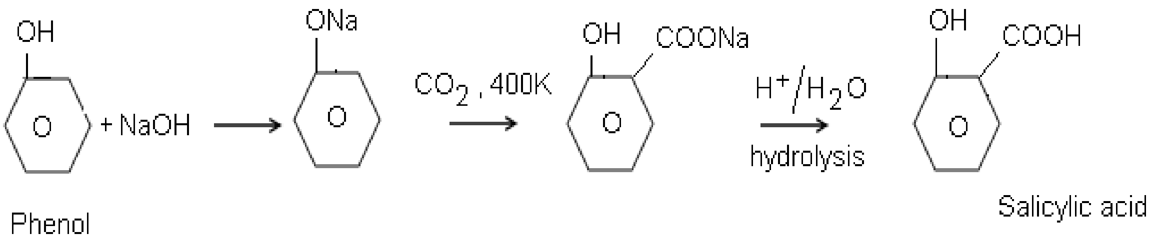
Ans 3.

$$\underset{\text{Butanol}}{CH_3CH_2CH_2CH_2OH} \xrightarrow[\text{Oxidation}]{KMnO_4 / \text{dil } H_2SO_4} \underset{\text{Butanoic acid}}{CH_3CH_2CH_2COOH}$$

Ans 4.



Ans 5.



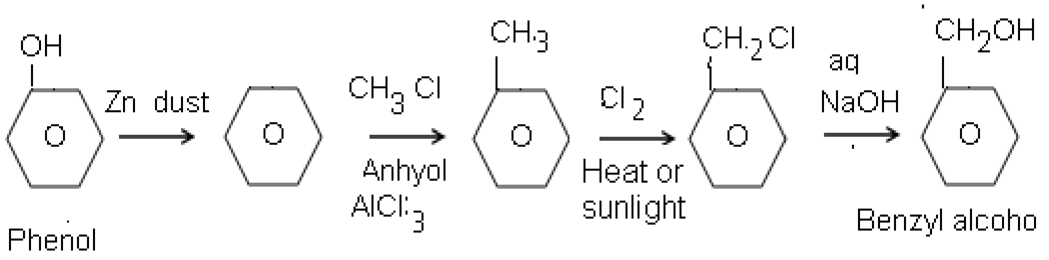
Ans 6.

$$\underset{\text{Methanol}}{CH_3OH} \xrightarrow[NaBr \quad + H_2SO_4]{HBr} CH_3Br \xrightarrow{KCN} CH_3CN \xrightarrow{LiAlH_4} CH_3CH_2NH_2 \xrightarrow{HNO_2} \underset{\text{Ethanol}}{CH_3CH_2OH}$$

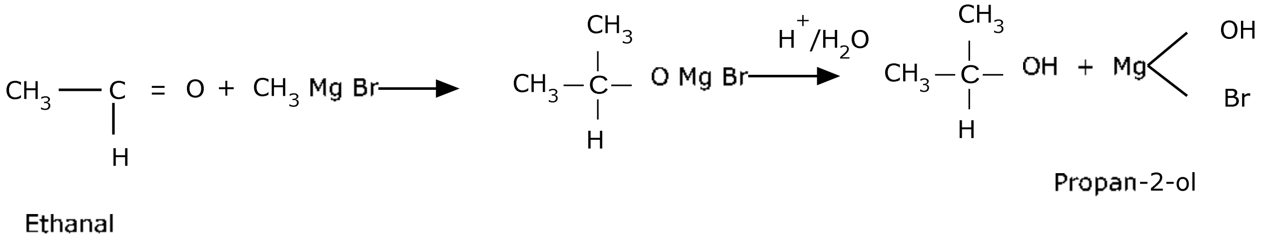
Ans 7.

$$\underset{\text{Ethanol}}{CH_3CH_2OH} \xrightarrow[NaBr + H_2SO_4]{HBr} CH_3CH_2Br \xrightarrow{KCN} CH_3CH_2CN \xrightarrow[\text{Reduction}]{[H]} CH_3CH_2CH_2NH_2 \xrightarrow{HNO_2} \underset{\text{Propanol}}{CH_3CH_2CH_2OH}$$

Ans 8.

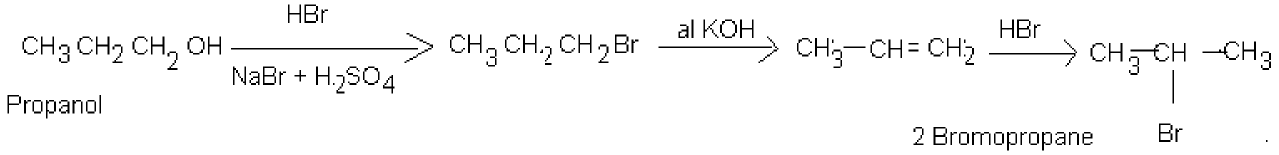


Ans 9.



$$\underset{\text{Ethanal}}{CH_3-\underset{H}{C}=O} + CH_3MgBr \longrightarrow CH_3-\overset{CH_3}{\underset{H}{C}}-OMgBr \xrightarrow{H^+/H_2O} \underset{\text{Propan-2-ol}}{CH_3-\overset{CH_3}{\underset{H}{C}}-OH} + Mg\begin{matrix}OH\\Br\end{matrix}$$

A10.



$$\underset{\text{Propanol}}{CH_3CH_2CH_2OH} \xrightarrow[NaBr + H_2SO_4]{HBr} CH_3CH_2CH_2Br \xrightarrow{al\ KOH} CH_3-CH=CH_2 \xrightarrow{HBr} \underset{\text{2 Bromopropane}}{CH_3-\underset{Br}{CH}-CH_3}$$

KASIDIH HIGH SCHOOL

CBSE TEST PAPER-04
CLASS - XII CHEMISTRY (Alcohols, phenols and Ethers)

Topic:- Identification Question

1. An organic compound ' A ' having molecular formula C_3 H_6 on treatment with aq. H_2SO_4 give 'B' which on treatment with Lucas reagent gives 'C'. The compound 'C' on treatment with ethanolic KOH gives back ' A' .Identify A, B , C . [3]

2. An organic compound A (C_6H_6O) gives a characteristic colour with aq. $FeCl_3$ solution. (A) On reacting with CO_2 and NaOH at 400k under pressure gives (B) which on acidification gives a compound (C) .The compound (C) reacts with acetyl chloride to give (D) which is a popular pain killer. Deduce the structure of A,B,C & D. [3]

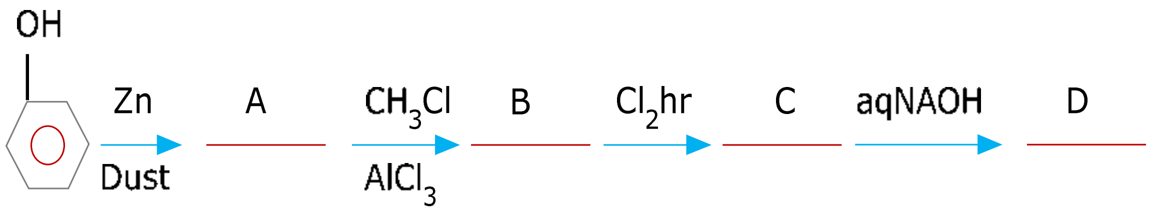
3. An organic compound (X) when dissolved in ether and treated with magnesium metal forms a compound Y. The compound, Y, on treatment with acetaldehyde and the product on acid hydrolysis gives isopropyl alcohol. Identify the compound X. What is the general name of the compounds of the type Y. [3]

4. A compound 'A' with molecular formula $C_4H_{10}O$ on oxidation forms compound 'B' gives positive iodoform test and on reaction with CH_3MgBr followed by hydrolysis gives (c). Identify A, B & C. [3]

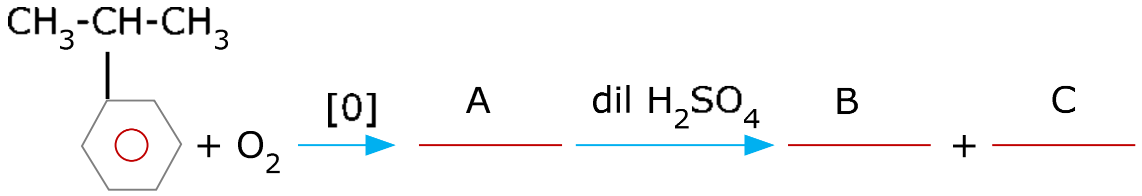
5. An aromatic compound (A) having molecular formula C_6H_6O on treatment with $CHCl_3$ and KOH gives a mixture two isomers 'B' and 'C' both of 'B' & 'C' give same product 'D' when distilled with Zn dust. Oxidation of 'D' gives 'E' of formula $C_7H_6O_2$. The sodium salt of 'E' on heating with soda lime gives 'F' which may also be obtained by distilling 'A' with zinc dust. Identify compounds 'A' to 'F' giving sequence of reactions. [3]

6. Compound 'A' of molecular formula $C_5H_{11}Br$ gives a compound 'B' of molecular formula $C_5H_{12}O$ when treated with aq. NaOH. On oxidation the compound yields a mixture of acetic acid & propionic acid. Deduce the structure of A, B & C. [3]

7. [3]



8. [3]



CBSE TEST PAPER-04

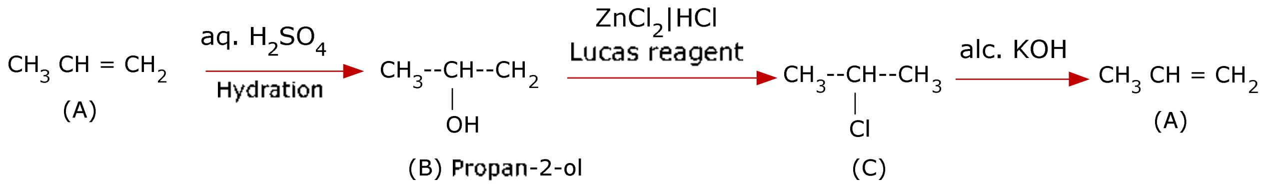
CLASS - XII CHEMISTRY (Alcohols, phenols and Ethers)

Topic:- Identification Question.

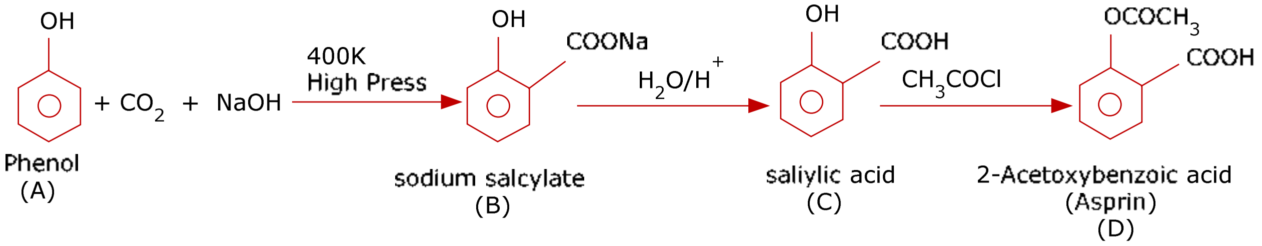
[ANSWERS]

Ans 1.

$$A\ (C_3H_6) \xrightarrow{\text{aq. } H_2SO_4} B \xrightarrow{\text{Lucas reagent}} C \xrightarrow{\text{alc. KOH}} A$$

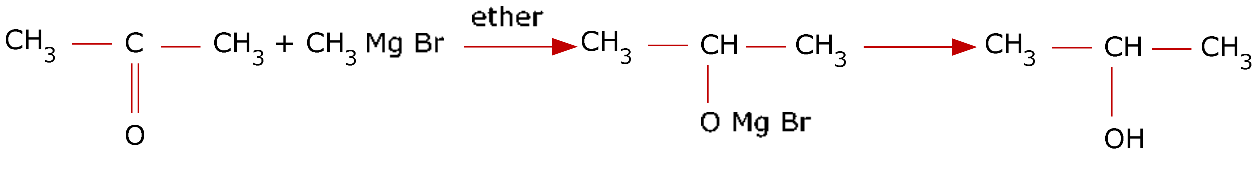


Ans 2.



Ans 3. The compound X is CH_3Br and Y is CH_3MgBr The compounds of the type 'Y' are called Grignard reagent.

$$\underset{(x)}{CH_3\,Br + Mg} \longrightarrow \underset{(y)}{CH_3\,Mg\,Br}$$

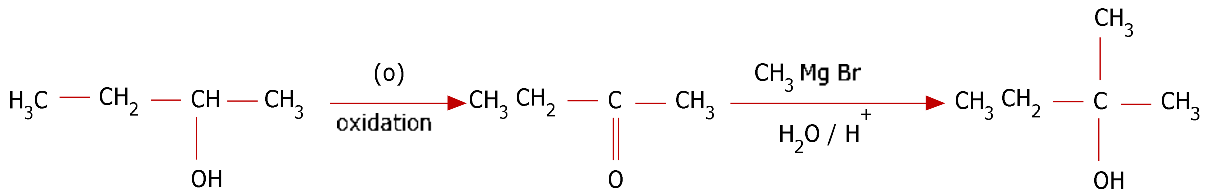


$$CH_3-\overset{\displaystyle O}{\overset{\|}{C}}-CH_3 + CH_3\,Mg\,Br \xrightarrow{\text{ether}} CH_3-\underset{O\,Mg\,Br}{\underset{|}{CH}}-CH_3 \longrightarrow CH_3-\underset{OH}{\underset{|}{CH}}-CH_3$$

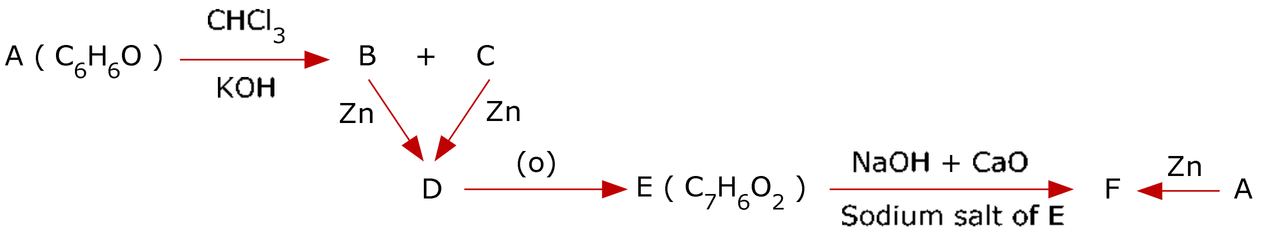
Isopropyl alcohol

Ans 4. The compound 'B' is obtained by oxidation of $C_4H_{10}O$ and gives positive iodoform test and also reacts with CH_3MgBr , it must be methyl Ketone , it must be methyl ketone having four carbon atoms i.e, $CH_3COCH_2CH_3$.

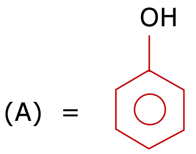
This can be obtained by oxidation of 2 – butanol i.e , $CH_3\underset{OH}{CH}CH_2CH_3$ Therefore , the reactions are.



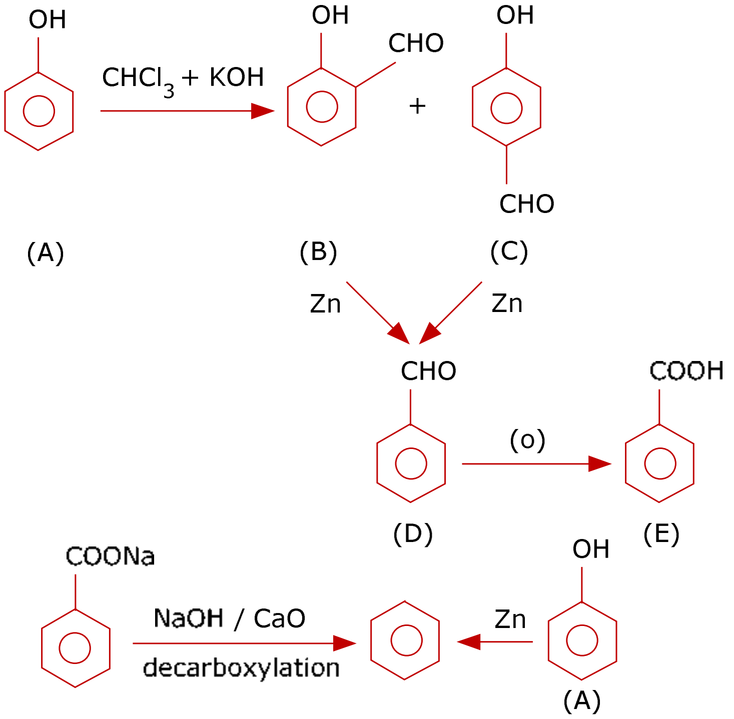
Ans 5.



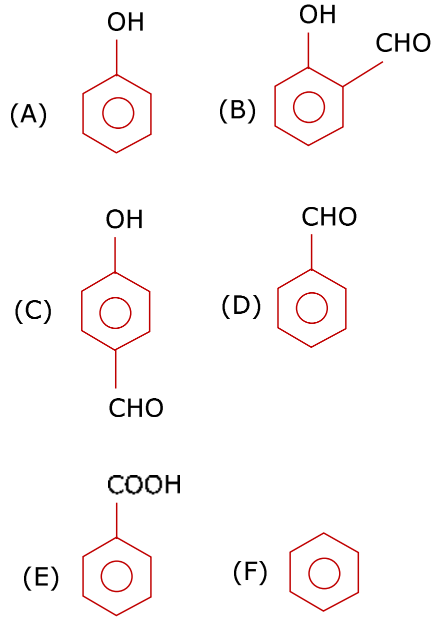
The aromatic compound having molecular formula C_6H_6O and which gives a mixture of two isomers on reacting with $CHCl_3$ and KOH is phenol i.e.



The reactions are



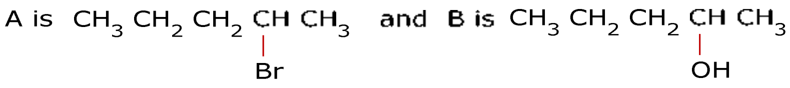
Therefore



Ans 6.

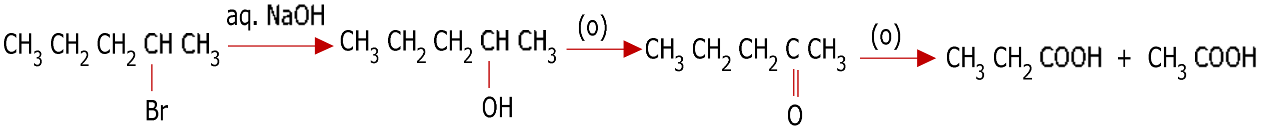
$$\underset{(A)}{C_5H_{11}Br} \xrightarrow{\text{aq. NaOH}} \underset{(B)}{C_5H_{12}O} \xrightarrow{(o)} \underset{(C)}{\text{Ketone}} \xrightarrow[(o)]{KMnO_4} CH_3\,CH_2\,COOH + CH_3\,COOH$$

Since acetic acid & propionic acid are the products of oxidation of C which is a ketone, C is $CH_3\,CH_2\,CH_2CO\,CH_3$. Since it is the oxidation product of B, therefore



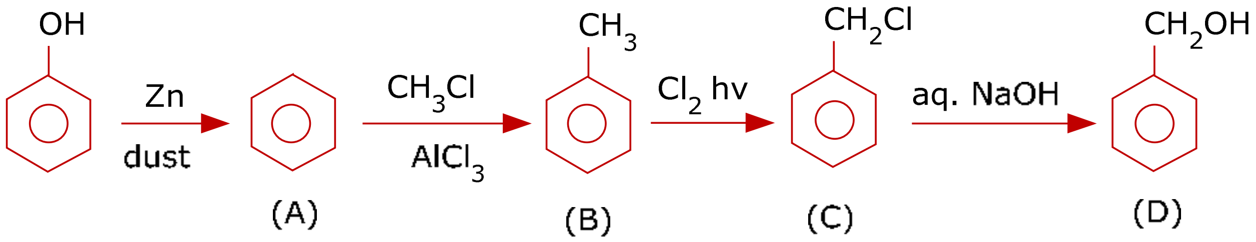
$$\text{A is } CH_3\,CH_2\,CH_2\,\underset{\displaystyle Br}{\underset{|}{CH}}\,CH_3 \quad \text{and B is } CH_3\,CH_2\,CH_2\,\underset{\displaystyle OH}{\underset{|}{CH}}\,CH_3$$

The reactions are

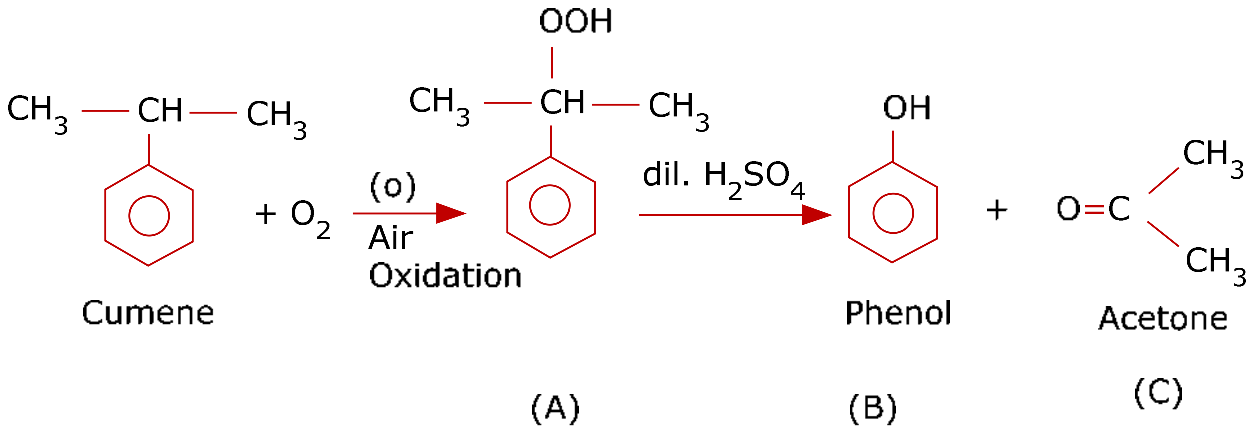


$$CH_3\,CH_2\,CH_2\,\underset{\displaystyle Br}{\underset{|}{CH}}\,CH_3 \xrightarrow{\text{aq. NaOH}} CH_3\,CH_2\,CH_2\,\underset{\displaystyle OH}{\underset{|}{CH}}\,CH_3 \xrightarrow{(o)} CH_3\,CH_2\,CH_2\,\underset{\displaystyle O}{\underset{\|}{C}}\,CH_3 \xrightarrow{(o)} CH_3\,CH_2\,COOH + CH_3\,COOH$$

Ans 7.



Ans 8.



KASIDIH HIGH SCHOOL

CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (Alcohols, phenols and Ethers)

Topic:- Miscellaneous Question.

1.	What is denatured alcohol?	[1]
2.	Mention two important uses of methanol.	[1]
3.	Arrange C_6H_5OH, C_2H_5OH & H_2O in the increasing order of acid strength.	[1]
4.	Give the structure of main product of action of excess of Br_2 on phenol.	[1]
5.	How is the presence of peroxides in ethers detected? How are peroxides removed from Ethers?	[2]
6.	Explain a chemical test to distinguish between primary, secondary and tertiary alcohols.	[2]
7.	What is Lucas test?	[2]
8.	What is Picric acid? How is it prepared from phenol?	[1]
9.	What is wood sprit? Why is it so called?	[1]
10.	Give equations for preparation of ethanol by fermentation.	[2]

CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (Alcohols, phenols and Ethers)

[ANSWERS]

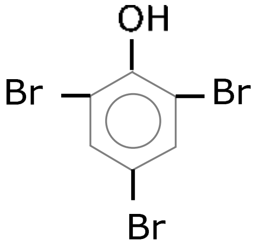
Topic:- Miscellaneous Question

1. Industrial alcohol (ethyl alcohol) is made unfit for drinking purpose by addition of a small quantity of poisonous substance, methanol. This is called denatured alcohol. For denaturation, copper sulphate or pyridine can also be added.

2. Uses of methanol:-
   i) It is used for denaturing alcohol.
   ii) It is used as a solvent for paints & varnishes.

3. The order is $C_2H_5OH < H_2O < C_6H_5OH$.

4. The main product will be 2,4,6-tribromophenol.



5. Presence of peroxides in ethers is detected by addition of freshly prepared $FeSO_4$ and KCNS. Appearance of blood red colour confirms the presence of peroxide. They can be removed by shaking ethers well with $FeSO_4$ solution.

6. Primary tertiary and secondary alcohols can be distinguished by oxidation reaction. Primary alcohols give aldehyde with CrO_3

$$RCH_2OH \xrightarrow{CrO_3} \mathrm{RCHO}$$

Secondary alcohols give ketone with CrO_3.

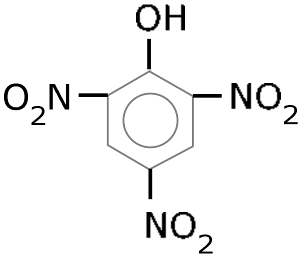
$$R_2CHOH \xrightarrow{CrO_3} \mathrm{R_2CO}$$

Tertiary alcohol do not get oxidized with CrO_3

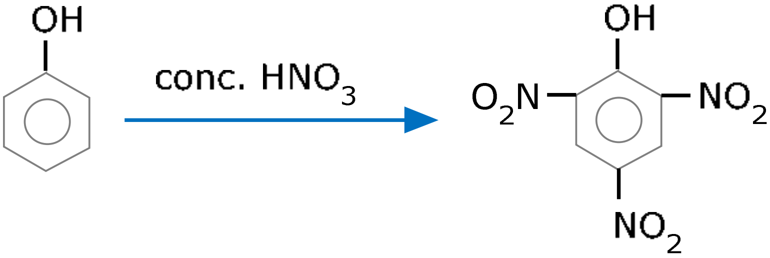
$$R_3COH \xrightarrow{CrO_3} \text{No reaction}$$

7. Lucas test is used for distinguishing between primary secondary and tertiary alcohols. When a tertiary alcohol is dissolved in Lucas reagent (Conc. HCl + $ZnCl_2$) it produces turbidity immediately where as secondary alcohols produce turbidity after some time and primary alcohols do not react at all and no turbidity is product.

8. Picric acid is 2,4,6 – trinitrophenol



It is prepared from phenol by nitration with conc. HNO_3.



9. Wood spirit is methanol. It is so called because earlier it was obtained from destructive distillation of wood only.

10. Ethanol can be prepared by fermentation of sugar –

$$\underset{\text{Sugar}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow[\text{enzymes}]{\text{Invertase}} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{fructose}}{C_6H_{12}O_6}$$

$$C_6H_{12}O_6 \xrightarrow[\text{enzymes}]{\text{Zymase}} \underset{\text{Ehanol}}{2C_2H_5OH} + 2CO_2$$

KASIDIH HIGH SCHOOL

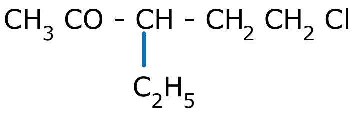
CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Aldehydes, Ketones and carboxylic acids)

Topic:- Nomenclature

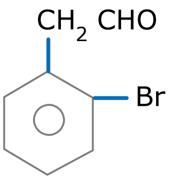
1. Give IUPAC names of following

(i)

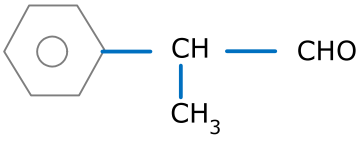


$CH_3\,CO - \underset{C_2H_5}{\underset{|}{CH}} - CH_2\,CH_2\,Cl$

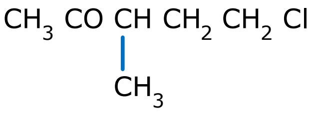
(ii)



(iii)



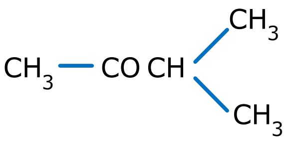
(iv)



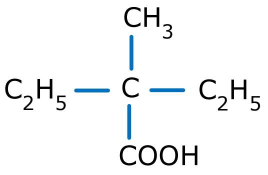
$CH_3\,CO\,\underset{CH_3}{\underset{|}{CH}}\,CH_2\,CH_2\,Cl$

(v) $CH_3\,CH\,(OH)\,CH_2\,CO\,CH_3$

(vi)

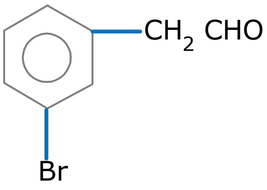


(vii)



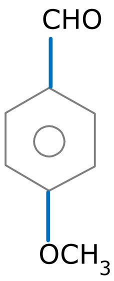
$C_2H_5 - \overset{CH_3}{\overset{|}{\underset{COOH}{\underset{|}{C}}}} - C_2H_5$

(viii)



(ix) $HOOC - CH = CH - COOH$

(x)



2. Draw the structure of the following –

(i) 4- Methoxybenzaldehyde

(ii) 5- Bromo -3- Chloro -2- iodobenzoic acid

(iii) 3,3 – Dimethyl -1- Chlorobutane

(iv) 2,3- Dihydroxy -4-methylpentanal

(v) 3- Hydroxy-2-methyl -propanal

(vi) 2,4 –Dimethyl -3- pentanone

(vii) 1,2 –Ethaneodioc acid

(viii) 3- Pentene -2-one

(ix) 1,3 – Propane –dioic acid

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Aldehydes, Ketones and carboxylic acids)

[Answer]

Topic:- Nomenclature

Ans1(i). 5-Chloro -3- ethylpentan -2-one.

Ans1(ii). 2 –(1-bromophenyl) ethanal

Ans1(iii). 2- Phenylpropanal

Ans1(iv). 5- Chloro -3- methyl pentan -2-one

Ans1(v). 4- Hydroxypentan -2- one

Ans1(vi). 3- Methylbutan -2-one

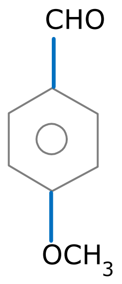
Ans1(vii). 2- Ethyl -2- methylbutanoic acid

Ans1(viii). 2- (1- Bromophenyl) ethanal

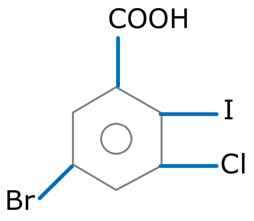
Ans1(ix). But-2- en -1,4 –dioic acid

Ans1(x). 4- Methoxybenzaldehyde

Ans 2(i).



Ans 2(ii).



CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (Aldehydes, Ketones and carboxylic acids)

Topic:- Reasoning Questions.

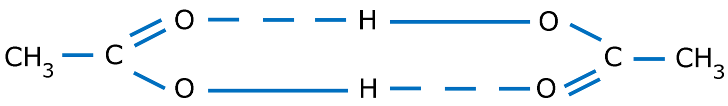
Q. Give Reasons :-

1. Carboxylic acid is stronger acid than phenol.
2. Ethanol is more soluble in water than ethyl chloride
3. Aldehydes are more reactive than Ketones towards nucleophilic additions.
4. Carboxylic acids has higher boiling points than alcohols of same no. of carbon atoms.
5. Ethanoic acid has molar mass of 120 in vapour state.
6. Carboxylic acids do not give characteristic reactions of carbonyl group.
7. Formal dehyde does not undergo aldol condensation.
8. Floro acetic acid is a stronger acid than acetic acid.

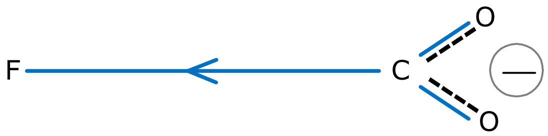
CBSE TEST PAPER-02
CLASS - XII CHEMISTRY (Aldehydes, Ketones and carboxylic acids)

Topic:- Reasoning Questions.
[ANSWERS]

1. Carboxylic acid on dissociation form carboylate ion which is stabilized by two equivalent resonance structure in which negative charge is at the more electronegative oxygen atom, whereas the conjugate base of phenol, phenoxide ion, has non – equivalent resonance structures in which negative charge is at the less electronegative carbon atom. Therefore resonance is not as important as it is in carboxylate ion. Moreover the negative charge is delocalized over two more electronegative oxygen atoms in carboxylate ion whereas it is less effectively delocalized over one oxygen atom and one carbon atom in phenoxide ion. Therefore the carboxylate ion is more stabilized than phenoxide ion and carboxylic acids are stronger acids than phenol.
2. Ethanol can form intermolecular Hydrogen bonding with water molecules, ethyl chloride can not. Therefore ethanol is soluble in water and ethyl chloride is not.
3. Aldehydes are more reactive than Ketones due to steric and electronic reasons. In Ketones due to presence of two relatively large alkyl groups, the approach of nucleophile is more hindered than in aldehydes having only one such substitute. More over the +I effect of alkyl groups reduces the electophilicity of carbonyl group more in Ketone than in aldehydes.
4. Carboxylic acids have more extensive association of molecules through intermolecular hydrogen bonding than alcohols. Moreover their boiling points are higher than alcohols of same carbon atoms.
5. Ethanoic acid exists as dimer in vapour state in which two molecules remain together by hydrogen bonding. This increases the effective molecular mass to 120.



6. In carboxylic acids due to presence of resonance, the C=O group is not a pure carbonyl group & therefore they do not show characteristic reactions of carbonyl group.
7. Formaldehyde does not have any α - hydrogen and therefore it can not show aldol condensation.
8. In fluoroacetic acid, Fluorine being electron withdrawing group stabilizes the conjugate base through delocalization of the negative charge



Therefore fluoroacetic acid is a stronger acid than acetic acid.

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Aldehydes, Ketones and carboxylic acids)

Topic:- Conversions

1. Toluene to benzaldehyde
2. Acetaldehyde to Acetamide
3. Methanol to acetic acid
4. Methanol to Ethanol
5. Acetic acid to Propionic acid
6. Ethyl alcohol to acetone
7. Acetone to tert butyl alcohol
8. Toluene to m- nitrobenzoic acid
9. Phenol to acetophenone
10. Acetaldehyde to Acetone

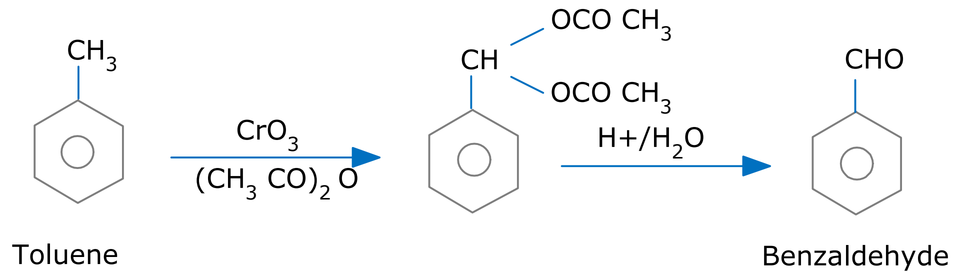
CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Aldehydes, Ketones and carboxylic acids)

[ANSWER]

Topic:- Conversions

Ans1.



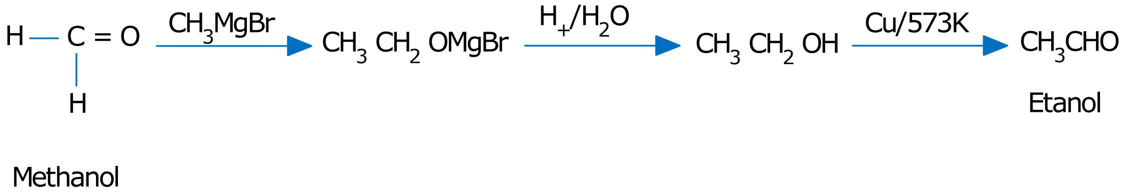
Ans2.

$$\underset{\text{Acetaldehyde}}{CH_3CHO} \xrightarrow[\text{KMnO4}]{(O)} CH_3\ COOH \xrightarrow{NH_3} CH_3COO\ NH_4 \xrightarrow{\Delta} \underset{\text{Acetamide}}{CH_3CONH_2}$$

Ans3.

$$\underset{\text{Methanol}}{CH_3OH + SOCl_2} \longrightarrow CH_3Cl \xrightarrow{KCN} CH_3CN \xrightarrow[H_2O/H^+]{} \underset{\text{Acetic acid}}{CH_3\ COOH}$$

Ans.4



$$\underset{\text{Methanol}}{H-\underset{H}{\underset{|}{C}}=O} \xrightarrow{CH_3MgBr} CH_3\ CH_2\ OMgBr \xrightarrow{H_+/H_2O} CH_3\ CH_2\ OH \xrightarrow{Cu/573K} \underset{\text{Etanol}}{CH_3CHO}$$

Ans5.

$$\underset{\text{Acetic acid}}{CH_3COOH} \xrightarrow[(H)]{LiAlH_4} CH_3\ CH_2\ OH \xrightarrow{12\ \text{Red P}} CH_3\ CH_2\ I \xrightarrow{KCN} C_3\ CH_2\ CN$$

$$\Big\downarrow H^+\ H_2O$$

$$\underset{\text{Propionic acid}}{CH_3\ CH_2\ COOH}$$

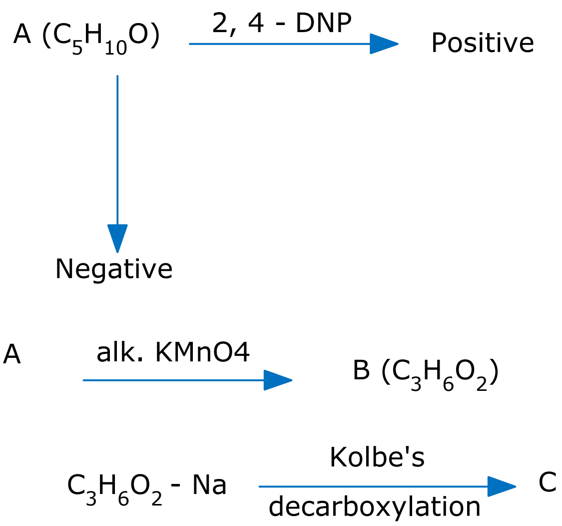
CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (Aldehydes, Ketones and carboxylic acids)

[Answers]

Topic:- Identification Question

Ans1.



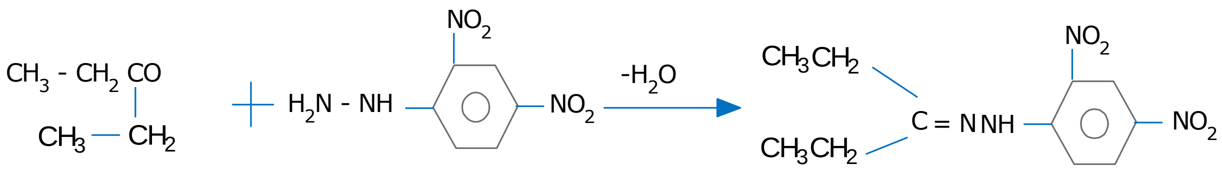
As the compound A gives a positive 2, 4-DNP test but negative Tollen's test, it is a ketone. Since on oxidation, it gives an acid B, of molecular formula $C_3H_6O_2$, it is $CH_3CH_2COCH_2CH_3$ and B is CH_3CH_2COOH. As C is obtained by Kolbes decarboxylation of B, C is CH_3CH_2 CH_2 CH_3.

Therefore A = Pentan -3 one, CH_3 CH_2 CO CH_2 CH_3

B = Propanoic acid CH_3 CH_2 COOH

And C = Butane CH_3 CH_2 CH_2 CH_3

The sequence of reactions is



$$CH_3\ CH_2\ CO\ CH_2\ CH_3 \xrightarrow{alk.kmNo_4} CH_3CH_2COOH + \mathrm{CH_3\ COOH}$$

$$CH_3\ \mathrm{CH_2\ COOK} \xrightarrow[decarboxylation]{kolbe's} \mathrm{CH_3\ CH_2\ CH_2\ CH_3\ + CO_2\ + KOH\ + H_2}$$

CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (Aldehydes, Ketones and carboxylic acids)

Topic:- Miscellaneous Questions

1. Give one use of Formalin. [1]
2. What is the chemical name of Tollen's reagent and Fehling's solution [2]
3. Write the structure of alkenes that on ozonolysis will give ketone only. [1]
4. What is the function of $BaSO_4$ in rosenmund reaction? [1]
5. Name the isomers with molecular formula C_3H_6O.

   Which one will have high boiling point? [1]
6. Write a chemical test to distinguish between aldehyde and ketone. [1]
7. What happens when acetaldehyde is kept with a trace of sulphuric acid?

   Write the structure of product. [1]
8. What is the Hofmann bromamide reaction? Illustrate with one example. [1]

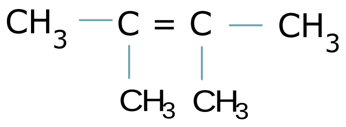
CBSE TEST PAPER-05
CLASS - XII CHEMISTRY (Aldehydes, Ketones and carboxylic acids)

[ANSWERS]
Topic:- Miscellaneous Question

Ans.1 Formalin is used as a disinfectant, preservative for biological specimens and in leather industry.

Ans.2 Tollen's reagent = Ammoniacal Silver Nitrate
Fehlings solution = Sodium Potassium Tartarate.

Ans.3



$$CH_3-\underset{CH_3}{\underset{|}{C}}=\underset{CH_3}{\underset{|}{C}}-CH_3$$

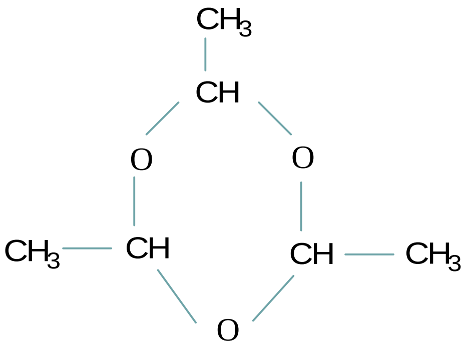
2, 3 - dimethyl but - 2 - ene

Ans.4 $BaSO_4$ acts as a catalytic poison which prevents further reduction of aldehyde to alcohol.

Ans.5 The two isomers are CH_3COCH_3 and CH_3 CH_2CHO. Acetone boils at higher temperature due to presence of two electron donating alkyl groups.

Ans.6 Aldehydes and ketones can be distinguished by Tollen's test. Aldehydes give a silver mirror on reacting with Tollen's reagent whereas ketones will not react.

Ans.7 A trimer of acetaldehyde, called paraldchyde is formed.



Ans.8 Hoffman bromamide reaction is a reaction in which amides are converted to amines of one carbon less than the starting amide. It is a very important step – down reaction.

$$RCONH_2 + Br_2 + KOH \longrightarrow RNH_2 + KBr + K_2CO_3 + H_2O$$

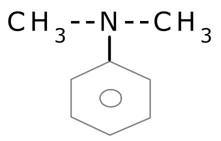
CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Amines)

Topic:- Nomenclature

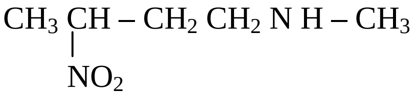
1. Give IUPAC name of 1X 10=10

(i)



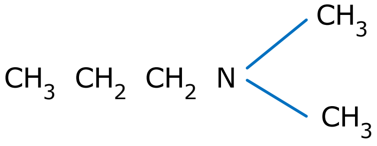
(ii) m- NC $C_6H_4NH_2$

(iii)

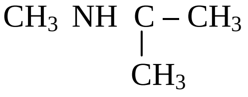


$$CH_3\underset{\underset{NO_2}{|}}{CH}-CH_2\,CH_2\,NH-CH_3$$

(iv)

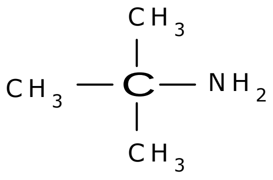


(v)



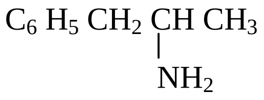
$$CH_3\ NH\ \underset{\underset{CH_3}{|}}{C}-CH_3$$

(vi)



$$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-NH_2$$

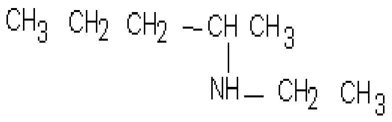
(vii)



$$C_6H_5\,CH_2\,\underset{\underset{NH_2}{|}}{CH}\,CH_3$$

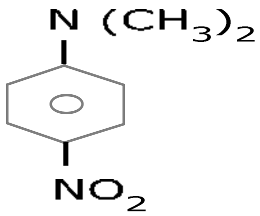
(viii) $O-(NH_2)_2\,C_6H_4$

(ix)



$$CH_3\ CH_2\ CH_2-\underset{\underset{NH-CH_2\ CH_3}{|}}{CH}\ CH_3$$

(x)



2. Write structure of following 1x10=10

(i) Aminobut -2- ene

(ii) N- Methyl –N- ethylaniline

(iii) N- Ethyl -2- pentanamine

(iv) 2,4,6 – Tribromoaniline

(v) N, N- Dimethyl methanamine

(vi) N- Phemylaniline

(vii) 3-Phenyl propanamine

(viii) Benzylamine

CBSE TEST PAPER-01

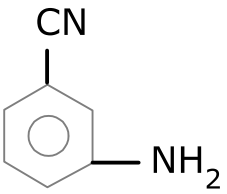
CLASS - XII CHEMISTRY (Amines)

[ANSWERS]

Topic:- Nomenclature

1 (i) N, N–dimethylaniline

1 (ii)



3-aminobenzonitrile

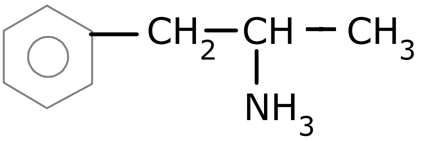
1 (iii) N- methyl -3 – nitro -1- butanamine

1 (iv) N, N – dimethylpropanamine

1 (v) N- methyl -2- aminopropanamine

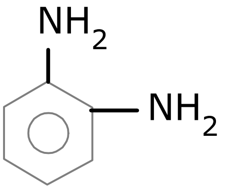
1 (vi) 2- Methyl propane

1 (vii)



1-phenyl-2-propanamine

1 (viii)



1, 2-benzenediamine

1 (ix) N – Ethyl pentan-2-amine

1 (x) N, N – Dimethyl-4-nitro aniline

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (Amines)

Topic:- Reasoning Questions.

Give Reasons

1. It is difficult to prepare pure amines by ammonolysis of alkylhalides. [2]
2. Amines have higher boiling points than hydrocarbons of similar molecular mass. [2]
3. Aniline is weaker base than cyclohexylamine. [2]
4. Methylamine is a stronger base than aniline. [2]
5. Before nitration, aniline is converted to acetanilide. [2]
6. It is easier to brominate aniline as compared to benzene. [2]
7. Reduction of nitro compound to aniline using iron scrap and HCl is preferred. [2]
8. Aromatic amines cannot be prepared by Gabriel Phthalimide synthesis. [2]
9. During acylation of amines, pyridine is added. [2]
10. Aniline does not undergo Friedel – Craft’s reaction. [2]

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (Amines)

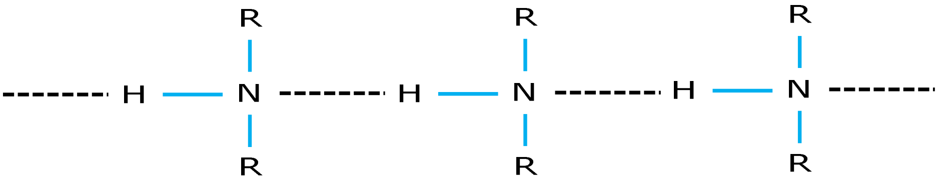
[ANSWERS]

Topic:- Reasoning Questions.

1. The process of ammonolysis yields a mixture of primary, secondary, tertiary amines and quaternary salts. The separation of this amines is a very complicated process and difficult. Therefore it is difficult to prepare pure amines by ammonolysis of alkyl halides.

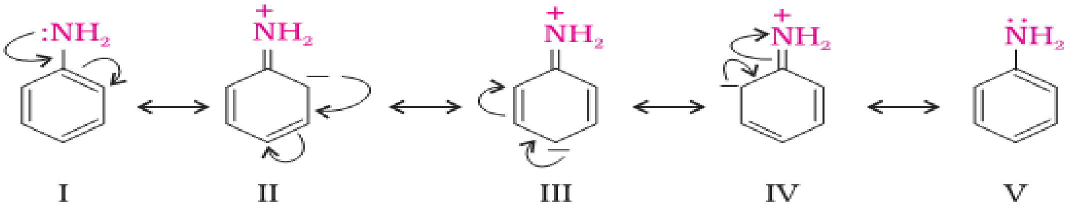
$$Rx \xrightarrow[-Hx]{NH_3} RNH_2 \xrightarrow[-Hx]{Rx} R_2NH \xrightarrow[-Hx]{Rx} R_3N \xrightarrow{Rx} [R_3N]^+ X^-$$

2. Amines have higher boiling points than hydrocarbons of comparable molecular mass due to the presence of intermolecular hydrogen bond in amines which is absent in hydrocarbons. Therefore, amines exist as associated molecules and have higher boiling points.



In alcohols and carboxylic acids, the electro- negativity of oxygen is more than nitrogen of amines. Therefore the hydrogen bonds of alcohols and acids are stronger than in amines and alcohols & carboxylic acids have higher boiling points.

3. As a result of resonance in aniline; the lone pair on nitrogen delocalized over the benzene ring and is less available for protonation than in cyclohexyl amine which does not undergo resonance.
Resonating structure of aniline –



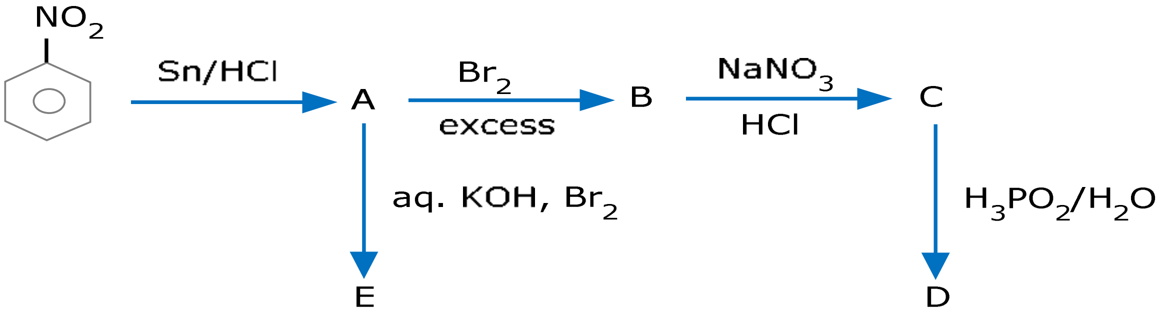
CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Amines)

Topic:- Identification Question.

Each question carries 3 marks

1.



2. A compound (X) having formula C_3H_7 NO reacts with Br_2 in the presence of NaOH to give another compound (Y). Compound (Y) reacts with HNO_2 to form ethanol and N_2 gas . Identify (X) and (Y) . Write the reaction involved.

3. An organic compound A (C_3H_5N) on boiling with alkali gives NH_3 and sodium salt of an acid B ($C_3H_6O_2$). The compound A on reduction gives C (C_3H_9N) which on treatment with nitrous acid gives an alcohol D (C_3H_8O). Identify A to D

4.

$$C_6H_5CONH_2 \xrightarrow[SOCl_2]{P_2O_5 \text{ or}} (A) \xrightarrow{\text{catalytic reduction}} (B) \xrightarrow[NaNO_2\,/\,HCl]{HONO \text{ or}} (C)$$

5.

$$(A) \xrightarrow{Br_2\,/KOH} (B) \xrightarrow[HNO_2]{NaNO_2\,/\,HCl} (C) \xrightarrow[Br_2]{\text{Red } P/} CH_3\,Br$$

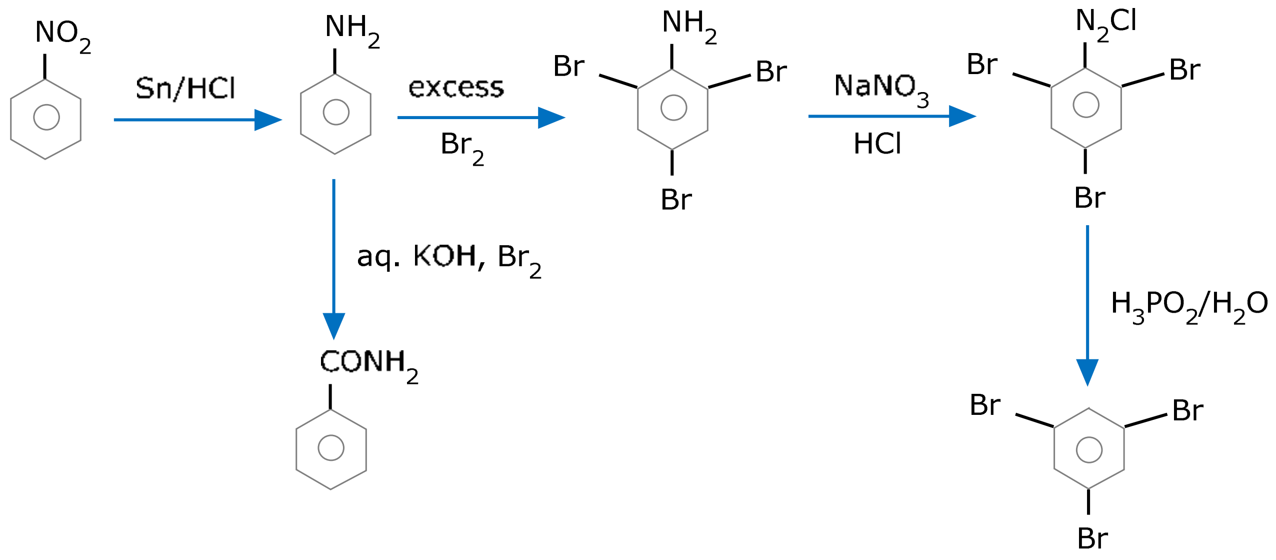
CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Amines)

[ANSWERS]

Topic:- Identification Question

Ans 1.



Ans 2.

$$X\ (C_3H_7NO) + Br_2 \xrightarrow{NaOH} Y \xrightarrow{HNO_2} CH_3\ CH_2\ OH + N_2$$

Since Y gives ethanol and N_2 gas with HNO_2, therefore it is $CH_3\ CH_2\ NH_2$.

Ethan amine (Y) is formed on reacting (X) with Br_2 and NaOH;

Therefore X is $CH_3\ CH_2\ CO\ NH_2$.

Therefore

X= $CH_3\ CH_2\ CONH_2$

Y = $CH_3\ CH_2\ NH_2$

The reactions are –

$$CH_3\ CH_2\ CONH_2 + Br_2 \xrightarrow{NaOH} CH_3\ CH_2\ NH_2\ (Y) \xrightarrow{HNO_2} CH_3\ CH_2\ OH + N_2$$

CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (Amines)

Topic:- Conversions

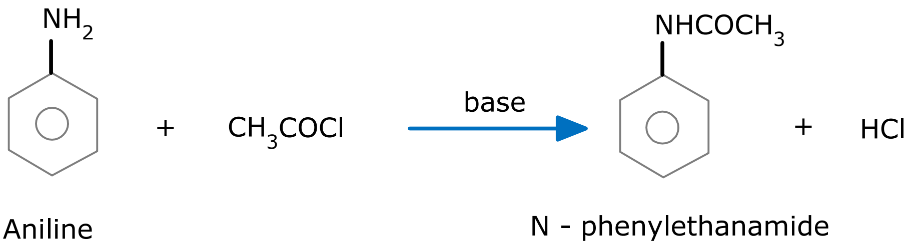
1. Aniline to N- phenylethanamide
2. Aniline to P- aminoazobenzene
3. Benzene to Aniline
4. Nitrobenzene to bromobenzene
5. Benzene to m- bromoaniline
6. Aniline to benzoic acid
7. Aniline to p- nitro aniline
8. Methylamine to ethylamine
9. Nitroethane to Nitro methane
10. Benzene to 1,3,5 – tribromobenzene

CBSE TEST PAPER-04

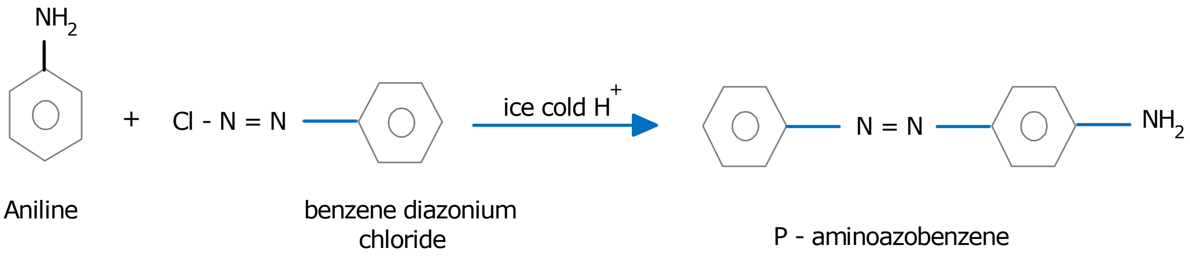
CLASS - XII CHEMISTRY (Amines)

Topic:- Conversions

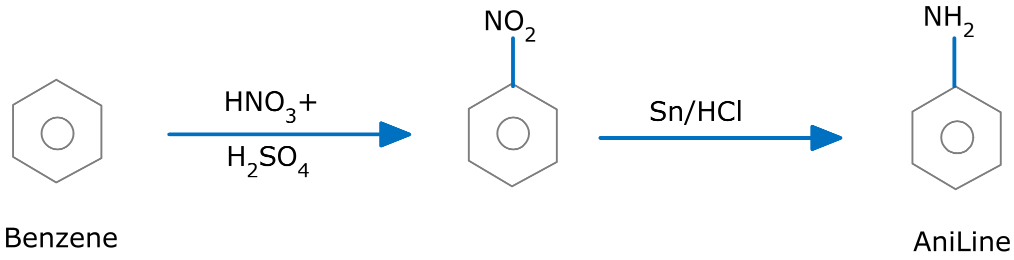
Ans1.



Ans2.

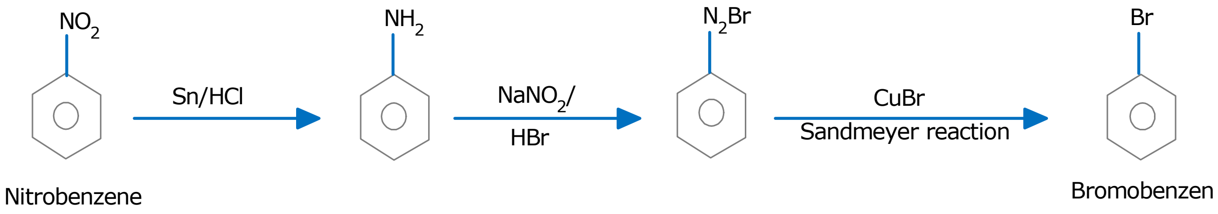


Ans3.



Benzene

Ans4.



CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (Amines)

Topic:- Miscellaneous Questions

1. For an amine RNH_2, write an expression to indicate its basic strength [1]
2. Give one use of quaternary ammonium salts. [1]
3. Give one example of Hoffmann – Bromamide reaction [1]
4. Distinguish between ethylamine and aniline. [1]
5. The IUPAC name of secondary amine having lowest molecular mass is __________. [1]
6. Give an example of diazotization [1]
7. Write one use of diazonium salt [1]
8. How can the reactivity of aromatic amines be controlled? [1]
9. Give one use of tertiary amines. [1]
10. Name a reagent which can distinguish between primary, secondary and tertiary amines [1]

CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (Amines)

Topic:- Miscellaneous Questions

[ANSWERS]

1.

$$RNH_2 + H_2O \rightleftharpoons RNH_3^+ + OH^-$$

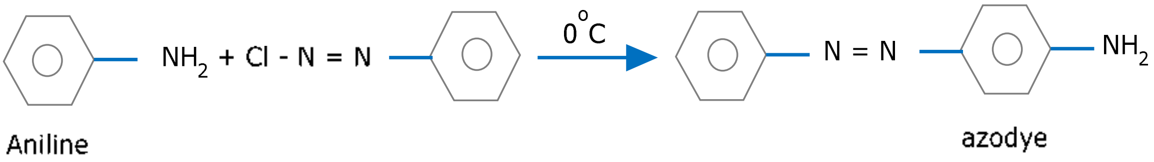
$$K_b = \frac{[RNH_3^+]\ [OH^-]}{[RNH_2]}$$

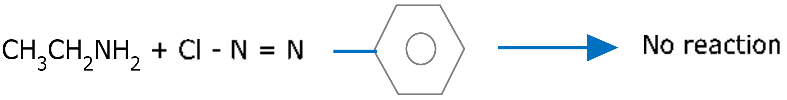
2. Quaternary ammonium salts are widely used for manufacture of synthetic detergents.

3. In Hoffmann – Bromamide reaction an acid amide is reacted with Bromine in presence of a base to give a primary amine having one carbon less than the starting amide.

$$RCONH_2 + Br_2 + 4\,NaOH \rightarrow RNH_2 + Na_2CO_3 + 2\,NaBr + 2\,H_2O$$

4. Ethylamine and aniline can be distinguished by azodye test. On treating aniline with benzene diazonium salt, orange or red coloured azodye is formed which is not formed with ethyl amine.





5. N- Methylmethanamine.

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Bimolecules)

Topic:- Carbohydrates and their classification

1. Give some examples of bimolecules [1]
2. What are carbohydrates? [1]
3. Give one example of each- Monosaccharide, disaccharide and polysaccharides. [1]
4. Which disaccharides are non – reducing sugars? [1]
5. Classify the following as monosaccharides disaccharides and polysaccharides- [1]

   Glucose, Sucrose, maltose, ribose, glycogen, lactose, fructose.
6. What is the meaning of statement- Glucose is an aldohexose. [1]
7. Why are polysaccharides considered non- sugars? [1]
8. Give two examples of reducing sugars [1]
9. Which sugar is present in milk? [1]
10. Name the reagents used to check the reducing nature of carbohydrates. [1]

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Bimolecules)

Topic:- Carbohydrates and their classification
[ANSWERS]

Ans1. Examples of biomolecules –

carbohydrates, proteins, Nucleic acids, Lipids, enzymes etc.

Ans2. Carbohydrates are optically active polyhydroxy aldehydes or ketones or the compounds which produce such units on hydrolysis.

Ann3. Monosaccharide – Glucose, Fructose etc.

Disaccharide – Sucrose, maltose etc.

Polysaccharide – Cellulose, starch etc.

Ans4. In disaccharides, if the reducing groups of monosaccharides, i.e. aldehydic or ketonic groups are bonded eg. In sucrose, these are non- reducing.

Ans5

Monosaccharide	Disaccharides	Polysaccharides
Glucose	Sucrose	Glycogen
Fructose	Maltose	
Ribose	Lactose	

Ans6. Glucose is an aldohexose means that it contains six carbon atoms and aldehyde group.

Ans7. Polysaccharides are not sweet in taste & hence are called non – sugars.

Ans8. Examples of reducing sugars –

Maltose and Lactose.

Ans9. In milk, lactose is present.

Ans10. Tollen’s reagent and Fehlings solution can be used to check reducing nature of sugars.

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (Bimolecules)

Topic:- Carbohydrates and their classification

1. How is glucose obtained from starch? [1]

2. Give a reaction to prove that –

   (a) Glucose has carbonyl group

   (b) The six carbons in glucose are arranged in a straight chain [2]

3. What is the significance of ‘D’ and ‘+’ before the name of glucose in D (+) – glucose? [2]

4. Which reaction of glucose cannot be explained by its cyelic structure? [2]

5. What are anomers? Name the two anomers of glucose. [2]

6. Give the structures of α and β forms of glucose. [2]

7. What are the expected products of hydrolysis of

   (a) Sucrose

   (b) Galactose [2]

8. What is animal starch ? Where is it found? [2]

9. Give two examples of polysaccharides. [1]

10. Name any Hexose other than glucose [1]

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (Bimolecules)

[ANSWERS]

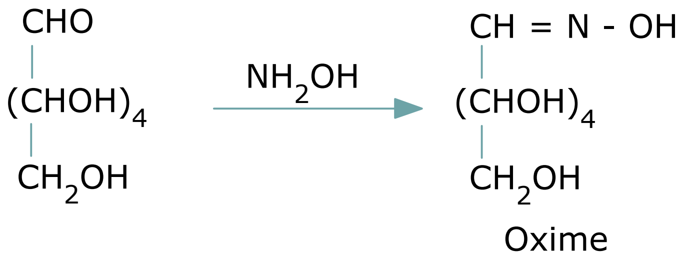
Topic: - Carbohydrates and their classification

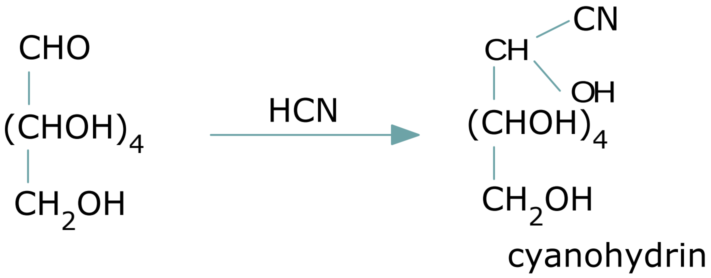
Ans1. Glucose can be obtained from sucrose by boiling sucrose with dil – HCl in alcoholic medium.

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow{H+} C_6\ H_{12}\ O_6 + C_6\ H_{12}\ O_6$$

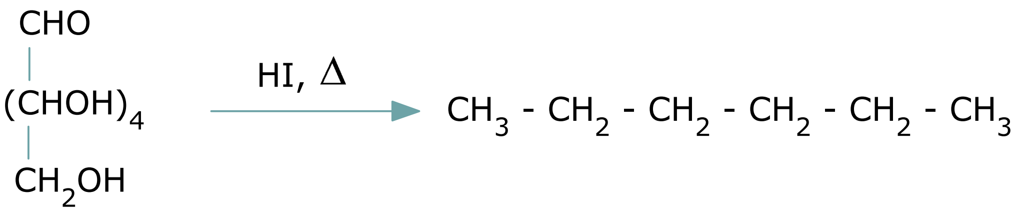
Sucrose Ghuose Fructose

Ans2. (a) Glucose molecule reacts with hydroxylamine to form an oxime and adds a molecule of HCN to form cyanohydrin . These reactions prove that a carboxyl group is present in glucose





(b) When glucose in heated with HI, it forms n- hexane. This shows that 6 carbons of glucose are arranged in a straight chain.



CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Bimolecules)

Topic:- Proteins

1. What is the basic unit of proteins? [1]
2. How are amino acids classified? [2]
3. Give an example of zwitter ion? [1]
4. Write the name of bond between the two α - amino acids. [1]
5. Differentiate between fibrous and globular proteins. [1]
6. What is the information given by primary structure of proteins? [1]
7. Differentiate between α - helical and β - pleated sheet structure. [2]
8. What do you understand by secondary structure of proteins? [2]
9. Name the forces responsible for secondary and tertiary structure. [1]
10. What is denaturation of proteins? Explain with examples. [1]

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Bimolecules)

Topic:- Proteins

[ANSWERS]

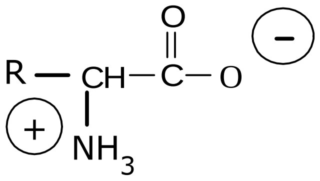
Ans1. The basic unit of all proteins in α - amino acids.

Ans2. Amino acids are classified as essential and non – essential amino acids.

The amino acids which can be synthesized in the body are known on non – essential amino acids e.g. Asparetic acid, Glycine etc.

The amino acids which cannot be synthesized in the body and must be obtained through diet are known as essential amino acids. E.g. Histidine, lysine.

Ans3.



$$R-\underset{\underset{\oplus\ NH_3}{|}}{CH}-\overset{\overset{O}{\|}}{C}-O^{\ominus}$$

Zwitter ion

Ans4. α - amino acids are connected by peptide linkage.

Ans5.

Fibrous Proteins	Globular Proteins
1. Their molecules have long thread like structure.	1. They have folded ball – like structure
2. they have helical or sheet structures	2. They may have three dimensional Shapes.
3. They are in soluble in water but soluble in strong acids and bases. e.g. Keratin, fibroin etc.	3. They are soluble in water, acids and Bases and salts. e.g. Egg albumin, casein insulin.

CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (Bimolecules)

Topic:- Enzymes and Vitamins

1. What are enzymes? [1]
2. How are enzymes named? Give an example. [2]
3. Give an example of enzyme catalysed reaction. [1]
4. What are vitamins? Give two examples. [1]
5. How are vitamins classified? [2]
6. Which vitamins cannot be stored in our body? [1]
7. Where are fat soluble vitamins like A, D, E, and K stored in our body? [1]
8. Write the disease caused by deficiency of vitamins A, B_2 , B_6 , B_{12}, C, D E and K. [4]

CBSE TEST PAPER-04
CLASS - XII CHEMISTRY (Bimolecules)

[ANSWERS]
Topic:- Enzymes and Vitamins

Ans1. Enzymes are biocatalyst which are very specific for a particular reaction and a particular substrate. Almost all enzymes are globular proteins.

Ans2. Enzymes are generally named after the compound upon which they work. e.g. enzyme that catalyses the hydrolysis of maltose into glucose is named maltase.

Some times enzymes are named after the reaction where they are used. e.g. the enzymes which catalyze reduction of other is called oxidoreductase.

Ans3. Example of enzyme catalysed reaction –

$$\underset{Maltose}{C_{12}H_{22}O_{11}} \xrightarrow{Maltase} \underset{\text{Glucose}}{2\,C_6H_{12}O_6}$$

Ans4. Vitamins are organic compounds required in the diet in small amounts to perform specific biological functions for normal maintenance of optimum growth and health of the organism. e.g. vitamins A, B, C, D etc.

Ans5. Vitamins are classified into two groups depending upon their solubilities-

(i) Fat soluble vitamins – which are soluble in fats and oils. e.g. vitamins A, D, E & K.

(ii) Water soluble vitamins – which are soluble in water e.g. vitamins B& C.

Ans6. Water soluble vitamins cannot be stored in our body as they are excreted in urine.

Ans7. Water soluble vitamins are stored in liver and adipose (fat storing) tissues in our body.

Ans8.

Vitamin	Deficiency disease
A	Xerophthalmia, Night blindness
B_2	digestive disorders
B_6	Convulsions
B_{12}	Pernicious anaemia
C	Scurvy
D	Rickets
E	Muscular weakness
K	Increased blood clotting time.

CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (Bimolecules)

Topic: - Nucleic Acids

1. Name the different types of RNA molecules found in the cells of organisms [1]

2. What are the three components of nucleic acids? [1]

3. Name different bases present an (i) DNA (ii) RNA [2]

4. What is nucleoside? [1]

5. What type of bonding occurs between two nucleotides? [1]

6. Write the sequence of bases in the complementary strand of the given strand - [1]

   A G G C T T A A C C T

7. Name the various sugars present in RNA & DNA. [1]

8. Write functional differences between [2]

   RNA & DNA.

CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (Bimolecules)

[ANSWERS]

Topic:- Nucleic Acids

Ans1. The different types of RNA molecules are transfer RNA (+ RNA), messenger RNA (m–RNA), ribosomal RNA (r- RNA)

Ans2. The three components of nucleic acid are base, sugar and phosphate group.

Ans3. Bases present in DNA – Thyamine (T), Adenine (A), Guanine (G), Cytosin (C) and in RNA are uracil (U), Adenine (A), Cytosine (C) and Guanine (G).

Ans4. The molecules in which one of the organic base is combined with sugar are called nucleosides.

Ans5. The two nucleotides are joined by phopho- diester linkage.

Ans6. The sequence of bases in the complementary sequence is –

T C C G A A T T G G A

Ans7. The various sugars present in nucleic acids are Ribose in RNA and deoxyribose in DNA.

Ans8. DNA is very important for passing of hereditary information from one generation to other.

In RNA protein synthesis takes place.

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Chemical Kinetics)

Topic: -Rate of reaction – Average and instantaneous rates

1. Define the term chemical kinetics? [1]

2. Define – Rate of reaction? [1]

3. What is average rate of a reaction? How is it determined? [2]

4. What are the units of rate of a reaction? [1]

5. What is instantaneous rate of a reaction? How is it determined? [2]

6. For the following reactions, write the rate of reaction expression in terms of reactants and products? [2]

   i) $4NH_3\ (g) + 5O_2\ (g) \rightarrow 4NO\ (g) + 6H_2O\ (g)$
   ii) $2N_2O_5 \rightarrow 2NO_2 + O_2$

7. For the chemical decomposition of SO_2Cl_2, its initial concentration is 0.8420 mol/L and final concentration is 0.215 mol^{L-1} in 2 hours. What is the average rate of this reaction? [2]

8. In the expression of rate of reaction in terms of reactants, what is the significance of negative sign? [2]

9. For the reaction $2O_3\ (g) \rightleftharpoons 3O_2\ (g)$, $-\dfrac{\Delta[O_3]}{\Delta t}$ was found to be 5.0×10^{-4} at m/s.

   Determine the value of $\dfrac{\Delta[O_2]}{\Delta t}$ in atm /s during this period of time? [2]

10. A chemical reaction $2A \Leftrightarrow 4B+C$ in gas phase occurs in a closed vessel. The concentration of B is found to be increased by 5×10^{-3} mole L^{-1} in 10 second. Calculate (i) the rate of appearance of B (ii) the rate of disappearance of A? [2]

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Chemical Kinetics)

[ANSWERS]

Topic: -Rate of reaction –Average and instantaneous rates.

1. The branch of chemistry that deals with the study of reaction rates and their mechanisms is called chemical Kinetics.

2. Rate of reaction can be defined as the change in concentration of a reactant or product per unit time.

3. Average rate of a reaction is defined as the change in concentration of a reactant or a product per unit time. It can be determined by dividing the change in concentration of reactant or product by the time interval

   For the reaction: A $\rightarrow$ B $\qquad R\text{ av} = \frac{-\Delta[A]}{\Delta t} = \frac{\Delta[B]}{\Delta t}$

4. The units of rate of a reaction are Mol /L /s

5. The rate of a reaction at a particular moment of time is called instantaneous rate of a reaction.

   For a reaction $\qquad$ A $\rightarrow$ B

   $R\text{ inst} = \frac{d[A]}{dt} = \frac{d[B]}{dt}$. Where dt = the smallest possible time interval $(\Delta t \rightarrow 0)$

6. In terms of reactant

   i) $R_1 = \frac{-1}{4}\frac{\Delta[NH_3]}{\Delta t}$

   $R_2 = \frac{-1}{5}\frac{\Delta[O_2]}{\Delta t}$

   In terms of products

   $R_3 = \frac{1}{4}\frac{\Delta[NO]}{\Delta t}$

   $R_4 = \frac{1}{6}\frac{\Delta[H_2O]}{\Delta t}$

$$\frac{1}{4}R_1 = \frac{1}{5}R_2 = \frac{1}{4}R_3 = \frac{1}{6}R_4$$

$$-\frac{1}{4}\frac{\Delta[NH_3]}{\Delta t} = -\frac{1}{5}\frac{\Delta[O_2]}{\Delta t} = \frac{1}{4}\frac{\Delta[NO]}{\Delta t} = \frac{1}{6}\frac{\Delta[H_2O]}{\Delta t}$$

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (Chemical Kinetics)

Topic: -Factors affecting rate of a reaction , order and molecularity of a reaction.

1. Is rate of reaction always constant? [1]

2. Enlist the factors affecting rate of a reaction? [1]

3. What do you understand by rate law expression? [2]

4. Is it possible to determine or predict the rate law theoretically by merely looking at the equation? [1]

5. Define the terms – i) Order of a reaction [2]
   ii) Molecularity of a reaction.

6. What are elementary and complex reactions? [2]

7. Differentiate between order and molecularity of a reaction? [2]

8. Determine the overall order of a reaction which has the rate law [2]
   $$R = K [A]^{5/2} [B]^{3/2}$$

9. What are the units of a rate constant of a [2]
   a) First order reaction
   b) nth order reaction.

10. For the reaction $A+B \rightarrow C+D$, the rate of reaction doubles when the concentration of A doubles, provided the concentration of B is constant. To what order does A enter into the rate expression? [2]

CBSE TEST PAPER-02
CLASS - XII CHEMISTRY (Chemical Kinetics)
[ANSWERS]

Topic: - Factors affecting rate of a reaction , order and molecularity of a reaction.

1. No. rate of a reaction is not always constant. It depends on many factors such as concentration, temperature etc.

2. The factors affecting rate of a reaction are –
    a) Concentration of reactants
    b) Temperature
    c) Catalyst

3. The rate law is the expression in which 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 coefficient of the reacting species in a balanced chemical equation.

4. No, the rate law can not be predicted by merely looking at the balanced chemical equation but must be determined experimentally.

5. i) <u>Order of a reaction.</u>
   The sum of powers of the concentration of the reactants in the rate law expression is called order of that reaction.

   ii) <u>Molecularity of a reaction.</u>
   The number of reacting species which must collide simultaneously in order to bring about a chemical reaction is called molecularity of a reaction.

6. The reactions taking place in one step are called elementary reactions whereas when a sequence of elementary reactions , called mechanism , gives us the product , it is called complex reaction.

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Chemical Kinetics)

Topic: -Determination of order of a reaction.

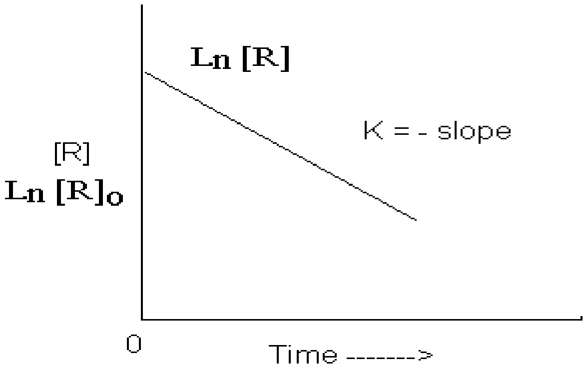
1. Identify the reaction order for from each of the following rate constant –
a) k = 2.3 ×10^{-5} L mol-1 s^{-1}
b) k = 3.1 × 10^{-4} s^{-1} [1]

2. Consider the equation 2 NO (q) + $2H_2$ (g) $\rightarrow$ N_2 (g) + $2H_2O$ (g)
The rate law for this equation is first order with respect to H_2 and second order with respect to NO. write the rate law for this reaction. [1]

3. The rate Law for the reaction A+B $\rightarrow$ C is rate = K $[A]^2$ [B] . What would the reaction rate be when concentration of both A and B are doubled? [2]

4. Write the integrated rate equation for –
i) zero order reaction.
ii) first order reaction. [2]

5. From the graph below [2]
i) Identify the order of reaction.
ii) What will be the unit of rate constant?



CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Chemical Kinetics)

[ANSWERS]

Topic: -Determination of order of a reaction

1. a) Since the units of rate constant are Lmol^{-1} s^{-1} The reactions is of second order.
   b) Since the units of rate constant are s^{-1} , The reaction is of first order.

2. The rate law will be $R = K\,[NO]^2\,[H_2]$

3. R1 = K [A]2 [B] -----------------------------------1)
   R2 = K [2A]2 [2B] -----------------------------------2)
   Dividing 2) by 1)

$$\frac{R_2}{R1} = \frac{[2A]^2\ [2B]}{[A]^2\ [B]} = \frac{8\,[A]^2\ [B]}{[A]^2\ [B]} = \frac{R_2}{R_1} = 8:1 \text{ or } R_2 = 8R_1$$

   The rate of reaction increases eight times.

4. i) Zero order reaction - $K = \frac{[R]_0 - [R]}{t}$

   ii) First order reaction $K = \frac{2.303}{t} \log \frac{[R_0]}{[R]}$

   Where R_0 is the initial concentration
   R is concentration at time t.

5. From the graph
   i) Reaction is first order reaction
   ii) The unit of rate constant will be sec^{-1}.

6. Let the order of reaction be x
   Rate = $K[N_2O_5]^x$
   i) From the data -
   $34 \times 10^{-5} = (1.13\times 10^{-2})^x$ ----------------1)
   $25\times 10^{-5} = (0.84\times 10^{-2})^x$ ---------------2)

CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (Chemical Kinetics)

Topic: -Half life period Temperature dependence.

1. Give an example of pseudo – first order reaction ? [1]

2. Write the expression for half – life period of a first order reaction? [1]

3. A first order reaction is found to have a rate constant K = 5.5×10^{-14} sec $^{-1}$.
Find half life of reaction? [1]

4. The time required to decompose SO_2Cl_2 to half of its initial amount is 60 min. If the decomposition is a first order reaction, calculate the rate constant of the reaction? [2]

5. The rate constant for the first order decomposition of N_2O_5 at 25^0C is $3X10^{-2}$ min^{-1}.
It the initial concentration of N_2O_5 is $2X10^{-3}$ mol/L, How long will it take to drop the concentration to $5X10^{-4}$ mol /L ? [2]

6. Write Arrhenius equation. [1]

7. If the activation energy of a reaction is zero, will the rate of reaction still depend on temperature? [2]

8. In general it is observed that the rate of a chemical reaction doubles with every 10^0 rise in temperature. If this generalization holds for a reaction in the temperature range295K to 305K, what would be the activation energy for this reaction?
($R=8.314Jk^{-1}$ mol^{-1}) [3]

9. The rate constant for a reaction is 1.5×10^7 s^{-1} at 50^0C and 4.5×10^7 s^{-1}at 100^0C.
Calculate the value of activation energy for the reaction R=8.314 JK^{-1} mol^{-1}? [3]

10. Plot a graph showing variation of potential energy with reaction .coordinate? [1]

CBSE TEST PAPER-04
CLASS - XII CHEMISTRY (Chemical Kinetics)
[ANSWERS]

Topic: - Half life period Temperature dependence.

1. Hydrolysis of ethyl acetate when concentration of water is very large , is an example of pseudo first order reaction.

   $CH_3COO\ C_2H_5 + H_2O \rightarrow CH_3\ COOH + C_2H_5OH.$

2. For a first order reaction , the half life period is

   $$T_{1/2} = \frac{0.693}{k}$$

3. $$t1/2 = \frac{0.693}{k}$$

   $$= \frac{0.693}{5.5\times10^{-14}\ \text{sec}^{-1}} = 1.26\times10^{13}\ \text{s}$$

4. $0.011\ 55\ \text{min}^{-1}$

5. $$t = \frac{2.303}{k}\ \log\ \frac{[R]_o}{[R]}$$

   $$= \frac{2.303}{3\times10^{-2}\ \text{min}^{-1}}\ \log\ \frac{2\times10^{-3}}{5\times10^{-4}}$$

   $$= \frac{2.303}{3\times10^{-2}}\ \log 4\ \ (\log 4 = 0.6021)$$

   $= 46.22$ min.

6. Arrhenius equation

   $K = A\ e^{-Ea/RT}$

   Where K = rate constant , T = absolute temperature

   E_a = Activation energy, R = gas constant.

7. $K = A\ e^{-Ea/RT}$

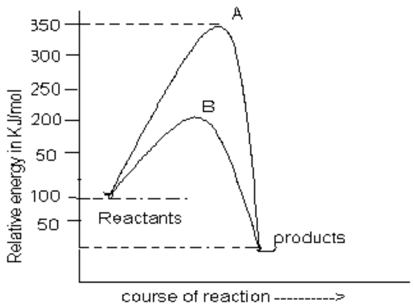
   When Ea = 0

   $K = A\ e^{-0/RT}$

CBSE TEST PAPER-05
CLASS - XII CHEMISTRY (Chemical Kinetics)

Topic: -Effect of catalyst, collision theory.

1. What is the effect of catalyst on rate constant? [1]
2. How is activation energy affected on adding a catalyst? [1]
3. What do you mean by the term- collision frequency? [2]
4. How does collision theory explain formation of products in a chemical reaction? [1]
5. What is the drawback of collision theory? [2]
6. How does the number of collisions change on increasing the temperature? [2]
7. There is no bar on the no. of collisions among the reaching species. Why most of the reactions do not take place under normal conditions? [2]
8. From the fig. (1) [2]
   (a) Calculate ΔE for the reaction, activation energy for forward reaction.
   (b) Identify the curve for catalysed reaction.
   (c) what is the energy of activation in the presence of catalyst?



9. The activation energy of reaction is 75.2 KJ/mol in the absence of a catalyst and 50.14 KJ/Mol in the presence of a catalyst. How many times will the reaction grow in the presence of a catalyst, if the reaction proceeds at 25^0C? [2]

10. The rate of a particular reaction quadruples when the temperature changes from 293 K to 313 K. Calculate activation energy for such a reaction. [2]

CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (Chemical Kinetics)

[ANSWERS]

Topic: -Rate of reaction – Effect of catalyst , collision theory.

1. A catalyst increases the rate constant value.

2. A catalyst lowers the activation energy by following a different path for the reaction.

3. The no. of collisions per second per unit volume of the reaction mixture is known as collision frequency. It is denoted by Z.

4. According to collision theory, the reactant molecules are assumed to be hard spheres and reaction occurs when these molecules collide with each other. The collisions in which molecules collide with sufficient kinetic energy (called threshold energy) and proper orientation, lead to formation of product. Here activation energy and proper orientation of the molecules determine the criteria for effective collision & hence the rate of a reaction.

5. The drawback of collision theory is that it considers the molecules to be hard spheres and ignores their structural aspect.

6. The rate of reaction would increase on increasing the temperature as it will increase the no. of collision as well as no. of effective collisions.

7. The reactions either do not have required energy or are not properly oriented, then the reaction will not take place.

8. (a) From the figure-

Energy of reactions E_r = 150KJ/Mol
Energy of products, E_p = 50Kj/Mol
Change in energy, $\Delta E = E_P - E_R$
= 50-150 = 100KJ/Mol
Threshold energy, E_r = 350 KJ/Mol

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Chemistry in Everyday Life)

Topic:-Drugs

1. Define Drugs. [1]
2. Define chemo therapy. [1]
3. What are the various basis of classification of drugs? [2]
4. Give some examples of drug targets. [1]
5. Explain drug – enzyme interaction. [2]
6. What are antagonists and agonists? [1]
7. Metal – hydroxides are used an antacids instead of metal hydrogen carbonates. Why? [1]
8. What are antihistamines? Give two examples. [2]

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Chemistry in Everyday Life)

[ANSWERS]

Topic: - Drugs

Ans1: Drugs are chemicals of low molecular masses which interact with macromolecular targets and produce a biological response.

Ans2: The use of chemicals for therapeutic use is called chemotherapy.

Ans3: Drugs are classified on the basis of

(a) Pharmacological effect
(b) Drug action
(c) Chemical structure
(d) Molecular targets

Ans4: Examples of drug targets – Enzymes, Receptors, Lipids, Carbohydrates etc.

Ans5: <u>Drug – Enzyme interaction</u> –

Drugs can block the binding site of the enzyme and prevent the binding of substrate or can inhibit the catalytic activity of enzyme acting as enzyme inhibitors. Drugs inhibit the attachment of substrate on active site of enzyme in two different ways –

(i) They compete with the natural substrate for their attachment on the active site of enzyme acting as competitive inhibitors.

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (Chemistry in Everyday Life)

Topic:-Drugs

1. What are tranquilizers? [1]
2. How does an antidepressant work? Explain with example. [2]
3. Give two examples of barbiturates. [1]
4. What are analgesics? [1]
5. Explain the types of analgesics with example. [2]
6. What are antibiotics? [1]
7. How are antibiotics classified? Explain with example. [3]
8. What in the difference between antiseptics & disinfectants? [2]
9. Give two examples of drugs used as antiseptics and disinfectants. [1]
10. Give two examples of antifertility drugs. [1]

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (Chemistry in Everyday Life)

[ANSWERS]

Topic: - Drugs

Ans1: Tranquilizers are neurologically active drugs which are used for the treatment of stress and mild or even severe mental diseases.

Ans2: Antidepressants are used in case of a person suffering from depression e.g. noradrenalin is a neurotransmitter that plays a role in mood change. If the level of noradrenaline is low, the person suffers from depression. An antidepressants inhibits the enzyme which catalyses the degradation of noradrenalin. If the enzyme is inhibits, the neurotransmitter is slowly metabolized & can activate the receptor for longer time & counteracts the effect of depression.

Ans3: Examples of barbiturates –
Veronal, amytal, Nebutal, Liminal & Seconal.

Ans4: Analgesics reduce or cure pain without causing impairment of consciousness, mental confusion, incoordiantion or paralysis or some other problem of nervous system.

Ans5: Analgesics are classified an

(i) Non narcotic analgesics – These drugs are effective in reliving skeletal pain & are non – addictive. They may have many other effects like reducing fever and preventing platelet coagulation. e.g. Aspirin & Paracetamol.

(ii) Narcotic analgesics – These are habit forming or addictive drugs e.g. morphine & its homologues. They, when administered in medicinal doses relieve pain & produce sleep but in poisonous doses, they can produce coma, convulsions & even death.

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Chemistry in Everyday Life)

Topic:-Artificial Sweeteners, soaps and detergents

1. Give some examples of artificial sweeteners. [1]

2. Which artificial sweetener is preferred for diabetes and why? [2]

3. What are the limitations of aspartame and alitame? [2]

4. Name two food preservatives. [1]

5. How are floating soaps made? [1]

6. Why soaps do not work in hard water? [1]

7. How are detergents classified? [3]

8. How is the problem of non – biodegradable detergents solved? [1]

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Chemistry in Everyday Life)

[ANSWERS]

Topic: - Artificial Sweeteners, soaps and detergents

Ans1: Examples of artificial sweeteners are Aspartame, Saccharin, Alitame, Sucrolse etc

Ans2: Saccharin is preferred for diabetic persons as it is excreted from body in urine unchanged. It is entirely inert and harmless when taken.

Ans3: Aspartame is of limited use because it in unstable at cooking temperature & is used in cold foods & soft drinks.
Alitame is a high potency sweetener & its sweetness cannot be controlled.

Ans4: Two food preservatives are table salt, sodium benzoate etc.

Ans5: Floating soaps are made by beating tiny air bubbles before the hardening of soap.

Ans6: Hard water contains calcium and magnesium ions, which form insoluble calcium or magnesium soaps when soap is dissolved in hard water. They separate as scum in water and are useless as cleaning agents. Therefore soaps do not work in hard water.

Ans7: Synthetic detergents are classified as –

(a) Anionic detergents – these are sodium salts of sulphonated long chain alcohols or hydrocarbon. Here the anionic part of the molecule is involved in the cleansing action. e.g. sodium laurylsulphate.

(b) Cationic detergents – these are quaternary ammonium salts of amines with acetates, chlorides or bromides anions. e.g. cetyletrimethyl – ammonium bromide.

(c) Non – ionic detergents – these detergents do not contain any ion in their constitution. e.g. $CH_3(CH_2)_{16}COO(CH_2CH_2O)_nCH_2CH_2OH$

Ans8: The detergents having highly branched hydrocarbon part is non – biodegradable & causes water pollution. This problem can be overcome if the branching of hydrocarbon chain is controlled & kept to minimum – unbranched detergents are biodegradable and cause less pollution.

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (coordination compounds)

Topic:- Werner's theory, some definitions

1. What are complex compounds? [1]

2. Give some examples of coordination compounds. [1]

3. What were the two valences given by Werner for coordination compounds? [1]

4. Enlist the common shapes of Werner's complexes. [1]

5. What is the difference between a double salt and a complex?

   Explain with an example. [2]

6. What are ligands? Explain different types of ligands. [3]

7. What do you understand by the term coordination number? [1]

8. What are the different shapes or coordination polyhedra in the complexes? [2]

9. Define oxidation state of a metal. [1]

10. Distinguish between homoleptic and hetroleptic ligands. [1]

CBSE TEST PAPER-01
CLASS - XII CHEMISTRY (coordination compounds)
[ANSWER]

Topic:- Werner's theory, come definitions

Ans.1 Complex compounds or coordination compounds are those compounds in which the metal atoms are bound to a number of anions or neutral molecules.

Ans.2 Examples of coordination compounds are chlorophyll, haemoglobin and vitamin B_{12}.

Ans.3 Werner gave the concept of two valences-

a) Primary or ionisable valences.

b) Secondary or non ionisable valences.

Ans.4 The common shapes given by Werner were – octahedeal, tetrahedral and square planar.

Ans.5 Double salts dissociate completely into simple ions when dissolved in water e.g., Mohr salt, $FeSO_4\ (NH_4)_2\ SO_4, 6H_2O$ will dissolve in water and give ferrous, ammonium and sulphate ions. On the other hand, the complex ions do not completely dissociate into all constituent ions e.g. $K_4\ [Fe(CN)_6]$ will dissociate to give potassium ions and $[Fe(CN)_6]^{4-}$ ions only.

Ans.6 The ions or molecules bound to central atom or ion in the coordination entity are ligands e.g $[Fe(CN)_6]^{4-}$ has six CN^- ligands.

Types:-

(1) On the basis of charges on them ligands con be negative (e.g. Cl^-, OH^-, CN^- etc.), positive (e.g. H_3O^+, NH_4^+ etc.) or neutral (e.g. CO, NH_3, H_2O).

(2) On the basis of their donor atoms ligands can be monodentate or unidentate (one donor atom) e.g- H_2O, NH_3, Cl^- etc, or didentate (two donor atoms) $H_2N\ CH_2\ CH_2\ NH_2$ or $C_2O_4^{2-}$ etc. or polydentate (several donor atoms) e.g $[EDTA]^{4-}$ is a hexadentate ligand.

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (coordination compounds)

Topic:- Nomenclature of coordination compounds.

1. **What IUPAC names of following complexes?**
    1. $[Co\ (NH_3)_6]^{3+}$
    2. $[Fe\ (C_2O_4)_3]^{3-}$
    3. $[Ni\ (CN)_4]^{2-}$
    4. $[Pt(NH_3)_4\ Cl_2]^{2+}$
    5. $[NiCl_4]^{2-}$
    6. $[Co(NH_3)_5\ ONO]^{2+}$
    7. $[Co\ (NH_3)_5Cl]Cl_2$
    8. $[Cr\ (CN)\ (H_2O)_5]^{2+}$
    9. $[Co\ (NO_2)_6]^{3-}$
    10. $[Co\ (en)_3]Cl_3$

2. **Write formula for the following compounds.**
    1. Hexammineplatinum (VI) Chloride
    2. Potassium hexacyanoferrate (III) ion
    3. diamminedichloridoplatinum (III) ion
    4. Tetramminedichloridocobalt (III) ion
    5. Annine chlorobis (elhylenediamine) cobalt (III) ion.
    6. Hexaamminechromium (III) hexacyanocobaltate (III)
    7. Pentramminenitro –N- Cobalt (III) Chloride.
    8. Pentramminebromidoocobalt (III) sulphate
    9. triamminediaquachlorocobalt (III) Chloride
    10. Tetramminedichloridooplatinum (IV) Bromide

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (coordination compounds)

[ANSWERS]

Topic:- Nomenclature of coordination compounds.

Ans1. Hexamminecobalt (III)ion

Ans2 Trioxalatoferrate (III) ion

Ans3 Tetracyanonickelate (II) ion

Ans4 Tetraamminedichlidooroplatinum (IV) ion

Ans5 Tetrachloridoonickelate (II) ion

Ans6 Pentamminenitrito –O-cobalt (III) ion

Ans7 Pentamminechloridoo cobalt (III) Chloride

Ans8. Pentaquacyano chromium (III) ion

Ans9 Hexanitrito –N-cobaltate (III) ion

Ans10 Tris (ethylenediamine) Cobalt (III) Chloride

Ans1. $[Pt(NH_3)_6]Cl_6$

Ans2. $K_3[Fe(CN)_6]$

Ans3. $[Pt(Cl_2)(NH_3)_2]^+$

Ans4. $[Co(NH_3)_4Cl_2]^+$

Ans5. $[CoCl(en)_2(NH_3)]^{2+}$

Ans6. $[Cr(NH_3)_6][CO(CN)_6]$

Ans7. $[Co(NH_3)_5NO_2]Cl_2$

Ans8. $[Co(NH_3)_5Br]SO_4$

Ans9. $[Co(NH_3)_3(H_2O)_2Cl]Cl_2$

Ans10. $[PtCl_2(NH_3)_4]Br_2$

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (coordination compounds)

Topic:- Isomerism in coordination compounds

1. Define – isomerism. [1]

2. What is geometric isomerism? When can a compound show. [2]

   (1) Cis – Trans isomerism

   (2) Fac and Mer isomerism.

3. How do optical isomer differ from each other? [1]

4. Make the cis and trans forms of the complex [2]

   $[Cr\,Cl_2\,(en)_2]^+$. Which one of these will be optically active?

5. Which isomerism is shown by a compound having ambidentate ligand? Give example. [2]

6. What is ionization isomerism? Give an example. [1]

7. How do solvate isomers differ from each other? [1]

8. Draw the geometrical isomers of $[Cr\,(NH_3)_2\,(CN)_4]^-$? [1]

9. Indicate the types of isomerisms shown by the complex – $K\,[Fe\,(H_2O)_2\,(en)_2\,Cl_2]$? [1]

10. Give an example of coordination isomerism? [1]

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (coordination compounds)

[ANSWER]

Topic:- Isomerism in coordination compounds

Ans1. Isomerism is the phenomenon of existence of two or more compounds with same chemical formula but a different arrangement of atoms.

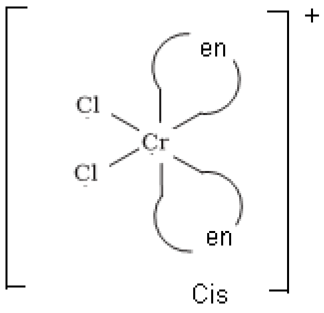
Ans2. The isomerism that arises in hetroleptic complexes due to different possible geometric arrangements of the ligands is called geometric isomerism.

1) Cis and Trans isomerism can occur in square planar complexes of formula $[MX_2 L_2]$ (X&L are unidentate ligands) , square planar complexes of formula MAB X L & octahedral complexes of formula $MX_2 L_4$.
2) Fac and mer isomerism can occur in octahedral complexes of formula Ma_3b_3.

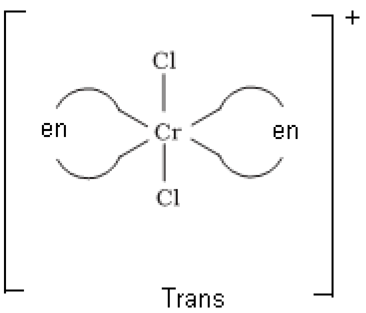
Ans3. Optical isomers differ in the direction in which they rotate the plane of polarized light in a polarimeter.

Ans4. $[Cr\,Cl_2\,(en)_2\,]^+$

Cis and trans forms.



Cis



Trans

CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (coordination compounds)

Topic:- Valence bond theory and crystal field theory

1. State the postulates of valence bond theory. [2]

2. Explain that the complex $[Co(NH_3)_6]^{3+}$ is diamagnetic on the basis of valence bond theory. [2]

3. $[Ni(CO)_4]^{2+}$ is square planar whereas $[NiBr_4]^{2-}$ is tetrahedral . Explain. [2]

4. Enlist the limitations of valence bond theory. [2]

5. State crystal field theory. [2]

6. What is crystal field splitting? [1]

7. How does the magnitude of Δo and P decide the actual configuration of d^4 in the presence of octahedral field? [2]

8. Show with diagram, the crystal field splitting of d- orbital in an octahedral field. [2]

9. Why are complexes coloured? [1]

10. When is a coordination compound colourlese? [1]

CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (coordination compounds)

[ANSWER]

Topic: - Valence bond theory and crystal field theory.

Ans1. According to valence bond theory:-

(a) In the presence of ligands, the metal ion uses its ns,(n-1)d, np or ns, np, nd orbitals for hybridization.

(b) These hybrid orbitals are of equivalent energy.

(c) The hybrid orbitals have definite geometry such as octahedral, tetrahedral, square planar etc.

(d) The hybrid orbitals overlap with ligand orbitals which can donate electrons to make bond.

Ans2. In $[Co(NH_3)_6]^{3+}$

Orbitals of Co^{3+} ion ↑↓ ↑ ↑ ↑ ↑ ☐ ☐☐☐

(ground state) 3d 4S 4P

Excited state configuration ↑↓ ↑↓ ↑↓ ☐☐ ☐ ☐☐☐

3*d* 4S 4P

d^2SP^3 hybridised orbitals ↑↓ ↑↓ ↑↓ XX XX XX XX XX XX

Six electron pairs from ligands

Since there is no unpaired electron, the complex is diamagnetic.

Ans3. $[Ni\ (CO)_4]^{2+}$

Orbitals of Ni^{2+} ↑↓ ↑↓ ↑↓ ↑ ↑ ☐ ☐☐☐

3d 4S 4P

(ground state)

CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (coordination compounds)

Topic: - Bonding in metal carboyl, stability of complex, applications of coordination compounds

1. What is the shape of [Fe $(CO)_5$]? [1]

2. Explain the synergic bonding in metal carbonyls. [2]

3. What do you understand by stability of a complex and instability constant of coordination compounds? [2]

4. How is EDTA used in estimation of hardness of water? [1]

5. Explain the role of complexes in metallurgy with an example. [1]

6. Give some example showing importance of complexes in biological system? [2]

7. How is excess of copper and iron removed from body? [1]

8. Give examples of complexes in [2]

   a) Chemical analysis

   b) Industrics

CBSE TEST PAPER-05

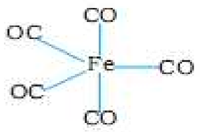
CLASS - XII CHEMISTRY (coordination compounds)

[ANSWER]

Topic:- Bonding in metal carboyl , stability of complex , applications of coordination compounds

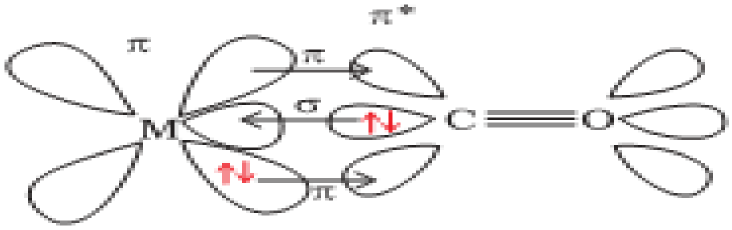
Ans. 1 $[Fe\ (CO)_5]$

Geomectry = Trigonal bipyramidal



$Fe(CO)_5$
Trigonal bipyramidal

Ans. 2 The metal – carbon bond in metal carbonyls has both s & P- character. The M – C σ bond is formed by donation of lone pair of electrons of carbonyl carbon into a vacant orbital of metal. The M – C π bond is formed by the donation of a pair of electron from a filled d- orbital of metal to the vacant π orbital of carbon monoxide. The metal to ligand bonding creates a synergic effect that strengthens the bond.



Synergic bonding

Ans. 3 The stability of a complex in solution is the degree of association between the two species involved in the state of equilibrium. The instability constant is reciprocal of the formation constant. It is also called dissociation constant.

Ans.4. Hard water is titrated with Na_2 –EDTA complex for estimation of its hardness. During the process, the Ca^{2+} and Mg^{2+} ions form complex with EDTA replacing Na^+. The method is based on the difference in the stability constant of calcium and magnesium complexes.

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Electrochemistry)

Topic: -Electrochemical Cells and Electrode Potential

1. Define the term – Electrode potential? [1]

2. Define the term – standard electrode potential? [1]

3. What is electromotive force of a cell? [1]

4. Can an electrochemical cell act as electrolytic cell? How? [2]

5. Single electrode potential cannot be determined. Why? [1]

6. What is SHE? What is its electrode potential? [1]

7. Explain construction and working of standard Hydrogen electrode? [3]

8. What does the positive value of standard electrode potential indicate? [1]

9. What is an electrochemical series? How does it predict the feasibility of a certain redox reaction? [2]

10. Give some uses of electrochemical cells? [2]

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Electrochemistry)

[ANSWERS]

Topic: -Electrochemical Cells and Electrode Potential

1. A potential difference that develops between the electrode and the electrolyte is called electrode potential.

2. When the concentration of all the species involved in a half-cell is unity, then the electrode potential is called standard electrode potential.

3. Electromotive force of a cell is also called the cell potential .It is the difference between the electrode potentials.

   $E_{cell} = E_{cathode} - E_{anode}$

4. Yes, An electrochemical cell can be converted into electrolytic cell by applying an external opposite potential greater than its own electrical potential.

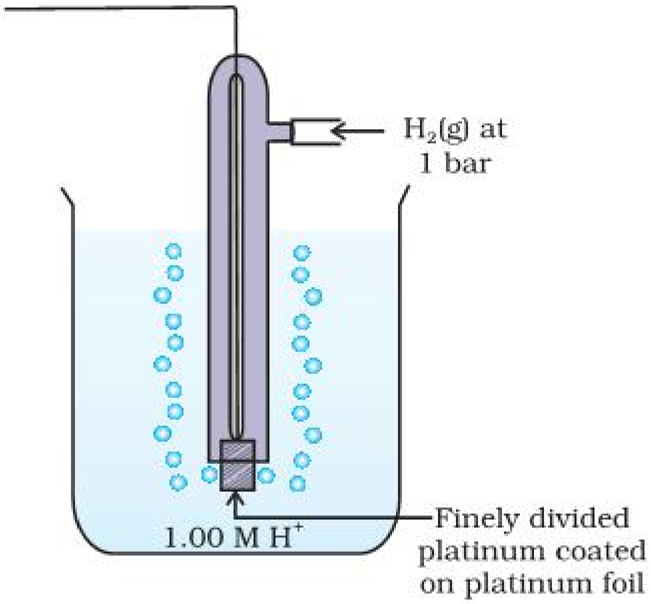
5. A single half cell does not exist independently as reduction and oxidation occur simultaneously therefore single electrode potential cannot be measured.

6. SHE stands for standard Hydrogen electrode. By convention, its electrode potential is taken as 0 (zero).

7. Construction :

   SHE consists of a platinum electrode coated with platinum black. The electrode is dipped in an acidic solution and pure Hydrogen gas is bubbled through it. The concentration of both the reduced and oxidized.

   Forms of Hydrogen is maintained at unity i.e) pressure of H_2 gas is 1 bar and concentration of Hydrogen ions in the solution is 1 molar.



CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (Electrochemistry)

Topic: -Nernst equation and its applications

1. A cell is represented by notation –

   Cu (s) /cu^{2+} (aq) // Ag^+ (aq) / Ag (s)

   Calculate e.m.f of the cell if E^0Cu^{2+}/Cu = + 0.34V and E^0 Ag^+/Ag = 0.08V? [1]

2. What would happen if Nickel spatula is used to stir a solution of $CuSO_4$?

   E^0Cu^{2+} / Cu = 0.34 V, E^0_N ; 2^+ / Ni = -0.25V? [1]

3. State the factors that affect the value of electrode potential? [1]

4. Write Nernst equation for a Daniel cell? [1]

5. How is standard electrode potential of a cell related to :-

   1) Equilibrium constant? [2]

   2) Gibbs free energy change.

6. What is the half cell potential for Fe^{3+} /Fe electrode in which [Fe^{3+}]= 0.1 m.

   E^0Fe^{3+} /Fe = + 0.771V [2]

7. Calculate pH of following half cell .

   Pt , H_2 / H_2SO_4 , if its electrode potential is 0.03V. [2]

8. What is the cell potential for the cell at 25^{0}C

   Cr / Cr^{3+} 10.1 m] //Fe^{2+} (0.01m) /Fe

   $E^0_{cr+/cr}$ = -0.74V ; E^0 Fe^{2+}/Fe = - 0.44V. [3]

CBSE TEST PAPER-02
CLASS - XII CHEMISTRY (Electrochemistry)
[ANSWERS]

Topic: -Nernst equation and its applications

1. $E^0_{cell} = E^0_{cathode} - E^0_{Anode}$
$= E^0_{Ag^+/Ag} - E^0_{Cu^{2+}/Cu}$
$= 0.80V - (+0.34V)$
$= +0.46V$

2. From the reduction potential values, it is indicated that Nickel (more negative value) is more reactive than copper and will, then displace copper from $CuSO_4$
$Ni(s) + Cu^{2+}(aq) \longrightarrow Ni^{2+}(aq) + Cu(s)$.

3. Factors affecting electrode potential values are –
a) Concentration of electrolyte
b) Temperature.

4. Daniel cell:
$Zn(s) / Zn^{2+}(aq) // Cu^{2+}(aq)/Cu(s)$
Nernst equation – at 298 K

$$E_{cell} = (E^0_{Cu^{2+}/Cu} - E^0_{Zn^{2+}/Zn}) - \frac{0.059}{2} \log \frac{[Zn^{2+}]}{[cu^{2+}]}$$

5. (i) Standard electrode potential and equilibrium constant

$$E^0_{cell} = \frac{2.303RT}{nF} \log k_c$$

Where E^0_{cell} = standard electrode potential of cell
R = Gas constant
T = temperature in Kelvin
n = no .of electrons.
F = Faraday's constant and
Kc = Equilibrium constant

(ii) Standard electrode potential and Gibbs free energy change-

$$\Delta G^0 = -nFE^0_{cell}$$

Where ΔG^0 = Change in Gibbs' free energy
n = No. of electrons

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Electrochemistry)

Topic: -Conductance, Equivalent – conductance and Molar conductance

1. Define the term – Resistivity? [1]

2. Give the unit of conductance? [1]

3. What do you understand by the term- conductivity? [1]

4. What are the factors on which conductivity of an electrolyte depend? [2]

5. How is molar conductance related to conductivity of an electrolyte ? [1]

6. Write an expression relating cell constant and conductivity? [1]

7. The conductivity of an aqueous solution of NaCl in a cell is 92 Ω^{-1} cm^{-1} the resistance offered by this cell is 247.8 Ω. Calculate the cell constant? [2]

8. The molar conductivity of 0.1M CH_3COOH solution is 4.6 cm^2 mol^{-1}.
   What is the conductivity and resistivity of the solution? [2]

9. The conductivity of metals decreases while that of electrolytes increases with increases in temperature. Why? [2]

10. The measured resistance of a cell containing 7.5 x 10^{-3} M solution of KCl at 25^0C was 1005 Ω calculate
    (a) Specific conductance and
    (b) Molar conductance of the solution. Cell Constant = 1.25 cm^{-1} [2]

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Electrochemistry)

[ANSWERS]

Topic: - Conductance, Equivalent Conductance and Molar conductance

1. The resistively of a substance is its resistance when it is one meter long and its area of cross Section is one m^2.

2. The SI unit of conductance is Siemens, denoted by the symbol, S & is equal to Ω^{-1}.

3. Conductivity of a material in Sm^{-1} is its conductance when it is 1m long and its area of cross - section is $1m^2$. It is represented by κ.

4. The conductivity of an electrolyte depends upon
   - i) The nature of electrolyte added
   - ii) Size of the ions produced and their solvation
   - iii) Concentration of the electrolyte
   - iv) Temperature

5. Molar conductance, Ω m is related to conductively by the relation.

$$\Omega \text{ m} = \frac{k}{c}$$

Where κ = conductivity in s/m.

C = concentration in mol/m^3

6. Cell constant and conductivity are related by the expression-

$$\kappa = \frac{G}{R}$$ where G = Cell constant

κ = conductivity

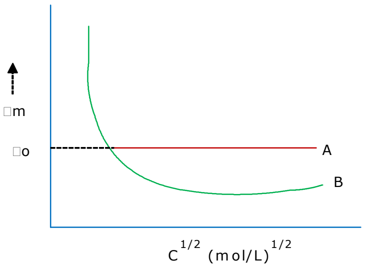
R = Resistance.

CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (Electrochemistry)

Topic: - Kohlrausch Law & Electrolysis

1. What do you understand by strong and weak electrolytes? [1]
2. State kohlrausch's Law? [1]
3. How is Limiting molar conductivity related to
   i) degree of ionization and ii) dissociation constant [2]
4. In fig. (1), identify the nature of electrolyte A& B. In which case it is not possible to obtain value of limiting molar conductance? [2]



5. At 298 K , the molar conductivities at infinite dilution of NH_4Cl , NaOH and NaCl are 129.8 , 217.4 and 108.9 scm2 mol^{-1} respectively .It molar conductivity of 0.01M NH_4OH solution is 9.33 scm2 mol^{-1} ,calculate the degree of dissociation of NH_4OH at this dilution? [2]
6. State Faraday's Laws of electrolysis? [2]
7. What is meant by Faraday's constant? [1]
8. How many faradays are needed to reduce 3g mole of Cu^{2+} to Cu metal? [1]
9. How many g of chlorine can be produced by the electrolysis of molten NaCl with a current of 1 amp. for 15 min? [2]
10. How many electrons flow when a current of 5 amps is passed through a solution for 193 sec. Given f = 96500 C. $N_A = 6.002 \times 10^{23}$ mol^{-1}? [2]
11. There are two possible reactions for cathode in the electrolysis of aqueous $ZnCl_2$: [2]

    $Zn^{2+}(aq) + 2e^- \rightarrow Zn(s)$ E = -0.76v

    $2H_2O(l) + 2e^- \rightarrow H_2(g) + 2OH^-(aq)$ E = - 0.83v

    Which one will take place ?
12. Silver is deposited on a metallic vessel by passing a current of 0.2 amps. for 3 hrs. Calculate the weight of silver deposited.
    (At mass of silver = 108 amu, F = 96500 C? [2]

CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (Electrochemistry)

[ANSWERS]

Topic: -Kohlrausch Law & Electrolysis

1. An electrolyte that ionises completely in solution is a strong electrolyte eg. NaCl , $CaCl_2$ etc and an electrolyte that ionizes partially in solution is weak electrolyte eg CH_3 COOH , NH_4OH etc.

2. Kohlrausch Law of independent migration states that limiting molar conductivity of an electrolyte can be represented as the sum of the individual contributions of the anion and cation of the electrolyte.

3. Relation between limiting molar conductance and degree of dissociation –

$$\alpha = \frac{\Omega m}{\Omega^{o} m} \quad \text{where } \alpha = \text{degree of dissociation}$$

λm = molar conductance

λm^0 Limiting molar conductance

Relation between dissociation constant and limiting molar conductance –

$$Ka = \frac{C\ \lambda \mathrm{m}^2}{\lambda m^0\ (\lambda \mathrm{m}^0 - \lambda \mathrm{m})} \quad \text{where c = concentration}$$

4. A = strong Electrolyte
B = weak Electrolyte
In case of B , it is not possible to get an exact value of limiting molar conductance.

5. $\lambda_m^{\ 0}\ (NH_4OH) = \lambda_m^{\ o}\ (Na_4Cl) + \lambda_m^{\ o}\ (NaOH) - \lambda_m^{\ o}\ (NaCl)$

$= 129.8 + 217.4 - 108.9 = 237.3\ 5\ cm^2/mol$

Degree of dissociation , $\alpha = \dfrac{\lambda m}{\lambda m^0} = \dfrac{9.33\ 5\ cm^2\ /\ mol}{237.3\ 5\ cm^2\ /\ mol}$

= 0.039 or 3.9 %.

6. Faraday's Laws of electrolysis

<u>First Law:</u> The amount of chemical reaction which occurs at any electrode during electrolysis by a current is proportional to the quantity of electricity passed through the electrolyte.

CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (Electrochemistry)

Topic: - Batteries and corrosion.

1. What do you mean by primary and secondary battery? [2]

2. Name the cell used for low current devices like hearing aids, watches etc. Also give the half cell reactions for such a cell? [2]

3. Give the reaction taking place in lead storage battery when it is on charging? [1]

4. A Leclanche cell is also called dry cell. Why? [1]

5. Why is the voltage of a mercury cell constant during its working? [1]

6. What are fuel cells? [1]

7. What do you understand by corrosion? [1]

8. Rusting of iron is quicker in saline water than in ordinary water .Explain? [2]

9. Name two metals than can be used for cathodic protection of iron? [1]

10. Enlist the factors affecting corrosion? [2]

CBSE TEST PAPER-05
CLASS - XII CHEMISTRY (Electrochemistry)
[ANSWERS]

Topic: -Batteries and corrosion.

1. In the primary batteries, the reaction occurs only once and after the use over a period of time battery becomes dead and cannot be reused again. A secondary battery , after used, can be recharged by passing current through it in the opposite direction so that it can be used again.

2. This cell is mercury cell – Half cell reactions are
Anode Zn (Hg) + $2OH^- \rightarrow ZnO + H_2O + 2e^-$ and Cathode $HgO + H_2O + 2e^- \rightarrow Hg\ (e) + 2OH^-$

3. When the lead storage battery is on charging –
$2PbSO_4\ (s) + 2H_2O\ (e) \rightarrow Pb\ (s) + PbO_2\ (s) + 2H_2SO_4\ (aq)$

4. Leclanche cell consists of zinc anode (container) and carbon cathode. The electrolyte is a moist paste of MnO_2, $ZnCl_2$, NH_4Cl and carbon black. Because there is no free liquid in the cell, it is called dry cell.

5. As all the products and reactants are either in solid or liquid state, their concentration does not change with the use of the cell.

6. A fuel cell is a galvanic cell for converting the energy of a fuel directly into electrical energy without use of a heat engine.

7. Corrosion is an electrochemical phenomenon in which metal gets decomposed in the presence of air and water and forms compounds like oxides, sulphates, carbonates, sulphides etc.

8. Saline water consists of greater no. of ions than normal water which increases the electrochemical reaction. This increases rate of corrosion.

9. Names of the metals are – Zinc and Magnesium.

10. Factors affecting corrosion are -
1) Water and air 2) Presence of electrolytes in water. 3) Presence of gases like CO_2 , SO_2.

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (General principles and processes of isolation of elements)

Topic :- Occurrence of metals, concentration methods

1. Define the term - metallurgy? [1]

2. What is gangue? [1]

3. Give some important ores of Aluminum, Iron, Copper and Zinc? [2]

4. Name the most abundant and second most abundant metal in earth's crust. [1]

5. What do you understand by benefaction of ore? [1]

6. What is the basis of hydraulic washing? For which type of ores is it used? [2]

7. When is magnetic separation used? [1]

8. Explain froth floatation method. [2]

9. What is the role of a depressant in the floatation process? Give an example? [2]

10. What is used as collectors and froth stabilizers in froth floatation process? What is their role in the process? [2]

11. What is leaching? Explain with an example. [2]

12. Which reagent is used for leaching of Gold or silver? Write the equations involved. [2]

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (General principles and processes of isolation of elements)

[Answers]

Topic: - Occurrence of metals, concentration methods

Ans.1 The scientific and technological process used for isolation of the metal from its ores is known as metallurgy.

Ans. 2 The earthly or undesired materials which contaminate ore are called gangue.

Ans. 3

Metal	**Ore**
Aluminum	Bauxite
Iron	Hematite, Magnetite
Copper	Copper pyrite, Copper glance
Zinc	Zinc blende, Calamine

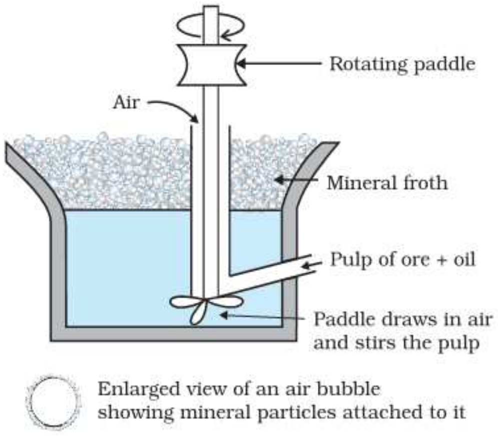
Ans.4 The most abundant metal is Aluminum & second most abundant metal is iron.

Ans.5 Benefaction, concentration or dressing of ore means removal of unwanted materials from the ore.

Ans.6 Hydraulic washing is based on the differences in the gravities of the ore and the gangue particles. It is used when ore is heavy and impurities are lighter.

Ans. 7 If either of the ore or gangue is capable of being attracted by a magnetic field e.g. in case of iron ores, magnetic separation is used for its concentration.

Ans. 8 Froth floatation is used for removing gangue from sulphide ores. Here a suspension of the powdered ore is mixed with water. To it collectors and froth stabilizer are added. A rotating paddle agitates the mixture and draws air in it. As a result froth is formed. The mineral particles become wet by froth (oil) and gangue particles by water. The froth is skimmed off and dried for the recovery of ore.



CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (General principles and processes of isolation of elements)

Topic:- Extraction of crude metal from concentrated ore, Thermodynamic principles of metallurgy

1. Sulphide and carbonate ores are converted to oxide before reduction. Why? [1]
2. What is calcinations and roasting? Give one example of each? [2]
3. What is slag? Give an example. [1]
4. How does a reducing agent helps in reduction? [1]
5. Write the relationship between Gibbs free energy, enthalpy change and change in entropy? [1]
6. What is the condition for a reduction reaction to occur in terms of free energy change? How can it be achieved? [2]
7. What are Ellingham diagrams? [1]
8. State one limitation of Ellingham diagrams. [1]

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (General principles and processes of isolation of elements)

[Answers]

Topic:- Extraction of crude metal from concentrated ore, Thermodynamic principles of metallurgy

Ans 1. Since the reduction of oxide ores involves a decrease in Gibb's free energy making ΔG value more negative, it is easier to reduce oxides therefore suphide and carbonate ores are converted to oxides before reduction.

Ans 2. Calcination:- It is the process of heating carbonate ore in the absence of air when volatile matter escape leaving behind metal oxide . e.g.

$ZnCO_3\ (s) \xrightarrow{\Delta} ZnO\ (s) + CO_2\ (g)$

$CaCO_3 - MgCO_3 \xrightarrow{\Delta} CaO\ (s) + MgO\ (s) + 2CO_2\ (g)$

Roasting :- Here ore is heated in a regular supply of air at a temperature below the melting point of metal e.g.

$2ZnS + 3O_2 \rightarrow 2ZnO + 2SO_2$

$2PbS + 3O_2 \rightarrow 2PbO + 2SO_2$

Ans 3. Slag is the substance obtained after flux reacts with impurity.

Flux + Impurity → Slag.

For example silica is added as flux to remove iron oxide during extraction of copper as ferrous silicate.

$FeO + SiO_2 \rightarrow FeSiO_3$ (slag)

Impurity flux

Ans 4. During the reduction of the metal oxide, the reducing agent combines with oxygen of metal oxide and gets itself oxidized.

$M_xO_y + {}_yC \rightarrow {}_xM + {}_yCO$ Here carbon is reducing agent.

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (General principles and processes of isolation of elements)

Topic:- Extraction of iron, copper and Aluminum

1. What is pig iron? [1]

2. What is cast iron? [1]

3. What is wrought iron? [1]

4. What is added as flux in extraction of iron? [1]

5. Explain the extraction of copper? [2]

6. What is Blister copper? [1]

7. Write the equation for reduction of zinc oxide? [1]

8. What is the basis of reduction of a molten metal salt? Explain [2]

9. Why is cryolite used during extraction of Aluminum? [1]

10. How is copper extracted from low grade ores? [1]

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (General principles and processes of isolation of elements)

[Answers]

Topic:- Extraction of iron, copper and Aluminum

Ans 1. The iron which is obtained from blast furnace and contains about 4% carbon and many other impurities in smaller amounts like S, P, Si, Mn etc, is called pig iron.

Ans 2. Iron obtained by melting pig iron with scrap iron and coke using hot air blast is cast iron.

Ans 3. Wrought iron and malleable iron is the purest form of commercial iron which is prepared from cast iron by oxidizing impurities in a reverberatory furnace lined with heamatite.

Ans 4. Limestone is used as flux in extraction of iron.

Ans 5. The sulphide ores of copper are roasted to give oxides:

$$2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$$

The oxide can then be easily reduced to metallic copper using coke.

$$Cu_2O + C \rightarrow 2Cu + CO$$

The impurities like iron oxide are removed as slag by reacting with SiO_2, added as flux.

$$FeO + SiO_2 \rightarrow FeSiO_3$$

Ans 6. The solidified copper obtained after extraction has blistered appearance due to evolution of SO_2 is called blister copper.

Ans.7. The reduction of zinc-oxide is done using coke. $ZnO + C \xrightarrow{COKE,673K} Zn + CO$

Ans.8 In the reduction of molten metal salt, electrolysis is done which is based on electrochemical principles following equation $\Delta G = -nFE^0$

Here n is the number of electrons and E^0 is the electrode potential of redox couple. More reactive metals have large negative values of the electrode potential and are difficult to reduce.

Ans.9 Cryolite is used to lower the melting point of alumina and increase conductivity.

Ans10. Copper is extracted by hydrometallurgy from low grade ores. It is leached out using acid or bacteria.

CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (General principles and processes of isolation of elements)

Topic:- Oxidation –Reduction; Refining.

1. Give an example of extraction based on oxidation reduction. [1]

2. How are gold and silver extracted? [2]

3. Give two examples of metal refined by [3]
   a) Distillation
   b) Liquation
   c) Electrolytic refining

4. Explain electrolytic refining of copper. [2]

5. Which method is used for refining of silicon or gallium? [1]

6. What is the principle behind zone refining? [1]

7. Give the requirements for vapour phase refining? [2]

8. Write a short note on Mond’s process. [2]

9. Which method is used for refining of zirconium? Explain. [2]

10. What is the principle behind chromatography?
    Name some types of chromatographic techniques. [2]

CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (General principles and processes of isolation of elements)

[Answers]

Topic:- Oxidation –Reduction; Refining

Ans 1. An example based on extraction by oxidation is extraction of chlorine from brine.

Ans 2. Gold and silver are extracted by leaching the metal with CN^-. The metal is later recovered by displacement method in which zinc acts as reducing agent.

$$4Au(s)+8CN^-+2H_2O(aq)+O_2(g)\rightarrow 4[\mathrm{Au(CN)_2}]^-(\mathrm{aq})+4\mathrm{OH}^-(\mathrm{aq})$$

$$2[Au(CN)_2]^-+Zn(s)\rightarrow 2Au(s)+[Zn(CN)_4]^{2-}$$

Ans 3. a) Distillation – Zinc and Mercury

b) Liquation – Tin and Antimony

c) Electrolytic refining – Copper and Zinc

Ans 4. Electrolytic refining of copper-

In this method impure copper acts as anode and a strip of the same metal in the pure form is used as cathode. The electrolyte is acidified solution of copper sulphate. The net result is the transfer of copper in pure form from the anode to cathode.

$$\textit{Anode}:\ \mathrm{Cu}\rightarrow \mathrm{Cu}^{2+}+2\mathrm{e}^-$$
$$\textit{Cathode}:\ \mathrm{Cu}^{2+}+2\mathrm{e}^-\rightarrow \mathrm{Cu}$$

Impurities from the blister copper like antimony, selenium, tellurium, silver, gold and platinum deposit as anode mud.

Ans 5. The refining of Silicon or gallium is done by Zone refining.

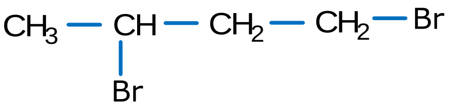
Ans 6. The principle of zone refining is that impurities are more soluble in the melt then in the solid state of the metal.

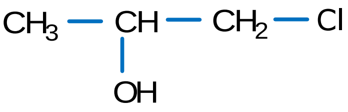
CBSE TEST PAPER-01

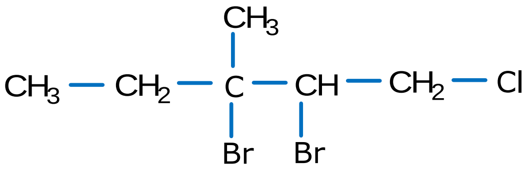
CLASS - XII CHEMISTRY (Haloalkanes and Haloarenes)

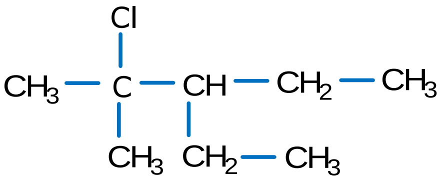
Topic:- Nomenclature

(1). Give IUPAC names of following compounds 1x10=10

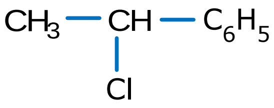
1.

$CH_3-\underset{\underset{Br}{|}}{CH}-CH_2-CH_2-Br$

2.

$CH_3-\underset{\underset{OH}{|}}{CH}-CH_2-Cl$

3.

$CH_3-CH_2-\overset{\overset{CH_3}{|}}{\underset{\underset{Br}{|}}{C}}-\underset{\underset{Br}{|}}{CH}-CH_2-Cl$

4.

$CH_3-\overset{\overset{Cl}{|}}{\underset{\underset{CH_3}{|}}{C}}-\underset{\underset{CH_2-CH_3}{|}}{CH}-CH_2-CH_3$

5. $C_6H_5CH_2CH_2Cl$

6.

$CH_3-\underset{\underset{Cl}{|}}{CH}-C_6H_5$

7. $C_6H_6Cl_6$

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Haloalkanes and Haloarenes)

[ANSWERS]

Topic: - Nomenclature

Ans1. 1, 3- Dibromobutane

Ans2. 1- Cholopropan-2-ol

Ans3. 2, 3 – Dibromo-1-chloro-3-methylpentane

Ans4. 2-Choloro-3-ethyl-2-methyl pentane

Ans5. 1-Chloro-2-phenylethane

Ans6. 1-Chloro-1-phenyl ethane

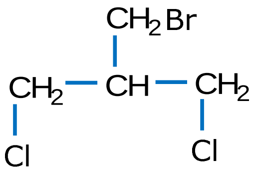
Ans7. 1, 2, 3, 4, 5, 6- hexachlorocyclohexane

Ans8. 2, 2- Dihexyl 1, 1, 1-Trichloro ethane

Ans9. 4, 4-dibromobiphenyl

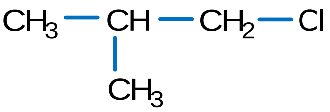
Ans10. 1, 3-Dibromo -3- methyl butane

Ans1.



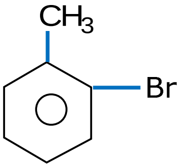
$\underset{Cl}{CH_2}-\overset{CH_2Br}{CH}-\underset{Cl}{CH_2}$

Ans2.



$CH_3-\underset{CH_3}{CH}-CH_2-Cl$

Ans3.



Ans4. $Br-CH_2-CH_2-CH_2-CH_2-Cl$

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (Haloalkanes and Haloarenes)

Topic:- Reasoning Questions

Explain giving reasons:- (each question carries 2 marks)

1. Thionyl chloride is preferred for converting alcohol to haloalkane.

2. Phenol cannot be converted to chlorobenzene by reacting with HCl.

3. HNO_3 is added during iodination of benzene.

4. p- dichlorobenzene has higher melting point than meta – dichlorobenzene.

5. The boiling points of isomeric haloalkenes decrease with increase in branching.

6. Hydrolysis of optically active 2- bromobutane forms optically inactive butan - 2 - ol.

7. Chlorobenzene is less reactive towards nucleophilic substitution reaction.

8. Chloroform is stored in dark coloured bottles.

9. The order of boiling points is $RCl < RBr < RI$.

10. Vinyl chloride is less reactive than allyl chloride.

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (Haloalkanes and Haloarenes)

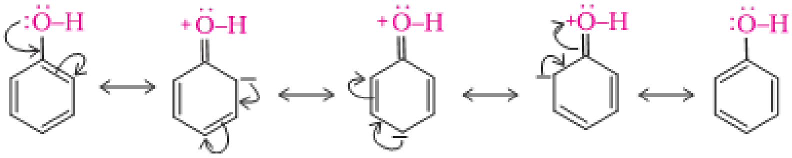
[ANSWERS]

Topic:- Reasoning Questions

Ans.1 Thionyl chloride is preferred for converting alcohol to haloalkane because the bi-products formed are all gases which escape into the atmosphere.

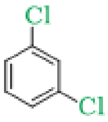
$R-OH + \text{SOCl}_2 \rightarrow \text{RCl} + \text{SO}_2 + \text{HCl}$

Ans.2 In phenol, due to resonance, the carbon –oxygen bond has a partial double bond character and is difficult to break being stronger than a single bond. Therefore it can not be converted to chlorobenzene by reacting with HCl.

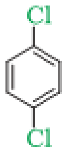


Ans.3 When benzene is reacted with iodine, the reaction is reversible in nature. It leads to the formation of reactants back. Therefore and oxidizing agent like HNO_3 oxidizes the HI formed in the reaction and keeps the reaction in forward direction.

Ans.4



m – dichlorobenzene



p - dichlorobenzene

p- dichlorebenzene is having symmetrical structure therefore it can fit better into the crystal cattie which increases its melting point.

Ans.5 The boiling points of isomeric haloakanes decreases with branching due to decrease in surface areas with branching .As branching increasing the structure becomes more spherical and the surface area decreases. e.g. the boiling points of isomers of C_4H_9 Br follows the order.

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Haloalkanes and Haloarenes)

Topic:- Conversions

Convert

1. 1 - Butene to 1 — chlorobutane.

2. Ethene to ethanol.

3. Chlorobenzene to phenol.

4. Methyl bromide to acetic acid.

5. 2- chlorobutane to sec- butyl ethyl ether.

6. Chlorobenzene to benzyl chloride.

7. Chlorobenzene to Benzene.

8. Methane to Ethane.

9. Benzene to o- chlorotoluene.

10. 1- chloropropane to 2- iodopropane.

CBSE TEST PAPER-03
CLASS - XII CHEMISTRY (Haloalkanes and Haloarenes)
[ANSWER]

Topic:- Conversions

Ans.1

$$CH_3 -- CH_2 -- CH = CH_2 \xrightarrow[Peroxide]{HBr} CH_3 -- CH_2 - CH_2 -- CH_2\,Br$$

1 - Butane

$$CH_3 -- CH_2 - CH_2 -- CH_2\,Br \xrightarrow{aq.\ KOH} CH_3 -- CH_2 - CH_2 -- CH_2\,OH$$

$$CH_3 -- CH_2 - CH_2 -- CH_2\,OH \xrightarrow{SOCl_2} CH_3\,CH_2\,CH_2\,CH_2Cl$$

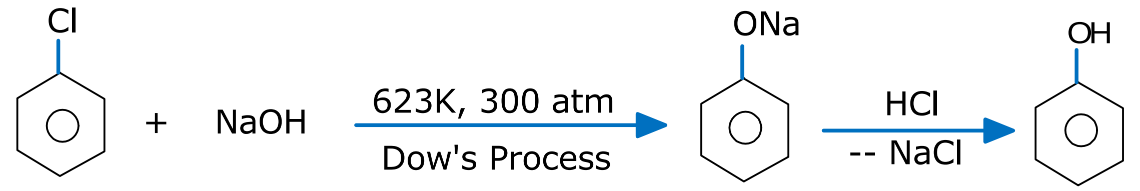
1 - Chlorobutane

Ans.2

$$CH_2 = CH_2 \xrightarrow[H_2O]{H_2SO_4} CH_3\,CH_2\,OH$$

ethene ethanol

Ans.3



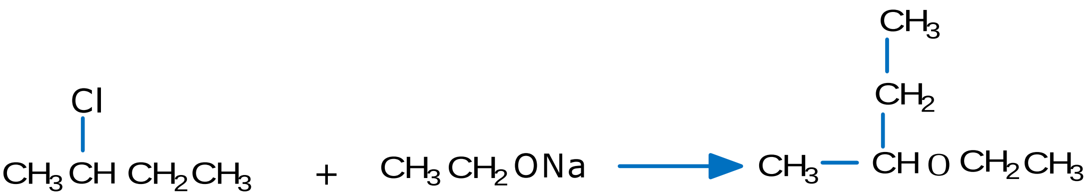
chlorobenzene Phenol

Ans.4

$$CH_3Br \xrightarrow{KCN} CH_3CN \xrightarrow{H_2O} CH_3COOH$$

methyl bromide Acetic acid

Ans.5



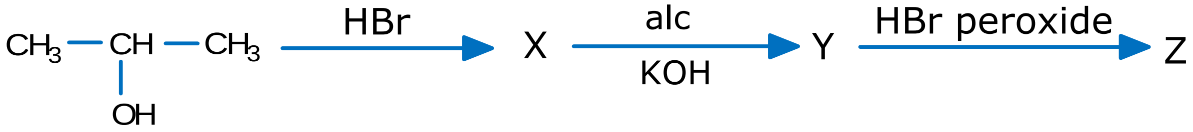
$$CH_3\,CH(Cl)\,CH_2CH_3 + CH_3\,CH_2\,ONa \longrightarrow CH_3 - CH(CH_2CH_3)\,O\,CH_2CH_3$$

2 -- chlorobutane Sec - butyl ethyl ether

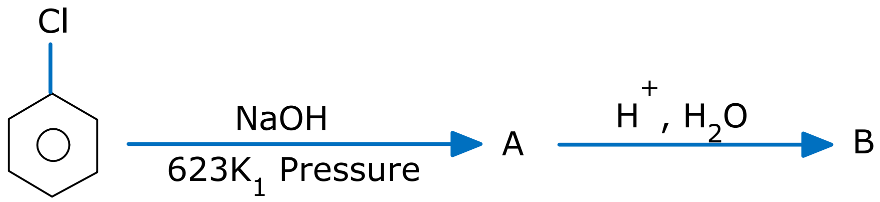
CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (Haloalkanes and Haloarenes)

Topic:- Identification Question

1. $CH_3CH_2CH_2Br \xrightarrow{alc\ KOH} (X) \xrightarrow{H/H_2O} (Y) \xrightarrow{PCl_5} (Z)$
2. An organic compound ‘A’ having molecular formula C_3H_6 on treatment with aqueous H_2SO_4 given’ B’ which on treatment with Lucas reagent gives ‘C’. The compound ‘C’ on treatment with ethanolic KOH gives back on compound ‘A’. Identify A, B, & C.
3. An organic compound ‘A’ on heating with NH_3 and cuprous oxide at high pressure gives compound ‘B’. The compound ‘B’ on treatment with ice cold solution of $NaNO_2$ and HCl gives ‘C” , which on heating with copper turning and HCl gives ‘A’ again. Identify A, B & C. compound
4. 

$$CH_3-\underset{\displaystyle OH}{\underset{|}{CH}}-CH_3 \xrightarrow{HBr} X \xrightarrow[KOH]{alc} Y \xrightarrow{HBr\ peroxide} Z$$

5. $C_2H_5Br \xrightarrow{alc\ KOH} A \xrightarrow{Br_2} B$
6. $C_6H_5NH_2 \xrightarrow[HCl]{NaNO_2} A \xrightarrow{CuBr} B$
7. 

8. A compound ‘A’ contains carbon and hydrogen only and has molecular mass of 72. Its photo chlorination gives a mixture containing only one monochloro and two dichloro hydrocarbons. Deduce the structure of A and chlorinated products.

CBSE TEST PAPER-04

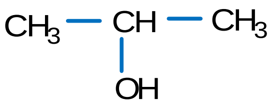
CLASS - XII CHEMISTRY (Haloalkanes and Haloarenes)

[ANSWERS]

Topic:- Identification Question

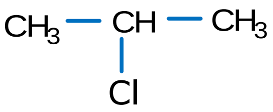
Ans1. X = $CH_3\ CH = CH_2$

Y =



$CH_3-\underset{OH}{\underset{|}{CH}}-CH_3$

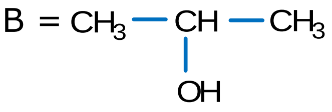
Z =



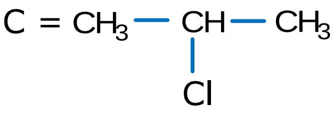
$CH_3-\underset{Cl}{\underset{|}{CH}}-CH_3$

Ans2. $A(C_3H_6) \xrightarrow{aq.H_2SO_4} B \xrightarrow{ZnCl_2\ HCl} C \xrightarrow[KOH]{alc} A$

$A = CH_3-CH = CH_2$

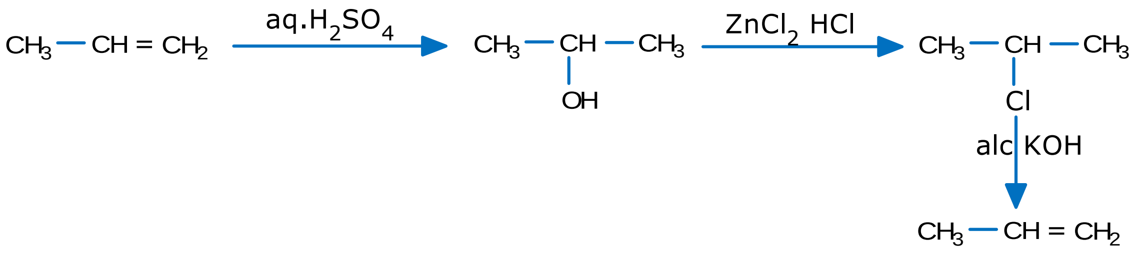


$B = CH_3-\underset{OH}{\underset{|}{CH}}-CH_3$



$C = CH_3-\underset{Cl}{\underset{|}{CH}}-CH_3$

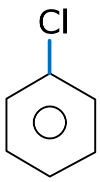
The equations are



$$CH_3-CH = CH_2 \xrightarrow{aq.H_2SO_4} CH_3-\underset{OH}{\underset{|}{CH}}-CH_3 \xrightarrow{ZnCl_2\ HCl} CH_3-\underset{Cl}{\underset{|}{CH}}-CH_3 \xrightarrow{alc\ KOH} CH_3-CH = CH_2$$

Ans3. $A \xrightarrow[Cu_2O]{NH_3} B \xrightarrow[HCl]{NaNO_2} C \xrightarrow{Cu/HCl} A$

A =



CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (Haloalkanes and Haloarenes)

Topic:- Miscellaneous Questions

1. What is lucas reagent? [1]

2. Which of the following will show optical is omerism

   1 – bromobutane or 2 – bromobutane? [1]

3. Arrange $CH_3\ CH_2\ CH_2\ CH_2\ Br$, $(CH_3)_3\ C\ Br$, $CH_3\ CH\ (CH_3)\ CH_2\ Br$

   in order of increasing boiling points. [1]

4. Give an example of [2]

   (a) Fittig reaction

   (b) Finkelstein reaction.

5. What happens when [2]

   a) Thionyl chloride acts upon I - propanol.

   b) Ethanol reacts with PBr_3

6. How many aromatic isomers are possible for the formula $C_7\ H_7\ Cl$?

   Write the structure and names. [2]

7. How is chlorobenzene prepared by [2]

   (a) direct chlorination

   b) diazotization method?

8. How can we distinguish between an alkyl halide and aryl halide? [2]

CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (Haloalkanes and Haloarenes)

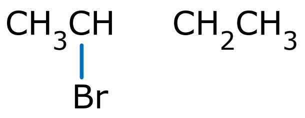
[ANSWER]

Topic:- Miscellaneous Questions

Ans1. A mixture of HCl and anhydrous $ZnCl_2$ is known as Lucas reagent.

Ans 2. $CH_3CH_2CH_2CH_2Br$

1 -- bromobutane

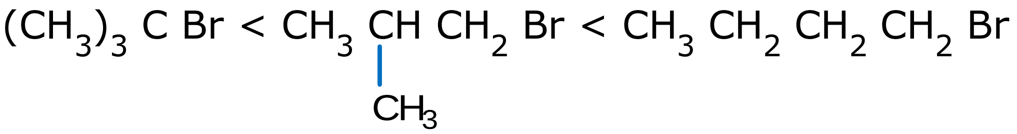


$$CH_3\underset{\displaystyle Br}{\underset{|}{C}H}\ CH_2CH_3$$

2 -- bromobutane

2- bromobutane will be optically active as it has one chiral carbon (C_2).

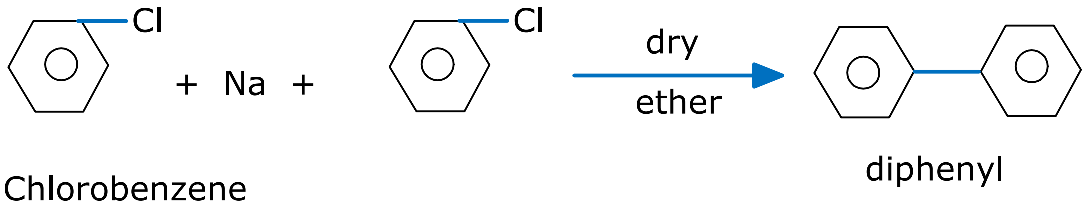
Ans3. The order of increasing boiling points is



$$(CH_3)_3\ C\ Br < CH_3\ \underset{\displaystyle CH_3}{\underset{|}{C}H}\ CH_2\ Br < CH_3\ CH_2\ CH_2\ CH_2\ Br$$

Boiling point decreases with increase in branching as it reduces the surface area.

Ans 4. (a) Fittig reaction



(b) Finkelstein reaction $CH_3CH_2Cl + NaI \longrightarrow CH_3CH_2\ I + NaCl$

chloroethane

Iodoethane

Ans5. (a) When thionyl chloride acts upon 1- propanol chloropropane is formed .

$$CH_3CH_2CH_2OH + SOCl_2 \rightarrow CH_3CH_2CH_2Cl + SO_2 + HCl$$

(b) When ethanol reacts with PBr_3, bromoethane is formed.

$$3CH_3CH_2OH + PBr_3 \rightarrow 3CH_3CH_2Br + H_3PO_3$$

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (P – block elements)

Topic:- 15th Group elements : Atomic properties , Oxidation states.

1. Write the elements of group 15? [1]

2. Write chemical name & formulae of
   a) Chile saltpetre
   b) Indian saltpetre [1]

3. What is special about the valence configuration of Group 15? [1]

4. The atomic radii increases considerably from N to P but very little increase is observed from As to Bi. why? [1]

5. Give reason for the following- the first ionization enthalpy of 15th group elements is higher than 16th group elements ? [1]

6. How does metallic character vary down the 15 group & why? [1]

7. What are the common oxidation states of this group? [1]

8. What is the maximum covalence shown by N? [1]

9. Bi (v) is a stronger oxidizing agent than Bi(III). Why? [1]

10. Give an example showing disproportionation of oxidation state of nitrogen? [1]

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (P – block elements)

[Answers]

Topic:- 15th Group elements : Atomic properties , Oxidation states.

Ans.1 The elements of group 15 are

Nitrogen (N), Phosphorous (P) , Arsenic (As) , Antimony (Sb) and Bismuth (Bi).

Ans 2. (a) Chile saltpetre – Sodiumritrate – $NaNO_3$

(b) Indian saltpetre – Potasium nitrate – KNO_3

Ans 3. The valence configuration of 15 group is ns^2np^3 the s-orbital is completely filled and p-orbital is half filled . This half filled orbital gives extra stability to elements of this group.

Ans 4. There is a considerable increase in size from N to P as expected but due to the presence of completely filled d- orbitals which have very poor shielding effects, the increases in size is very little from As to Bi.

Ans 5. Due to extra stability of half filled configuration, the first Ionisation enthalpy of 15th group elements is higher than 16th group configuration ns^2np^4)

Ans 6. The metallic character increases down the group due to decrease in ionization enthalpy and increase in size of atom.

Ans 7. The common oxidation states of the group are-

-3 , +3 & +5.

Ans 8. Nitrogen shows a maximum covalence of +4 because only four orbitals, one S and three P- orbitals are available for bonding in Nitrogen.

Ans 9. Bi is more stable in +3 oxidation state in comparison to +5 due to inert pair effect therefore Bi (v) has a strong tendency to act as oxidizing agent.

Ans 10. $$\underset{+3}{3HNO_2} \rightarrow \underset{+5}{HNO_3} + H_2O + \underset{+2}{2NO}$$

Here Nitrogen is getting oxidized to a higher oxidation state as well as reduced to a lower oxidation state.

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (P – block elements)

Topic:- Group 15 elements : Chemical Properties, Dinitrogen

1. Give reasons for the following? [1X5=5]

(a) Nitrogen does not show catenation.

(b) PCl_5 exists but NCl_5 does not.

(c) The stability of Hydrides follows the order-

$NH_3 > PH_3 > Ar_5H_3 > SbH_3$

(d) PH_3 is a weaker base than NH_3.

(e) Molecular nitrogen is chemically inert.

2. Complete and balance- [1x5=5]

(a) $NH_4Cl(aq) + NaNO_2(aq) \rightarrow$

(b) $Ba(N_3)_2 \rightarrow$

(c) $3Mg + N_2 \rightarrow$

(d) $N_2 + O_2 \xrightarrow{Heat}$

(e) $2NaN_3 \rightarrow$

3. What are the two isotopes of nitrogen? [1]

4. Write two uses of dinitrogen. [2]

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (P – block elements)

[Answers]

Topic:- Group 15 elements : Chemical Properties, Dinitrogen

Ans.1 (a) Nitrogen being small in size has high electron density. Due to strong inter electronic repulsions, N-N single bond is weak & nitrogen does not undergo catenation.

(b) Due to absence of d-orbitals, nitrogen cannot expand its oxidation state to +5 and NCl_5 does not exist whereas in P due to presence of empty 3d orbital +5 oxidation state is attained.

(c) As we move down the group 15, atomic radii increases making the bond of element with Hydrogen weaker this decreases the stability of hydrides of heavier elements. Therefore the order of stability is.

$$NH_3 > PH_3 > AsH_3 > SbH_3$$

(d) As Phosphorous atom is larger than N- atom, the lone pair of electrons is distributed over a large surface area of P-atom than N-atom. Therefore the tendency of P to donate the lone pair of electrons is less.

(e) Molecular nitrogen (N_2) is inert because $N\equiv N$ bond energy is very high due to small size of N- atom and presence of multiple bond.

Ans 2.

a. $NH_4Cl(aq)+NaNO_2(aq)\rightarrow N_2(g)+2H_2O(\ell)+NaCl(aq)$

b. $Ba(N_3)_2 \rightarrow Ba + 3N_2$

c. $3Mg+N_2\rightarrow Mg_3N_2$

d. $N_2+O_2\xrightarrow{Heat} 2NO(g)$

e. $2NaN_3 \rightarrow 2Na+3N_2$

Ans 3. The two isotopes of nitrogen are ^{14}N and ^{15}N.

Ans 4. Dinitrogen is used

(a) In the manufacture of ammonia.

(b) As a refrigerant to preserve biological material, food items.

(c) In cryosurgery.

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (P – block elements)

Topic:- 15th Group elements : Ammonia , Nitric acid , phosphorous – allotropes , phosphine.

1. Complete and balance - 1×10=10

(i) $(NH_4)_2SO_4 + 2NaOH \rightarrow$

(ii) $2FeCl_3\ (aq) + 3NH_4OH\ (aq) \rightarrow$

(iii) $AgCl(s) + 2NH_3(aq) \rightarrow$

(iv) $NaNO_3 + H_2SO_4 \rightarrow$

(v) $3NO_2\ (g) + H_2O(l) \rightarrow$

(vi) $Cu + 4HNO_3(conc) \rightarrow$

(vii) $4Zn + 10HNO_3(dil) \rightarrow$

(viii) $[Fe(H_2O)_6]_2 + + NO \rightarrow$

(ix) $I_2 + 10HNO_3 \rightarrow$

(x) $S_8 + 48HNO_3(conc) \rightarrow$

2. What are the optimum conditions for maximum yield of ammonia? [1]

3. Ammonia is a Lewis base. Why? [1]

4. Ammonia has higher boiling and melting points than expected .Why? [1]

5. Explain the chemistry behind brown ring test for detection of nitrate ions. [2]

6. Write three differences between white and red phosphorous. [3]

CBSE TEST PAPER-03
CLASS - XII CHEMISTRY (P – block elements)
[ANSWER]

Topic:- 15th Group elements : Ammonia , Nitric acid , phosphorous – allotropes , phosphine.

Ans 1. (i) $(NH_4)_2SO_4 + 2NaOH \rightarrow 2NH_3 + 2H_2O + Na_2SO_4$

(ii) $2FeCl_3\,(aq) + 3NH_4OH\,(aq) \rightarrow Fe_2O_3.\,xH_2O_{(s)} + 3NH_4Cl\,(aq)$

(iii) $AgCl(s) + 2NH_3(aq) \rightarrow [Ag(NH_3)_2]Cl\,(aq)$

(iv) $NaNO_3 + H_2SO_4 \rightarrow NaHSO_4 + HNO_3$

(v) $3NO_2\,(g) + H_2O(l) \rightarrow 2HNO_3(aq) + NO(g)$

(vi) $Cu + 4HNO_3(conc) \rightarrow Cu\,(NO_3)_2 + 2NO_2 + 2H_2O$

(vii) $4Zn + 10HNO_3(dil) \rightarrow 4Zn(NO_3)_2 + 5H_2O + N_2O$

(viii) $[Fe(H_2O)_6]^{2+} + NO \rightarrow [Fe\,(H_2O)_5\,(NO)]^{2+} + H_2O$

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

(x) $S_8 + 48HNO_3(conc) \rightarrow 8H_2SO_4 + 48NO_2 + 16H_2O$

Ans 2. The optimum conditions for the production of ammonia are-

200×10^5 Pa or 200 atm pressure, 700K temperature , and presence of catalyst such as iron oxide with K_2O and Al_2O_3 as promoters.

Ans 3. Due to the presence of lone pairs on nitrogen atom of ammonia, it can donate electron pair and acts as a lewis base.

Ans 4. In solid and liquid states, ammonia molecules are associated by intermolecular hydrogen bonding. There fore ammonia has higher boiling and melting points.

Ans 5. The brown ring test for nitrate ions depends on the ability of Fe^{2+} to reduce nitrates to nitric oxide, which reacts with Fe^{2+} to form a brown coloured complex.

$$NO_3^- + 3Fe^{2+} + 4H^+ \rightarrow NO + 3Fe^{3+} + 2H_2O$$

$$[Fe\,(H_2O)_6]^{2+} + NO \rightarrow [Fe(H_2O)_5NO]^{2+} + H_2O$$

Ans 6.

White phosphorous	Red phosphorous
1. It is translucent waxy solid	1. It has iron grey Lustre.
2. It is poisonous and glows in dark	2. It is non poisonous and does not glow in dark.
3. It is less stable and more reactive.	3. It is more stable and less reactive.

CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (P – block elements)

Topic:- 15th Group : phosphorous halides, oxoacids of 15 group elements, structures.

1. Complete and Balance-

   a) $P_4 + 8SOCl_2 \rightarrow$

   b) $3CH_3COOH + PCl_3 \rightarrow$

   c) $P_4 + 10SO_2\,Cl_2 \rightarrow$

   d) $POCl_3 + 3H_2O \rightarrow$

   e) $Sn + PCl_5 \rightarrow$

   f) $4AgNO_3 + 2H_2O + H_3PO_2 \rightarrow$

2. All five bonds in PCl_5 are not equal. Give an equation in support of this statement.

3. Draw the structure of following :-

   (i) NO

   (ii) N_2O_4

   (iii) HNO_3

   (iv) PCl_5

   (v) $(H_3PO_3)_3$

   (vi) $H_3\,PO_2$

   (vii) H_3PO_3

CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (P – block elements)

[ANSWER]

Topic:- 15th Group : phosphorous halides, oxoacids of 15 group elements, structures.

Ans. 1. Complete and Balance-

a) $P_4 + 8SOCl_2 \rightarrow 4PCl_3 + 4SO_2 + 2S_2Cl_2$

b) $3CH_3COOH + PCl_3 \rightarrow 3CH_3COCl + H_3PO_3$

c) $P_4 + 10SO_2Cl_2 \rightarrow 4PCl_5 + 10SO_2$

d) $POCl_3 + 3H_2O \rightarrow H_3PO_4 + 3HCl$

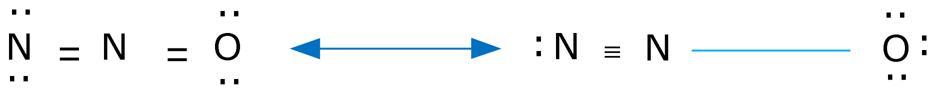
e) $Sn + PCl_5 \rightarrow SnCl_4 + 2PCl_3$

f) $4AgNO_3 + 2H_2O + H_3PO_2 \rightarrow 4Ag + 4HNO_3 + H_3PO_4$

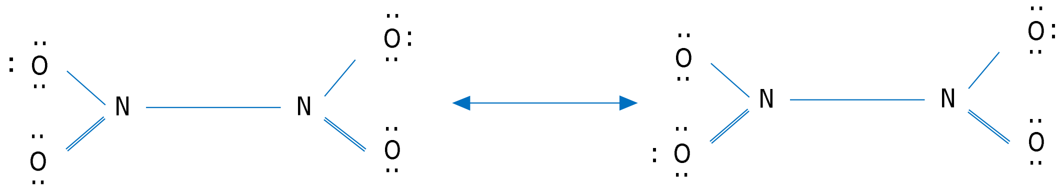
Ans 2. When heated , PCl_5 loses a chlorine molecule this shows that two P- CL bonds are weaker and hence longer than others.

$$PCl_5 \xrightarrow{Heat} PCl_3 + Cl_2$$

Ans 3. (i)



(ii)



CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (P – block elements)

Topic:- Group 16: general properties , Dioxygen , oxides.

1. Write the members of 16 Group. [1]
2. Give the general electronic configuration of 16 Group. [1]
3. Give reasons :- [5]
   - (a) Oxygen molecule is diatomic where as sulphur molecule is polyatomic.
   - (b) The most common oxidation state of oxygen is -2.
   - (c) H_2O is liquid whereas H_2S is gas at room temperature.
   - (d) The increasing order of acidic character in 16th group hydrides is $H_2O< H_2Se<H_2Te$.
   - (e) SF_6 is exceptionally stable, SH_6 does not exist.
4. Discuss the geometry of SF_4. [2]
5. Complete and balance-
   - (a) $2Ag_2O(s) \rightarrow$
   - (b) $2H_2O_2(aq) \rightarrow$
   - (c) $2Zns + 3O_2 \rightarrow$
   - (d) $4HCl + O_2 \xrightarrow{Cucl_2}$
   - (e) $Al_2O_3(s) + 6HCl(aq) + 9H_2O(l) \rightarrow$
   - (f) $Al_2O_3(s) + 6NaOH(aq) + 3H_2O(l) \rightarrow$
6. Discuss the different types of oxides. [2]
7. Enlist some uses of dioxygen. [2]
8. Write different isotopes of oxygen. [1]

CBSE TEST PAPER-05
CLASS - XII CHEMISTRY (P – block elements)
[ANSWERS]

Topic:- Group 16: general properties , Dioxygen, oxides..

Ans. 1. The elements of group 16 are.

Oxygen(O), Sulphur (S), Selenium (Se), Tellurium (Te) and Polonium (Po)

Ans 2. The general electronic configuration of 16 group is ns^2np^4.

Ans 3. (a) Oxygen being small in size forms effective and strong $P\pi$-$P\pi$ bonds with other oxygen atom. Therefore oxygen molecule is diatomic and discrete whereas Sulphur due to its larger size, its orbitals cannot overlap effectively to form $P\pi$-$P\pi$ bonds & completes valency by forming σ bonds with many sulphur atom. Therefore sulphur molecule is polyatomic solid.

(b) Since oxygen is highly electronegative, it has little tendency to give electrons. Therefore its most common oxidation state is -2.

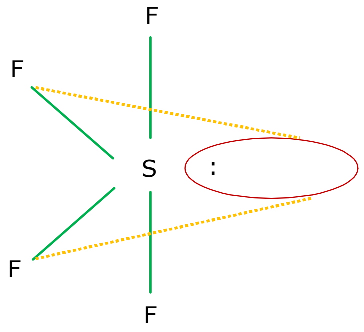
(c) H_2O is liquid at room temperature due to presence of intermolecular Hydrogen bonding which is absent in H_2S.

(d) As we move down the group, the size of atom increases this make the bond of the element with hydrogen weak. Due to weaker bonds, the bond dissociation enthalpy decreases making the molecule more acidic. Therefore the order of acidic strength is.

$H_2O < H_2S < H_2Se < H_2Te$

(e) SF_6 is exceptionally stable due to steric reasons. Hydrogen being electropositive or less electronegative than fluorine cannot make the s-electrons of sulphur to participate in bonding. Therefore SH_6 does not exist.

Ans 4. In SF_4 the hybridisation of sulphur is sp^3d. The structure is trigonal bi-pyramidal in which one of the equatorial positions is occupied by a one pair of electrons. The geometry is called see-saw geometry.



CBSE TEST PAPER-06

CLASS - XII CHEMISTRY (P – block elements)

Topic:- Ozone,Sulphur, Sulphur dioxide & oxoacids, Sulphuric acid.

1. Write the characteristics of pure Ozone? [1]

2. At what concentration ozone is harmful? [1]

3. Draw the resonating structures of ozone? [1]

4. Explain the oxidizing action of ozone? [1]

5. How is ozone estimated quantitatively? [1]

6. Complete and balance:- [6x1=6]

   (i) $PbS\,(s) + 4O_3(g) \rightarrow$

   (ii) $NO(g) + O_3(g) \rightarrow$

   (iii) $4FeS_2\,(s) + 11O_2(g) \rightarrow$

   (iv) $2NaOH + SO_2 \rightarrow$

   (v) $2Fe^{3+} + SO_2 + 2H_2O \rightarrow$

   (vi) $Cu + 2H_2SO_4$ (conc) $\rightarrow$

7. Give a test to detect the presence of SO_2 gas? [2]

8. Give the structures of

   (i) sulphurous acid and

   (ii) Peroxodisulphurous acid? [1]

9. Write the various steps for preparation of sulphuric acid by contact process?

   [2]

10. Name different sulphates formed by sulphuric acid? [1]

CBSE TEST PAPER-06

CLASS - XII CHEMISTRY (P – block elements)

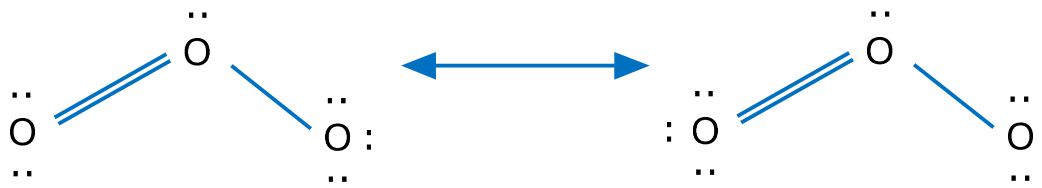
[ANSWER]

Topic:- Ozone,Sulphur, Sulphur dioxide & oxoacids, Sulphuric acid.

Ans. 1 Pure ozone is pale blue gas, dark blue liquid and violet black solid.

Ans. 2 If the concentration of ozone increases above 100 ppm, breathing becomes uncomfortable resulting in headache and nausea and it becomes harmful.

Ans. 3



Ans. 4 Ozone has a very strong tendency to liberate nascent oxygen according to the equation:-

$$O_3 \rightarrow O_2 + O$$

Therefore it acts as a strong oxidizing agent.

Ans. 5 When ozone reacts with an excess of potassium iodide solution buffered with a borate buffer (pH = 9.2) iodine is liberated. This iodine can be titrated against a standard solution of sodium thiosulphate to estimate the amount of ozone.

$$2I^-(aq) + H_2O + O_3 \rightarrow 2OH^-(aq) + I_2(s) + O_2(g)$$

Ans. 6 (i) $PbS(s) + 4O_3(g) \rightarrow PbSO_4(s) + 4O_2(g)$

(ii) $NO(g) + O_3(g) \rightarrow NO_2(g) + O_2(g)$

(iii) $4FeS_2(s) + 11O_2(g) \rightarrow 2Fe_2O_3(s) + 8SO_2(g)$

(iv) $2NaOH + SO_2 \rightarrow Na_2SO_3 + H_2O$

(v) $2Fe^{3+} + SO_2 + 2H_2O \rightarrow 2Fe^{2+} + SO_4^{2-} + 4H^+$

(vi) $Cu + 2H_2SO_4\ (conc) \rightarrow CuSO_4 + SO_2 + 2H_2O$.

CBSE TEST PAPER-07

CLASS - XII CHEMISTRY (P – block elements)

Topic:- Group 17

1. Give reasons- 6x1=6

   a) Halogens have smallest atomic radii in their periods

   b) The negative election gain enthalpy of fluorine is less than that of chlorine.

   c) All halogens are coloured.

   d) The only possible oxidation state of fluorine -1.

   e) Fluorine forms only one oxoacid.

   f) The stability of hydrides follows the order HF>HCl>HBr>HI.

2. Complete and balance- 5x1=5

   (i) $2F_2(g) + 2H_2O\ (l) \rightarrow$

   (ii) $4NaCl + MnO_2 + 4H_2SO_4 \rightarrow$

   (iii) $4HCl + O_2 \xrightarrow{CuCl_2}$

   (iv) $C_{10}H_{16} + 8Cl_2 \rightarrow$

   (v) $6NaOH + 3Cl_2 \rightarrow$

3. Chlorine water on standing loses its yellow colour. Why? [1]

4. Explain the bleaching action of chlorine? [1]

5. Write two uses of chlorine? [2]

CBSE TEST PAPER-07
CLASS - XII CHEMISTRY (P – block elements)
[ANSWER]

Topic:- Group 17

Ans. 1(a) Due to maximum effective nuclear charge, halogens have smallest atomic radii.

(b) Due to small size of fluorine atom, there are strong inter electronic repulsions in the small 2p orbital of fluorine and thus incoming electron does not experience much attraction and fluorine has less negative electron gain enthalpy than that of chlorine.

(c) Halogens absorb radiation in visible region which results in oxidation of electrons to higher energy level by absorbing different quanta of radiation, they show different colours.

(d) Since fluorine is most electronegative element and is short of only one electron for completing octet, it shows the only oxidation state of -1.

(e) Due to small size and high electro-negativity , Fluorine forms only one hypohalous acid.

(f) As the size of element increases down the group, the bond dissociation enthalpy for HX bond decreases making the bond weaker and weaker therefore the order of thermal stability is HI < HBr < HCl < HF.

Ans 2. (i) $2F_2(g) + 2H_2O\ (l) \rightarrow 4H^+(aq) + 4F^- + O_2\ (g)$

(ii) $4NaCl + MnO_2 + 4H_2SO_4 \rightarrow MnCl_2 + 4NaHSO_4 + 2H_2O + Cl_2$

(iii) $4HCl + O_2 \xrightarrow{CuCl_2} 2Cl_2 + 2H_2O$

(iv) $C_{10}H_{16} + 8Cl_2 \rightarrow 16HCl + 10C$

(v) $6NaOH + 3Cl_2 \rightarrow 5NaCl + NaClO_3 + 3H_2O$

Ans. 3 On standing chlorine water forms HCl and Hypochlorous acid (HOCl) due to which it loses its colour. $Cl_2 + H_2O \rightarrow HCl + HOCl$

Ans. 4 The bleaching action of chlorine is due to its tendency to give nascent oxygen so that the substance gets oxidixed. $Cl_2 + H_2O \rightarrow 2HCl + [O]$

Coloured substances + [O] → colourless substance.

Ans. 5 Culorine is used for

a) Bleaching wood pulp, cotton and textiles

b) Manufacturing dyes, drugs, refrigerants etc.

c) Sterilizing drinking water.

CBSE TEST PAPER-08

CLASS - XII CHEMISTRY (P – block elements)

Topic:- Hydrochloric acid, Interhalogen compounds, Group 18.

1. Complete and balance 1x10=10

   a. $NaHSO_4 + NaCl \xrightarrow{823k}$
   b. $Au + NO_3^- + 4H^+ + 4Cl^- \rightarrow$
   c. $Na_2CO_3 + 2HCl \rightarrow$
   d. $Na_2SO_3 + 2HCl \rightarrow$
   e. $Cl_2 + 3F_2 \xrightarrow{573k}$
   f. $Br_2 + 5F_2 \rightarrow$
   g. $XeF_4 + O_2F_2 \rightarrow$
   h. $XeF_2 + PF_5 \rightarrow$
   i. $XeF_6 + 3H_2O \rightarrow$
   j. $XeF_6 + 2H_2O \rightarrow$

2. Draw the structures of following: 1x6=6

   (i) HOClO (ii) $HClO_4$ (iii) BrF_3 (iv) XeO_3

   (v) XeF_4 (vi) XeF_2

3. What are interhalogen compounds? Why are they more reactive than halogens? [2]
4. Noble gases have very low melting and boiling points. Why? [1]
5. Name a gas used [2]

   a) In gas – cooled nuclear reactors
   b) In fluorescent bulbs
   c) For filling electrical bulbs
   d) As cryogenic agent.

CBSE TEST PAPER-08
CLASS - XII CHEMISTRY (P – block elements)
[ANSWER]

Topic:- Hydrochloric acid, Interhalogen compounds, Group 18.

Ans. 1 a. $NaHSO_4 + NaCl \xrightarrow{823k} Na_2SO_4 + HCl$

b. $Au + NO_3^- + 4H^+ + 4Cl^- \rightarrow AuCl_4^- + NO + 2H_2O$

c. $Na_2 CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$

d. $Na_2SO_3 + 2HCl \rightarrow 2NaCl + H_2O + SO_2$

e. $Cl_2 + 3F_2 \xrightarrow{573k} 2ClF_3$

f. $Br_2 + 5F_2 \rightarrow 2Br F_5$

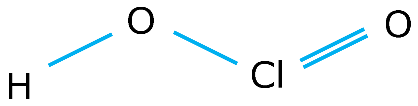
g. $XeF_4 + O_2F_2 \rightarrow XeF_6 + O_2$

h. $XeF_2 + PF_5 \rightarrow [XeF]^+ [PF_6]^-$

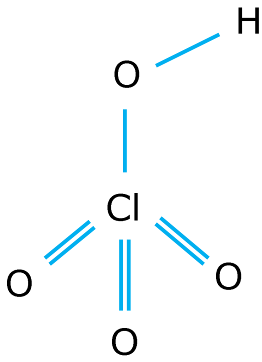
i. $XeF_6 + 3H_2O \rightarrow XeO_3 + 6HF$

j. $XeF_6 + 2H_2O \rightarrow XeO_2F_2 + 4HF$.

Ans. 2 i) HOClO



ii) HClO4



CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Polymers)

Topic:-Classification of polymers

1. Define polymers. [1]

2. Write various uses of polymers. [3]

3. On what basis are polymers classified? [2]

4. What is the difference between a homopolymer and a copolymer? [1]

5. Classify the following substances as natural, semi – synthetic and synthetic polymers [3]

6. Give two examples of each (i) linear polymer (ii) Network polymer. [2]

7. How are addition polymers different from condensation polymers? [2]

8. What is the basic difference between following pairs: [2]

   (a) Elastomers and fibres

   (b) Thermo setting polymer & thermo plastic polymers.

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Polymers)

[ANSWERS]

Topic: - Classification of polymers

Ans1: Polymer are defined a very large molecules having high molecular mass which are formed by joining of repeating structural units on a large scale.

Ans2: Polymers are used in manufacture of plastic buckets, cups and saucers, children's toys, packaging bags, synthetic clothing materials, automobile tyres, insulating materials etc. polymers are the back bone of five major industries – plastics, elastomers, fibres, paints & varnishes.

Ans3: Polymers are classified on the basis of

(a) Source
(b) Structure
(c) Mode of polymerisation
(d) Molecular forces

Ans4:

Homopolymer	**Copolymer**
The addition polymers formed by polymerisation of a single monomeric species are known an homopolymers e.g. – polythene	The polymers made by addition polymerisation from two different monomers are known as copolymers e.g. Buna – S

Ans5: Natural polymers : Cellulose, Starch, And Protein
Semisynthetic : Rayon
Synthetic : Plastic, Nylon

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (Polymers)

Topic:-Types of polymerisation Reactions

1. Name the two types of polymeristion. [1]

2. Name some initiators. [1]

3. Explain the mechanism of polymerisation of ethene. [2]

4. Name the two type of polyethene. [1]

5. Differentiate between LDP and HDP. [2]

6. Write the monomer of Teflon. [1]

7. Give preparation of polyacrylonitrile. [1]

8. Write one use of each – Teflon and polyacrylonitrile. [2]

CBSE TEST PAPER-02
CLASS - XII CHEMISTRY (Polymers)
[ANSWERS]

Topic: - Types of polymerisation Reactions

Ans1: The two types of polymerisation are

(a) Addition polymerisation and

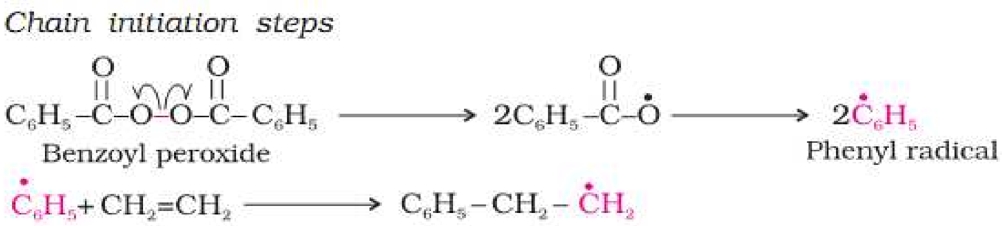
(b) Condensation polymerisation.

Ans2: Examples of initiator are –

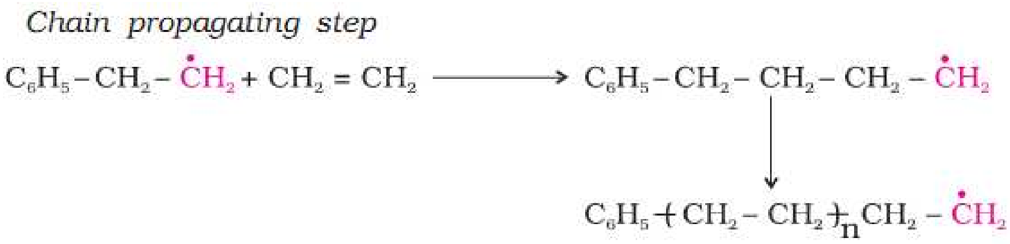
Benzoyl peroxide, acetyl peroxide, tert – butyl peroxide etc.

Ans3: Polymerisation of ethene takes place by free radical mechanism. It follows a three step mechanism:-

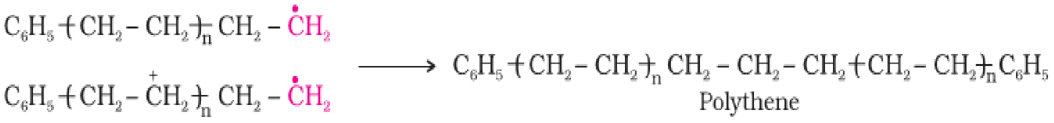
Step I: chain initiating step formation of phenyl free radical.



Step II:



Step III: Chain termination step



Ans4: Polyethene is of two types –

1) Low Density Polyethene 2) High Density Polythene

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Polymers)

Topic:-condensation Polymerisation

1. What is condensation polymerisation? [1]

2. Why is condensation polymerisation also called on step – growth polymerisation? [1]

3. Write some examples of condensation polymers. [1]

4. Give monomers and preparation of Nylon – 6, 6 and Dacron. [3]

5. How is Nylon – 6, 6 different from Nylon -6? [1]

6. What are Bakelite and Melamine? Give their structures. [2]

7. Write uses of bakelite and melamine. [2]

8. Give the formula of monomer of Nylon – 6. [1]

9. What is copolymerisation? [1]

10. Give the monomer and preparation of Buna – S. [2]

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Polymers)

[ANSWERS]

Topic: - Condensation Polymerisation

Ans1: Condensation polymerisation involves a repetitive condensation reaction between two bifunctional monomers which results in the loss of simple molecules of water, alcohol etc.

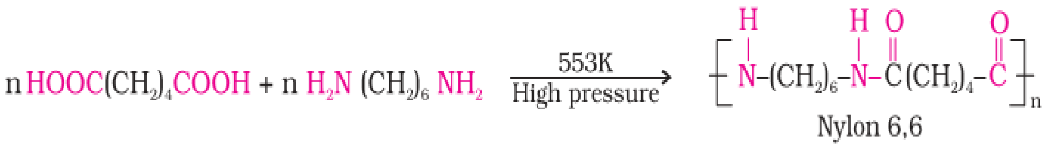
Ans2: Condensation polymerisation produces a distinct functionalized species and is independent of each other. Therefore it is also called step growth polymerisation.

Ans3: Examples of condensation polymers are Nylon-6, 6, Dacron, Nylon 6 etc.

Ans4: Preparation

(i) Nylon – 6, 6

Monomers: Hexamethylene diamine Adipic acid.

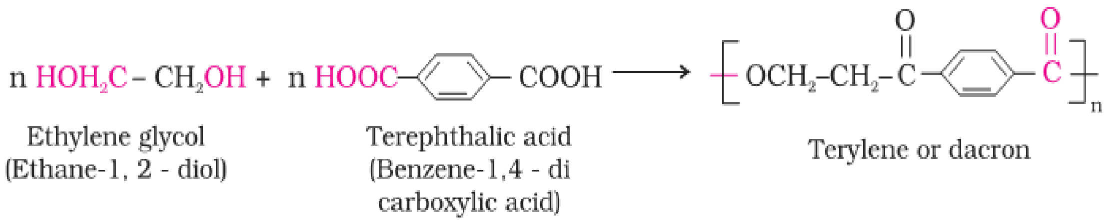


$$n\,HOOC(CH_2)_4COOH + n\,H_2N(CH_2)_6NH_2 \xrightarrow[\text{High pressure}]{553K} \left[\overset{H}{\overset{|}{N}}-(CH_2)_6-\overset{H}{\overset{|}{N}}-\overset{O}{\overset{\|}{C}}(CH_2)_4-\overset{O}{\overset{\|}{C}} \right]_n$$

(ii) Dacron

Monomers: Ethylene Glycol

Terephthalic acid



Ans5: Nylon – 6, 6 is made of two bifunctional monomers, each having 6 carbon atoms whereas Nylon – 6 is made from heating only one monomer having 6 carbon atoms.

CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (Polymers)

Topic:-Rubber, Biodegradable Polymers

1. What is the monomer of natural rubber? [1]

2. How are the characteristics of natural rubber modified? [1]

3. Give two examples of synthetic rubber. [1]

4. How are neoprene & Buna – N prepared? Which one is a copolymer? [2]

5. Give one example of biodegradable polymer. [2]

6. Classify following on Homopolymer and copolymer- [2]

   PVC, Polystyrene, Buna – S, Neoprene, Buna – N, Teflon.

7. Classify following an addition and condensation polymer- [2]

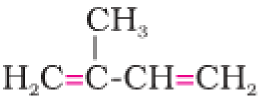
   Bakelite, Polythene, Nylon – 6, 6, Polyacrylonitrile

8. Write monomers of polystyrene and PVC. [2]

CBSE TEST PAPER-04
CLASS - XII CHEMISTRY (Polymers)
[ANSWERS]

Topic: - Rubber, Biodegradable Polymers

Ans1: Monomer of national rubber is isoprene or 2 – methyl – 1, 3 – butadiene.



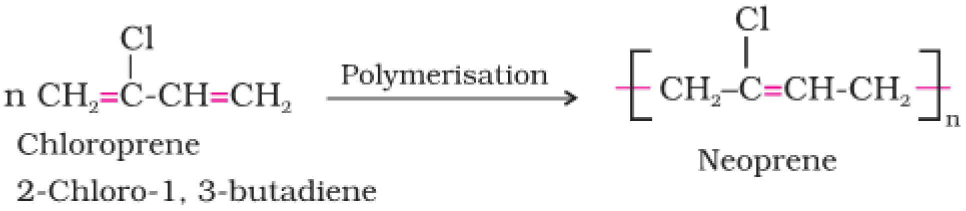
$H_2C{=}\overset{CH_3}{\overset{|}{C}}{-}CH{=}CH_2$

Isoprene

Ans2: Natural rubber is soft at high temperatures and brittle at low temperatures. It is soluble in non – polar solvents and non – resistant to oxidizing agents. These properties can be modified by mixing raw rubber with sulphur. & an appropriate additive at a temperature 373K to 415K. This is called venlcanisation.

Ans3: Example of synthetic rubber –
Neoprene, Buna – N etc.

Ans4: Preparation of Neoprene-



$n\,CH_2{=}\overset{Cl}{\overset{|}{C}}{-}CH{=}CH_2 \xrightarrow{\text{Polymerisation}} \left[CH_2{-}\overset{Cl}{\overset{|}{C}}{=}CH{-}CH_2 \right]_n$

Preparation of Buna – N.

$n\,CH_2{=}CH{-}CH{=}CH_2 + nCH_2{=}\overset{CN}{\overset{|}{CH}} \xrightarrow{\text{Copolymerisation}} \left[CH_2{-}CH{=}CH{-}CH_2{-}CH_2{-}\overset{CN}{\overset{|}{CH}} \right]_n$

Ans5: Biodegradable polymer: PHVB, Nylon – 2 – Nylon -6.

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (The Solid State)

Topic: Solids and their classification.

1. What are fluids? Give examples. [1]

2. Solids are rigid why? [1]

3. How are solids classified? [1]

4. Define the term amorphous with example. [1]

5. The window panes of the old buildings are thick at the bottom. Why? [2]

6. The stability of a crystal is reflected in the magnitude of its melting point. Explain [2]

7. Graphite is soft and good conductor of electricity. Explain. [2]

8. Ionic solids are good conductors in molten state and in aqueous solutions but not in solid state. Why? [2]

9. Differentiate between amorphous and crystalline solids with reference to
   (1) Melting point
   (2) Cleavage property
   (3) Nature [3]

10. How are crystalline solids classified on the basis of nature of bonding? Explain with examples. [3]

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (The Solid State)

[ANSWERS]

Topic: Solids and their classification.

Ans 1: Substances which flow are fluids e.g. liquids and gases.

Ans 2: Rigidity in solids is due to fixed positions of the constituent particles and their oscillations about their mean positions

Ans 3: Solids may be classified into two categories – crystalline and amorphous.

Ans 4: Amorphous means disordered and random arrangement of particles for example – silica, plastic, rubber

Ans 5: Glass panes of old buildings are thicker at the bottom than at the top as from is an amorphous solid and flows down very slowly and makes the bottom portion thicker.

Ans 6: Melting point of a solid gives an idea about the intermolecular forces acting between particles. When these forces are strong, the melting point is higher and when these forces are weak, low melting point is observed. Higher is the melting point, more stable the solid is.

Ans 7: Graphite is soft and good conductor due to its typical structure here carbon atoms are arranged in different layers and each atom a covalently bonded to three of its neighbouring atoms in the same layer. The fourth electron of each atom is free to move about due to which it conducts electricity. Different layers can slide over the other which makes it a soft solid.

Ans 8: In the solid state, the ions in the ionic solids are not free to move about due to their rigid structure & strong electrostatic forces. Therefore they cannot conduct electricity whereas in molten state and aqueous solution, the ions become free to move about and they conduct electricity.

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (The Solid State)

Topic: Structures of crystals

1. Define the term: Crystal lattice [1]

2. What is a unit cell? [1]

3. What are the axial angles and edge length in a cubic crystal system? [1]

4. Give one example of each – Tetragonal and hexagonal crystal system. [1]

5. Name three types of cubic unit cells? [1]

6. How many atoms are there in a unit cell of a metal crystallizing in a: [2]

   (a) FCC structure
   (b) BCC structure

7. What is the contribution of an atom per unit cell if the atom is: [3]

   (a) At the corner of the cube.
   (b) On the face of the cube.
   (c) In the centre of the cube.

8. A compound formed by A & B crystallizes in the cubic structure where ‘A’ are at the corners of the cube and B are at the face centre. What is the formula of the compound? [2]

9. Calculate the no. of atoms in a cubic based unit – cell having one atom on each corner and two atoms on each body diagonal. [2]

10. What is the no. of octahedral and tetrahedral voids present in a lattice? [2]

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (The Solid State)

[ANSWERS]

Topic: Structures of crystals

Ans 01: The three dimensional diagrammatic representation of constituent particles, in which each particle is depicted as a point is called crystal lattice.

Ans 02: The smallest portion of a crystal lattice which, when, repeated in different directions, generates the entire lattice, is called its unit cell.

Ans 03: Axial angles, $\alpha = \beta = \gamma = 90^0$ and edge lengths a = b = c.

Ans 04: Tetragonal crystal system – white tin, SnO_2.
Hexagonal crystal system – Graphite, ZnO.

Ans 05: (a) Simple cubic (b) Face – centred cubic (c) Body centred cubic

Ans 06: (a) FCC = 4 (b) BCC = 2

Ans 07: (a) When atom is at the corner of the cube, the contribution is 1/8 atom.
(b) When the atom is on the face of the cube, its contribution is ½ atom.
(c) If the atom is in the centre of the cube, its contribution is 1 atom.

Ans 08: Contribution of atom A per unit cell = $\frac{1}{8} \times 8 = 1$ atom

Contribution of atom B per unit cell = $\frac{1}{2} \times 6 = 3$ atom

Ratio of A & B = 1:3 Formula = AB_3.

Ans 09: No. of atoms contributed by 8 corners per unit cell = $\frac{1}{8} \times 8 = 1$atom.

No. of atoms contributed by one diagonal = 2
No. of diagonal = 4
$\therefore$ Total contribution by diagonal = 4× 2 = 8
$\therefore$ Total no. of atoms = 8 + 1 = 9 atoms

Ans 10: No. of octahedral voids present in a lattice is equal to the no. of close packed particles and the number of tetrahedral voids is twice the no. of close packed particles.

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (The Solid State)

Topic – Packing in crystals

1. What is square close packing? [1]

2. What is the coordination number in :- [1]

   (a) Square close packing (b) Hexagonal close packing.

3. Define – (a) void (b) coordination Number [2]

4. What is the packing efficiency in [3]

   (a) hcp structure (b) BCC structure (c) Simple cubic structure

5. Give the relationship between density and edge length of a cubic crystal. [2]

6. Copper which crystallizes as a face – centred cubic lattice has a density of 8.93 g/cm^3 at 20^o C. calculate the length of the unit cell. [3]

7. An element crystallizes in BCC structure. The edge of its unit cell is 288 pm. If the density is 7.2 glcm^3, calculate the atomic mass of the element. [3]

8. The compound CuCl has ZnS structure and the edge length of the unit cell in 500 pm. Calculate the density. (Atomic masses: Cu = 63, Cl = 35.5, Avogadro no = 6.02 $\times 10^{23}$ mol^{-1}) [3]

9. In a compound, B ions form a close – packed structure & A ions occupy all the tetrahedral voids. What is the formula of the compound? [2]

10. In crystalline solid, anions C are arranged in cubic close – packing, cations A occupy 50% of tetrahedral voids & cations B occupy 50% of octahedral voids. What is the formula of solid? [3]

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (The Solid State)

[ANSWERS]

Topic – Packing in crystals

Ans 01: The close packing of spheres – atoms or ions, in which each sphere is in contact with four of is neighbors, whose centres, if joined, form a square, is called square close packing.

Ans 02: (a) in square close packing, the coordination no. is 4.
(b) In hexagonal close packing, the coordination no. is 12.

Ans 03 (a) void – the empty space left between close packed spheres are voids.
(b) Coordination number – the number of spheres or atoms surrounding a single sphere or atom in a crystal is called coordination number.

Ans 04: (a) hcp packing efficiency is 74%.
(b) bcc packing efficiency is 68%.
(c) packing efficiency in simple cubic structure is 52.4%.

Ans 05: Density, d of a cubic cell is given by –

$$d = \frac{ZM}{a^3 N_A}$$

Where Z = no. of atoms per unit cell
M = molar mass
N_A = Avogadro number
a = edge length

Ans 06: 361.6 pm

Ans 07: 52 g/ mol

Ans 08: 5.22 g/cm^3

Ans 09: Let the no. of B ions = 100
No. of A ions = no. of tetrahedral voids
= 2 ×no. of 3 = 2 ×100 = 200
Ratio of A & B = 200 : 100 = 2 : 1
Formula = A_2B.

CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (The Solid State)

Topic – imperfections in crystals

1. What is the meaning of term ‘defect’ with reference to crystal? [1]

2. Define two main types of defects. [2]

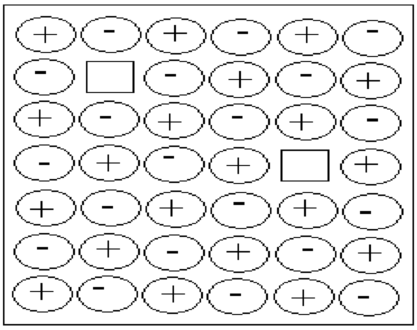
3. Name the types of point defect. [1]

4. (a) Identify the defect in figure below : [2]

   (b) How does it affect the density of crystal?

   (c) Give an example of crystal where this defect can be found.

   (d) What is its effect on electrical neutrality of crystal?



5. Which defect is observed in a solid solution of $CdCl_2$ and AgCl? Explain. [2]

6. Excess of lithium makes LiCl crystal pink. Explain. [2]

7. What are F centres? [1]

8. How does a crystal changes due to presence of F centre? [1]

9. Give an example which shows both frenkel and Schottky defect. [1]

10. Which type of ionic substances show? [2]

    (a) Schottky defect

    (b) Frenkel defect

CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (The Solid State)

[ANSWERS]

Topic – imperfections in crystals

Ans 01: The defects are irregularities in the arrangement of constituent particles in a crystal.

Ans 02: Defects are of two types –

Point defects: - Irregularities or deviations from ideal arrangement around a point or on atom in a crystal.

Line defect: - Irregularities or deviation from ideal arrangement in entire row of lattice points.

Ans 03: point defects are of three types – stoichiometric defect, impurity defect & non – stoichiometric defect.

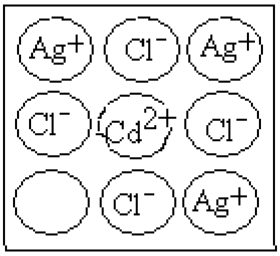
Ans 04: (a) Schottky defect.

(b) It decreases the density of crystal.

(c) NaCl, KCl

(d) The crystal remains electrically neutral.

Ans 05: In a solid solution of $CdCl_2$ and AgCl, impurity defect is observed. In the crystal of AgCl, some of the sites of Ag^+ are occupied by Cd^{2+}, each Cd^{2+} replacing two Ag^+. It replaces the site of one ion and other site remains vacant.



CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (The Solid State)

Topic – Electrical and magnetic Properties

1. Define the term – doping. [1]

2. What is the meaning of 13 – 15 compounds? [1]

3. Name an element which can be added to silicon to give a – [1]
   (i) p – type semiconductor (ii) n – type semiconductor.

4. What is the difference between ferromagnetic and paramagnetic substances? [1]

5. In the fig – (i)

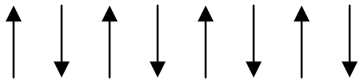


Fig. (i)

   (a) Identify the magnetic behaviour of substance. [2]
   (b) How are these substances different from diamagnetic substances?

6. Define the terms – Intrinsic semiconductor and extrinsic semiconductor. [2]

7. Classify solids on the basis of their conductivities. [2]

8. Explain conduction of electricity on the basis of band theory. [3]

9. Give two examples of each. [2]
   (a) Ferromagnetic substances (b) Ferrimagnetic substances

10. Give two application of p – type and n – type semiconductors. [2]

CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (The Solid State)

[ANSWERS]

Topic – Electrical and magnetic Properties

Ans 01: Doping – The process of introduction of impurity atoms into an insulator to make it a semiconductor is called doping.

Ans 02: A semiconductor formed by combination of 13 groups & 15 groups elements is 13 – 15 compound.

Ans 03: (i) For p – type semiconductor Borom can be added.
(ii) For n – type semiconductor, Phosphorous can be added.

Ans 04: A ferromagnetic substance has permanent magnetic behaviour whereas a paramagnetic substance acts as a magnet only in the presence of an external magnetic field.

Ans 05: (a) Antiferromagnetic field.
(b) In Antiferromagnetic substance the domain structure is similar to ferromagnetic substance but the domains are oppositely oriented and cancel out each others magnetic moment whereas in diamagnetic substance all individual electron are paired which cancels the individual magnetic moments.

Ans 06: Intrinsic semiconductor – An insulator which conducts electricity when heated.
Extrinsic semiconductor – An insulator which conducts electricity on addition of an impurity.

Ans 07: Solids can be classified into three types on the basis of their conductivities –

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Solutions)

Topic: -Concentration of solutions

1. Define ‘solution’? [1]

2. Define the term ‘concentration? [1]

3. How does change in temperature changes the molarity and molality values? [1]

4. Calculate the volume of water which could be added to 20 ml of 0.65 m HCl to dilute the solution to 0.2 m? [2]

5. A solution is prepared by dissolving 11g glucose in 200 cm^3 water at 30^0 C. What is the mass Percentage of glucose in solution? The density of water 30^0C is 0.996 $glcm^3$? [2]

6. Find the molality and molarity of a 15% solution of H_2SO_4 when its density is 1.10 $glcm^3$ & molar mass = 98 amu. [2]

7. Calculate the mole fraction of ethanol and water in a sample of rectified spirit which contains 46% ethanol by mass? [2]

8. Calculate the % composition in terms of mass of a solution obtained by mixing 300g of a 25% & 400 g of a 40% solution by mass? [2]

9. One litre of sea water weight 1030g and contains about 6×10^{-3} g of dissolved 0_2. Calculate the concentration of dissolved oxygen in ppm? [2]

10. The density of 85% phosphoric acid is 1.70 g/cm^3. What is the volume of a solution that contains 17g of phosphoric acid? [2]

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Solutions)

[ANSWERS]

Topic: -Concentration of solutions

1. Solutions are homogeneous mixtures of two or more than two components.

2. The relative amount of a substance in a solution is called its concentration.

3. As the temperature increases, volume increases and molarity decreases whereas molality does not change with any change in temperature.

4. For dilution –

$$M_1V_1 = M_2V_2$$

$$V_2 = \frac{M_1V_1}{M_2} = \frac{0.65M \times 20 \text{ ml}}{0.2M} = 65 \text{ ml}$$

Vol of water to be added to 20 ml =

$$= V_2 - V_1 = 65\text{ml} - 20\text{ml} = 45 \text{ ml}.$$

5. $\text{Density} = \frac{mass}{volume} = 0.996 \text{ g/cm}^3$

$$0.996 = \frac{mass}{200cm^3}$$

$$\text{Mass} = 0.996 \times 200 = 199.2 \text{ g}$$

$$\text{Mass\% of glucose} = \frac{mass \text{ of volume}}{mass \text{ of water} + \text{mass of glucose}} \times 100$$

$$= \frac{11}{199.2 + 11} 100 = 5.23 \%$$

6. Volume = mass/density

$$= 100 \text{ g}/1.10 \text{ glcm}^3 = 90.9 \text{ cm}^3$$

$$\text{Molarity} = \frac{\text{no. of moles of } H_2SO_4}{\text{volume of solution}} \times 1000$$

$$= \frac{(15/98)}{90.9} \times 1000 = 1.68 \text{ m}.$$

$$\text{Molality} = \frac{\text{no. of moles of solute}}{\text{mass of solvent in kg}}$$

$$\frac{(15/98)}{85g} \times 1000 = 1.8 \text{ M}.$$

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (Solutions)

Topic: - Solubility, vapour pressure and Raoult's Law

1. Define the term – solubility? [1]

2. What is the effect of pressure on solubility of a gas? [1]

3. Carbon tetrachloride and water are immiscible whereas alcohol and water are miscible. Explain on the basis of molecular structures of there compounds. [2]

4. State Henry's Law. [1]

5. Why do mountaineers carry oxygen cylinder while climbing mountains? [2]

6. State Raoult's Law. [1]

7. What are the factors on which vapour pressure depends? [1]

8. The vapour pressure of solvent gets lowered, when a non- volatile solute is added to it. Why? [1]

9. Name two ways by which vapour pressure of a liquid can be lowered. [1]

10. Plot a graph between vapour pressure and mole fraction of a solution obeying Raoult's Law at constant temperature? [2]

CBSE TEST PAPER-02
CLASS - XII CHEMISTRY (Solutions)

[ANSWERS]
Topic: - Solubility , vapour pressure and Raoult's Law

Ans 1. The maximum amount of a substance that can be dissolved in a specified amount of solvent is called its solubility.

Ans 2. The solubility of a gas increases with increases of pressure.

Ans 3. Carbon tetrachloride is a non-polar compound whereas water is a polar compound. They do not interact with each other and carbon tetrachloride cannot dissolve in water whereas alcohol and water are completely miscible due to high polarity.

Ans 4. Henry's Law states that the partial pressure of the gas in vapour phase is proportional to the mole fraction of the gas in solution.

Ans 5. At high attitudes the partial pressure of oxygen is less than that of the ground level which decreases the concentration of oxygen in blood and tissues. Low blood oxygen causes climbers to become weak and unable to think clearly & they suffer from anoxia. To avoid such situations, mountaineers carry oxygen cylinder while climbing.

Ans 6. Raoult's Law states that for a solution of volatile liquids, the partial vapour pressure of each component in the solution is directly proportional to its mole fraction.

Ans 7. The factors on which vapour pressure depends are –

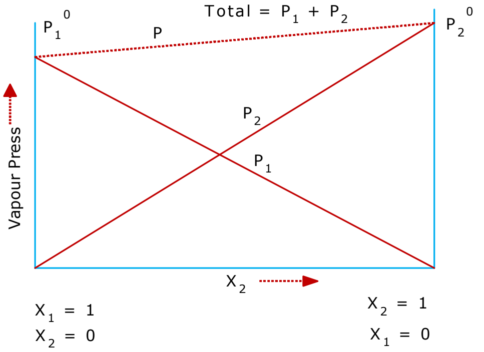
1) Temperature of the liquid. 2) Nature of the liquid.

Ans 8. When a non-volatile solute is added to a solvent, the surface area for escape of solvent molecules decreases and vapour pressure gets lowered.

Ans 9. The two ways by which vapour pressure can be lowered are –

1) By decreasing the temperature. 2) By adding a non- volatile solute.

Ans 10.



CBSE TEST PAPER-03
CLASS - XII CHEMISTRY (Solutions)

Topic: - Ideal & non-ideal solutions, colligative properties relative Lowering of vapour pressure

1. Define the term colligative properties? [1]

2. Name different colligative properties? [2]

3. Give the characteristics of ideal solution? [2]

4. A mixture of chlorobenzene and bromobenzene is a nearly an ideal solution but a mixture of chloroform and acetone is not Explain? [2]

5. What are the possible deviations from ideal behaviors? [1]

6. Give one example of each deviation? [1]

7. Define the term azeotrope? [2]

8. Obtain a relationship between relative lowering of vapour pressure and mole fraction of solute? [3]

9. The vapour pressure of CS_2at 500^0C is 854 mm Hg .A solution of 2.0g sulphur in 100g of CS_2 has a vapour pressure of 848.9 mm Hg .Calculate the formula of sulphur molecule. [3]

10. At 400^0C , the vapour pressure of water is 55.3 mm Hg .Calculate the vapour pressure at the same temperature over 10% aqueous solution of urea $[CO(NH_2)_2]$? [3]

11. How much urea (molar mass 60 g/mol) should be dissolved in 50g of water so that its vapour pressure at room temperature is reduced by 25%? [3]

12. Draw the graphs of both deviations from ideal behaviours? [2]

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Solutions)

[ANSWERS]

Topic: - Ideal & non-ideal solutions, colligative properties relative Lowering of vapour pressure

1. The property which depends upon amount of solute and not upon the nature of solute are called colligative properties.

2. The colligative properties are –
   a) Relative lowering of vapour pressure.
   b) Elevation in boiling point.
   c) Depression in freezing point
   d) Osmotic pressure.

3. An ideal solution is formed from two liquids only when –
   a) They obey Raoult's Law
   b) Δ Hmix = 0
   c) Δ Vmix = 0
   d) The various inter molecular forces are identical.

4. Chlorobezene & bromobenzene both have similar structure and polarity. Therefore the various interactions (solute – solute, solvent – solvent & solute – solvent) are same whereas in chloroform and acetone initially there is no hydrogen bonding but after mixing solute solvent interactions (H –bond) become stronger and solution deviates from ideal behaviour.

5. There are two types of deviation from ideal behaviour – positive and negative deviations.

6. Positive deviation – ethanol and acetone.
   Negative deviation – chloroform and acetone.

7. A solution at certain concentration when continues to boil at constant temperature without change in its composition in solution & in vapour phase is called an azeotrope.

CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (Solutions)

Topic : Elevation in boiling point, Depression in freezing point, osmotic pressure

1. Why is the boiling point elevated when a non – volatile solute is dissolved in a liquid? [1]
2. How is boiling point changed when mass of solvent is doubled? [1]
3. 0.90g of a non – electrolyte was dissolved in 87.90g of benzene. This raised the boiling point of benzene by 0.25^{0}C. If the molecular mass of non – electrolyte is 103.0 g/mol, calculate the molal elevation constant for benzene? [2]
4. Show graphically the depression in freezing point on adding a non volatile solute? [2]
5. Define cryoscopic constant? [1]
6. When 20g of a non – volatile solid is added to 250 ml of water, the freezing point of water becomes -0.9^{0}C. Calculate molecular mass of the solid if kf of water is 1.86^{0}Ckg/mol. [2]
7. What happens when red blood cells are placed in 0.1% NaCl solution? [1]
8. How is osmotic pressure of a solution related to its concentration? [1]
9. Calculate the osmotic pressure of 0.25 M solution of urea at 37^{0}C. R = 0.083 L bar/mol/k. [2]
10. An aqueous solution of glucose, $C_6H_{12}O_6$ has osmotic pressure of 2.72 atm at 298k. How many moles of glucose were dissolved per litre of solution? [2]

CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (Solutions)

[ANSWERS]

Topic : Elevation in boiling point, Depression in freezing point , osmotic pressure

1. When a non – volatile solute is added the vapour pressure decreases and the solution is heated to a higher temperature, increasing the boiling point.

2. $\Delta T_b = K_b \frac{Wsolute}{Wsolvent} \times \frac{1000}{Msolute}$

   = when the amount of solvent is doubled, ΔTb is halved.

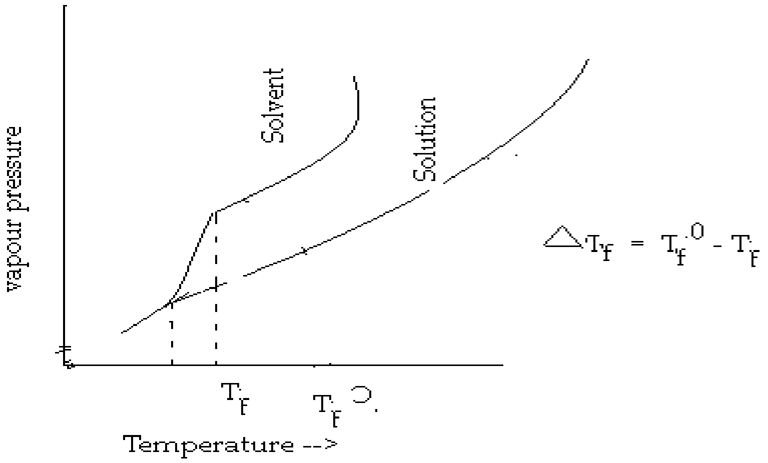
3. $\Delta T_b = K_b \frac{Wsolute}{Wsolvent} \times \frac{1000}{Msolute}$

   $K_b = \Delta T_b \times Msolute \times \frac{Wsolvent}{Wsolute} \times \frac{1}{1000}$

   $= 103 \times 0.25 \times \frac{87.90}{0.90} \times \frac{1}{1000}$

   = 2.514 k kg/mol.

4.



5. When 1 mole of a solute (that neither dissociates nor associates) is dissolved in 1kg of solvent, the depression in freezing point is called cryoscopic constant.

CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (Solutions)

Topics – Abnormal molecular mass

1. When does the measurement of colligative property leads to abnormal molecular mass? [1]

2. Give various expressions for van't Hoff factor? [2]

3. How are the various colligative properties modified after consideration of van't Hoff factor? [2]

4. The boiling point elevation of 0.6 g acetic acid in 100g benzene is 0.1265k. What conclusion can you draw about the state of solute in solution? Molar elevation constant for benzene is 2.53 deg per molar? [2]

5. A weak electrolyte AB in 5% dissociated in aqueous solution? What is the freezing point of a 0.10 molar aqueous solution of AB? K_f = 1.86 deg/molal? [2]

6. The osmotic pressure of a 0.0103 molar solution of an electrolyte is found to be 0.70 atm at 273^0C. Calculate van't Hoff factor. R=0.082 L atm/1 mol/k? [2]

7. When is the value of i less then unity? [1]

8. The molecular mass of a solute is 120 g/mol and van't Hoff factor is 4. What is its abnormal molecular mass? [1]

CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (Solutions)

[ANSWERS]

Topic: Abnormal Molecular Mass

1. When the solute undergoes either association or disassociation abnormal molar mass is obtained.

2. $$i = \frac{\text{Normal Molar mass}}{\text{Abnormal molar mass}}$$

$$= \frac{\text{Observed colligative property}}{\text{Calculated colligative property}}$$

$$= \frac{\text{Total no. of moles of particles after association/dissociation}}{\text{Total no. of moles of particles before association/dissociation}}$$

3. a) $\frac{p_1^0 - p_1}{p_1^0} = i\ X_2$

   b) $\Delta T_b = i\ K_b\ .m$

   c) $\Delta T_f = i\ K_f\ .m$

   d) $\pi = i\ CRT$

4. Molality of acetic acid = $\frac{0.6}{60} \times \frac{1000}{100}$

$= 0.10$ m.

$\Delta T_b = K_b \times m$

$M = \frac{\Delta T_b}{K_b} = \frac{0.1265}{2.53} = 0.050$ m

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Surface chemistry)

Topic: Adsorption – types and nature

1. What do you mean by the term –Adsorption ? [1]

2. Explain the terms – Adsorbate and Adsorbent ? [1]

3. Give some example of adsorbate and adsorbent ? [2]

4. Define the term – desorption? [2]

5. Give two differences between adsorption and absorption ? [1]

6. Why do finely divided solids act as good adsorbents ? [1]

7. Name the two types of adsorptions ? [2]

8. Write the four differences between physisorption and chemisorption? [2]

9. ‘Adsorption is an exothermic process ‘. Explain. [2]

10. Explain the Mechanism of adsorption. [1]

11. What is the sign of $\Delta H,\ \Delta S\ and\ \Delta G$ when a gas is adsorbed by an adsorbent? [2]

12. (a) Which gas is adsorbed more readily on charcoal lump: ammonia or carbon dioxide and why ?
    (b) Which adsorbs more of carbon monoxide: charcoal lump or charcoal powder & why? [2]

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (Surface chemistry)

Topic: Adsorption – types and nature

ANSWERS

1. The accumulation of molecular species at the surface rather than in bulk of a solid liquid is termed as Adsorption.

2. The molecular species which get concentrated or accumulated at the surface are adsorbate and the material on the surface of which the adsorption takes place is adsorbent.

3. Adsorbate examples O_2, H_2, CO, Cl_2, NH_3 etc.
   Adsorbent examples – charcoal, silica gel, alumina gel, clay, colloid etc.

4. The process of removing an adsorbed substance from a surface on which it is adsorbed is called desorption.

5.

Adsorption	Absorption
1. It occurs on the surface of the Adsorbent.	1. The molecules of the substance are uniformly distributed throughout the body of the solid or liquid.
2. Rate of adsorption decreases until the equilibrium is reached .	2. Rate of absorption is same throughout.

6. Powdering of solids increase its surface and therefore it can adsorb a greater amount of the adsorbate. Thus finely divided solids act as good adsorbents.

7. Two types of adsorptions are –
   1. Physical adsorption or physisorption .

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (Surface chemistry)

Topic: Factors affecting adsorption, Application of adsorption , Homogeneous and hetrogeneous catalysis

1. Name the factors which influence the extent of adsorption of a gas on solid. [2]

2. What is adsorption isotherm? [1]

3. ΔH for chemisorption is high .why? [1]

4. Explain Freundlich adsorption isotherm. [2]

5. Give an equation showing variation of extent of adsorption with concentration of a solution? [1]

6. Name the adsorbent used [3]
   a) To remove coloured impurities from sugar solution.
   b) In gas masks to remove chlorine.
   c) To remove moisture from air.

7. Define the terms – catalysis and catalyst. [2]

8. What are positive and negative catalysts? [1]

9. What do you mean by the term promoter? Give an example. [1]

10. What are homogeneous and heterogeneous catalysis? Give example. [3]

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (Surface chemistry)

Topic: Factors affecting adsorption, Application of adsorption, Homogeneous and hetrogeneous catalysis

ANSWERS

1. Factors affecting extent of adsorption are –
   (i) Nature of adsorbent and adsorbate.
   (ii) Surface area of solid
   (iii) Pressure of gas
   (iv) Temperature

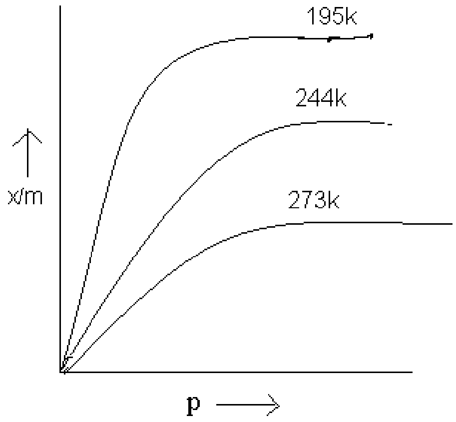
2. The variation in the amount of gas adsorbed by the adsorbent with pressure at constant temperature can be expressed by means of a curve known as adsorption isotherm.

3. In chemisorption, chemical bonds are formed that evolves a large amount of energy. Therefore ΔH for chemisorption is high.

4. Freundlich adsorption isotherm gives an empirical relationship between the quantity of gas adsorbed by unit mass of solid adsorbent and pressure at a particular temperature

   The relationship is $\frac{x}{m} = K.P^{1/n\ (N > 1)}$

   Where x is a mass of gas adsorbed on mass m of adsorbent at pressure P, K &n are constant that depend on the nature of adsorbent and adsorbate – The relationship can be represented by plotting curves between x/m and P. They show that at a fix pressure, the physical adsorption decreases with increase in temperature.



5. $x/m = K\ C^{1/n}\ (n > 1)$
   Where x/m is the extent of adsorption - k &n are constants and c is the concentration of solution.

6. (a) Activated charcoal
   (b) Activated charcoal

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Surface chemistry)

Topic: Hetrogeneous catalysis, zeolites, enzyme catalysis

1. Explain modern theory of heterogeneous catalysis. [2]
2. What is meant by activity and selectivity of a catalyst? [2]
3. What is shape – selective catalysis? Give an example of shape selective catalyst. [2]
4. Give two examples of enzyme catalysed reaction. [2]
5. Write characteristics of enzyme catalysed reactions. [3]
6. Explain the mechanism of enzyme catalysis. [2]
7. Name some important industrial catalytic process and their catalysts. [3]
8. How do metal ions act as activators? [1]
9. What is the optimum temperature and pH for enzyme catalysed reactions? [1]
10. Give two examples of reactions catalysed by zeolites. [2]

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (Surface chemistry)

Topic: Hetrogeneous catalysis, zeolites, enzyme catalysis

ANSWERS

Ans 1. According to modern theory of catalysis, the mechanism of heterogeneous catalysis involves following steps –

(i) Diffusion of reactants on the surface of catalyst.
(ii) Adsorption of reactant molecules on the surface.
(iii) Occurrence of reaction on the catalysts surface through formation of an intermediate.
(iv) Desorption of products from surface.
(v) Diffusion of products away from surface.

Ans 2. Activity of a catalyst is the extent to which a catalyst can increase the rate of reaction. It depends upon the strength of chemisorption.

Selectivity of a catalyst is its ability to direct a reaction to yield a particular product. The action of a catalyst is highly selective in nature.

Ans 3. The catalytic reaction that depends upon the pore structure of the catalyst and the size of the reactant and product molecules is called shape selective catalysis. Zeolites are good shape catalysts due to there honeycomb – like structure. The reactions taking place in zeolites depends upon the size and the shape of reactant and product molecules as well as upon the pores and cavities of the zeolites.

Ans 4. Examples of enzyme- catalysed reactions are –

(1) Inversion of cane sugar:

$$C_{12}H_{22}O_{11}(aq) + \mathrm{H_2O}(\ell) \xrightarrow{Invertase} \mathrm{C_6H_{12}O_6(aq) + C_6H_{12}O_6(aq)}$$

2. Decomposition of urea into ammonia and carbon dioxide.

$$NH_2CONH_2(aq) + H_2O(\ell) \xrightarrow{Urease} \mathrm{2NH_3(g)\ + CO_2(g)}$$

Ans 5. The characteristics of enzyme catalysed reactions are –

(1) They are highly efficient and specific in nature.
(2) They have maximum activity under specific temperature and pH.
(3) Their activity increases on adding activators and coenzymes while decreases in the presence of poison or inhibitors.

CBSE TEST PAPER-04

CLASS - XII CHEMISTRY (Surface chemistry)

Topic:-Colloids – classification and preparation

1. What are colloids? [1]

2. What is the range of particle size in colloids? [1]

3. What is dispersed phase and dispersion medium in [3]

   (i) sol (ii) Aerosol (iii) Foam?

4. Give two examples of solid Sol and Gel? [1]

5. Differentiate between lyophobic and lyophillic sol? [3]

6. Colloid is a state not a substance. Explain? [1]

7. Give two examples of substances that form: – [2]

   (a) Hydrophobic sol.

   (b) Hydrophilic sol.

8. Differentiate between multimolucular and macromolecular colloid? [2]

9. What are associated colloids? Give an example? [1]

10. What is CMC and Kraft's temperature? [1]

11. Write the equation for formation of [2]

    (a) Sulphur sol.

    (b) Ferric hydroxide sol.

12. Define the term peptization? [1]

CBSE TEST PAPER-04
CLASS - XII CHEMISTRY (Surface chemistry)
[ANSWERS]

Topic:-Colloids – classification and preparation

Ans 1. A colloid is a heterogeneous system in which one substance is dispersed (dispersed phase) as very fine particles in another substance called dispersion medium.

Ans 2. The range of diameter of colloidal particles is 1 to 1000 nm.

Ans 3.

	Dispersion medium	Dispersed phase	Colloid
(i)	Solid	Liquid	Sol
(ii)	Solid	Gas	Aerosol
(iii)	Liquid	Gas	Aerosol
(iv)	Gas	Liquid	Foam.

Ans 4. Solid sol – coloured glass, pumice stone.
Gel – Cheese, Butter.

Ans 5.

Lyophobic sol	**Lyophillic sol.**
1. It is relatively unstable due to Repulsion between dispersion medium and dispersed phase.	1. It is relatively more stable due to attraction between dispersion medium and dispersed Phase.
2. It is irreversible.	2. It is reversible.
3. It cannot be easily peptised.	3. It can be easily peptised.
4. Small quantities of electrolyte cause precipitation.	4. Small quantities of electrolyte has no effect larger concentration causes precipitation.

Ans 6. Every solute can be converted into the particle size of a colloid which is 1-1000 nm. Therefore every solute can act as a colloidal particle under suitable conditions.

CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (Surface chemistry)

Topic:- Properties and applications of colloids, Emulsions.

1. How is a colloidal solution purified by dialysis? [2]

2. What is observed when light is passed through a colloidal solution? [1]

3. Define the terms – (a) Brownian movement (b) Electrophoresis? [2]

4. State Hardy- Schulze rule? [1]

5. What is a protective colloid? [1]

6. What is flocculation? [1]

7. Alum is used for purification of water. Why? [1]

8. Give three applications of colloidal solutions? [3]

9. What are the two types of emulsions? [1]

10. How does an emulsifying agent work? Give an example of emulsifying agent. [2]

CBSE TEST PAPER-05

CLASS - XII CHEMISTRY (Surface chemistry)

[Answers]

Topic:- Properties and applications of colloids, Emulsions

Ans.1 Dialysis is a process of removing a dissolved substance from a colloidal solution by means of diffusion through a suitable membrane. A bag of suitable membrane containing the colloidal solution is suspended in a vessel through which fresh water is continuously flowing. The molecules and ions diffuse through membrane into outer water and pure colloidal solution is left behind

Ans 2. When light is passed through a colloidal solution, the path of light gets illuminated and a bright cone of light is observed due to scattering of light in all direction. This is called Tyndal effect.

Ans. 3 (a) Brownian movement:-

The continuous zig-zag movement of particles in a colloidal solution is called Brownian movement.

(b) Electrophoresis:-

The movement of particles under an applied electric potential is called electrophoresis.

Ans.4 According to Hardy- Schulze rule-

The greater the valence of the flocculating ion added, the greater is its power to cause precipitation.

Ans.5 A lyophillic colloid which is used to protect lyophobic colloid from electrolyte and from getting coagulated is called protective colloid.

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (The d– & f- block elements)

Topic:- General properties of transition metals.

1. Zinc, cadmium and mercury are not considered as transition metals. Why? [1]

2. Write the general configuration of d- block elements. [1]

3. Give reasons- [5]

(i) Transition metals have high melting points.

(ii) Second and third transition series have similar radii.

(iii) Second ionization is difficult from Cu and Cr whereas it is easy for Zn.

(iv) Most of the transition elements are paramagnetic.

(v) Transition elements form alloys.

4. What are the factors that decide the ionization potential? [1]

5. Transition metals generally form coloured ions. Why? [2]

Which of the following will be colored? [2]

Sc^{3+}, $V^{2+,}$ Mn^{2+} , Cu^{+}, $Ni^{2+.}$

6. Give an explanation for the catalytic properties shown by transition metals. [2]

7. Write some characteristics of interstitial compounds. [2]

CBSE TEST PAPER-01

CLASS - XII CHEMISTRY (The d– & f- block elements)

[ANSWER]

Topic:- General properties of transition metals.

Ans. 1. Zinc, cadmium and mercury have fully filled d^{10} configuration. Therefore they are not considered as transition metal.

Ans 2. General electronic configuration of d- block elements is $(n\text{-}1)d^{1\text{-}10}$ ns $^{1\text{-}2}$.

Ans 3. (i) In transition metals besides ns electrons, (n-1)d electrons can also participate in bonding making stronger metallic bonds. This increases their melting points.

(ii) Due to lanthanoid contraction, there is a decrease in size of 5d series. This makes their sizes same as sizes of elements of 4d series.

(iii) In Cr the electronic configuration is $3d^5\ 4s^1$ and for Cu, it is $3d^{10}\ 4s^1$. In these after first ionization, which removes the electron from 4s , second ionization requires disturbance in half filled or fully filled configuration which requires high enthalpy whereas the configuration of Zn is $3d^{10}4s^2$. Here after second ionization, the configuration of Zn is completely filled. Therefore second ionization is easier for Zn but difficult for Cr and Cu.

(iv) Para magnetism in transition elements arises due to presence of one or more unpaired electrons in atomic orbitals.

(v) Due to similarity in their sizes, transition metals can take each others position in their crystal lattice. Therefore they are able to form alloys.

Ans 4. The ionization potential values are governed by various ionization enthalpy values, bond enthalpy values and hydration enthalpy values.

CBSE TEST PAPER-02

CLASS - XII CHEMISTRY (The d– & f- block elements)

Topic:- potassium dichromate , potassium permanganate.

1. What is the ore of $K_2Cr_2O_7$ and $KMnO_4$? [1]

2. Explain the steps of preparation of potassium dichromate? [3]

3. What is the effect of adding a base to potassium dichromate? [1]

4. Draw the structure of chromate and dichromate ions? [2]

5. Describe the steps of preparation of $KMnO_4$? [2]

6. Give some of the uses of $KMnO_4$? [2]

7. Draw the structure of manganate and permanganate ions? [2]

8. Complete and balance:- [6×1=6]

    1. $5Fe^{2+} + MnO_4^- + 8H^+ \rightarrow$

    2. $5NO_2^- + 2MnO_4^- + 6H^+ \rightarrow$

    3. $2MnO_4^- + H_2O + I^- \rightarrow$

    4. $8MnO_4^- + 3S_2O_8^{2-} + H_2O \rightarrow$

    5. $Cr_2O_7^{2} + 14H^+ + 6Fe^{2+} \rightarrow$

    6. $Cr_2O_7^{2-} + Sn^{2+} + 14H^+ \rightarrow$

CBSE TEST PAPER-02
CLASS - XII CHEMISTRY (The d– & f- block elements)
[ANSWER]

Topic:- potassium dichromate , potassium permanganate

Ans. 1 Potassium dichromate → chromite ore ($FeCr_2O_4$) Potassium Permanganate → MnO_2 pyrolusite.

Ans. 2 Preparation of potassium dichromate takes place in three steps.

Step 1 : Fusion of chromite ore with sodium or potassium carbonate in free excess of air.

$$4FeCr_2O_4 + 8Na_2CO_3 + 7O_2 \rightarrow 8Na_2CrO_4 + 2Fe_2O_3 + 8CO_2$$

Step 2 : Conversion of Sodium Chromate to Sodium Dichromate by acidifying it.

$$2Na_2CrO_4 + 2H^+ \rightarrow Na_2Cr_2O_7 + H_2O + 2Na^+$$

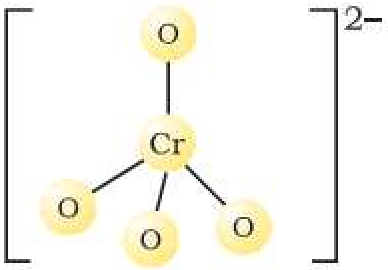
Step 3: Conversion of sodium dichromate to potassium dichromate by reaching it with KCl.

$$Na_2Cr_2O_7 + KCl \rightarrow K_2Cr_2O_7 + NaCl$$

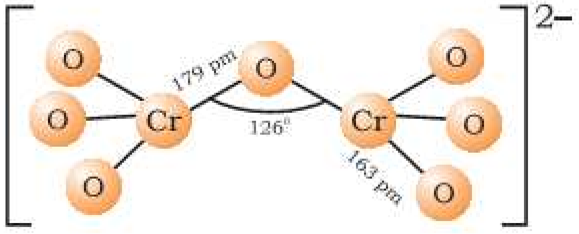
Ans.3 When a base is added to orange coloured potassium dichromate its colour changes to yellow due to formation of potassium chromate.

$$Cr_2O_7^{2-} + 2OH^- \rightarrow 2CrO_4^{2-} + H_2O$$

Ans.4



Chromate ion



Dichromate ion

CBSE TEST PAPER-03

CLASS - XII CHEMISTRY (The d– & f- block elements)

Topic:- f-block elements: Lanthanoids and Actinoids.

1. Name the two series of f-block. [1]

2. The chemistry of actionoids is more complicated than lanthanoids. Why? [1]

3. What is the general valance configuration of f-block elements? [1]

4. What is the lanthanoid contraction? What are its causes and consequences? [3]

5. What is the most common oxidation state of lanthanoids and actionoids? [1]

6. Actionoid contraction is more than lanthanoid contraction. Give reason. [1]

7. What is the composition of mischmetall? Give its one use. [2]

8. Actionoids show larger number of oxidation states than lanthanoids. Why? [1]

9. What happens when [2]
   (a) A lanthonoid reacts with dil- acid
   (b) A lanthonoid reacts with water.

CBSE TEST PAPER-03
CLASS - XII CHEMISTRY (The d– & f- block elements)
[ANSWER]

Topic:- f-block elements: Lanthanoids and Actinoids.

Ans. 1 The two series are-
i) 4f series or Lanthanoids ii) 5f series or actinoids.

Ans. 2 The complications in the actinoid series is due to
i) Existence of a wide range of oxidation states. ii) Their radioactivity.

Ans. 3 The general electronic configuration of f-block elements is $(n-2)\ f^{1-14}\ (n-1)\ d^{0-1}\ ns^2$

Ans. 4 Lanthanoid contractions – The cumulative effect of the regular decrease in size or radii of Lanthanoid with increase in atomic number is called Lanthanoid contraction.

Causes - The shape of f orbitals is diffused. They have poor shielding effect due to which the effective nuclear charge increase with increase in atomic number. This causes a decrease in atomic radii

Consequences – Due to Lanthanoid contraction-

1. Radii of the members of the third transition series is similar to those of second transition series.
2. It becomes difficult to separate Lanthanoids.

Ans. 5 The common oxidation states of
(1) 4f series is +3 (2) 5f series is +3, +4, +5, +6 & +7

Ans. 6 The actinoid contraction is more than Lanthanoid contraction as the shielding Power of 5f orbitals is poorer than 4f orbitals.

Ans. 7 Mischmetall is an alloy of a Lanthanoid metal and iron and traces of S, C, Ca & Aℓ. It is used in Magnesium based alloy to produce bullets, shell and lighter Flint.

Ans. 8 Actinoids can show many oxidation states as in actinoids 5f orbitals are filled which are not as buried as Lanthnoids and can also participate in bonding to a greater extent besides 6d and 7s electrons.

Ans. 9 (i) When a Lanthanoid reacts with dil- acid, it liberate hydrogen gas.

$$Ln + dil.HCl \rightarrow Ln\,Cl_3 + H_2$$

(ii) When a Lanthanoid reacts with water, it forms hydroxide.

$$Ln + H_2O \rightarrow Ln\,(OH)_3 + H_2$$

Ans 5. Potassium Permanganate is prepared in two steps:

Step 1: Fusion of MnO_2 with KOH and oxidizing agent to give dark green K_2MnO_4.

$$2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$$

Step 2: Disproportionation of manganate ions to give permanganate ions.

$$3MnO_4^{2-} + 4H+ \rightarrow 2MnO_4^{-} + MnO_2 + 2H_2O$$

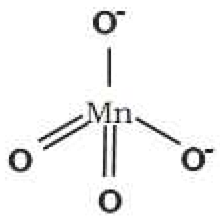
Ans6. Uses of potassium permanganate –

(a) As an oxidizing agent.

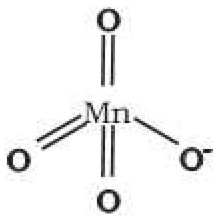
(b) For bleaching of wool, cotton & silk.

(c) For decolourisation of oils.

Ans.7



Tetrahedral manganate (green) ion



Tetrahedral permanganate (purple) ion

Ans 8

1. $5Fe^{2+} + MnO_4^{-} + 8H^{+} \rightarrow Mn^{2+} + 4H_2O + 5Fe^{3+}$
2. $5NO_2^{-} + 2MnO_4^{-} + 6H^{+} \rightarrow 2Mn^{2+} + 5NO_3^{-} + 3H_2O$
3. $2MnO_4^{-} + H_2O + I^{-} \rightarrow 2MnO_2 + 2OH^{-} + IO_3^{-}$
4. $8MnO_4^{-} + 3S_2O_3^{\ 2-} + H_2O \rightarrow 8MnO_2 + 6SO_4^{2-} + 2OH^{-}$
5. $Cr_2O_7^{2} + 14H^{+} + 6Fe^{2+} \rightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$
6. $Cr_2O_7^{2-} + Sn^{2} + 14H^{+} \rightarrow Sn^{4+} + 2Cr^{3+} + 7H_2O$

Ans 5. Transition metals form coloured ions due to d-d transition. Coloured ions will be those which have unpaired electrons

Sc^{3+}	$3d^0$	Colourless
V^{2+}	$3d^3$	Coloured
Mn^{2+}	$3d^5$	Coloured
Cu^+	$3d^{10}$	Colourless
Ni^{2+}	$3d^8$	Coloured.

Ans 6. Catalytic properties shown by transition metals can be explained due to

(i) Presence of variable valency and ability of elements to form complexes.
(ii) Surface of metals where the reaction can occur.

Ans 7. Some characteristics of interstitial compounds are

(i) They have high melting points.
(ii) They are very hard.
(iii) They retain metallic lusture.
(iv) They are chemically inert.

Ans.6 When a colloid precipitates and floats on the solvent, it is called flocculation.

Ans. 7 The dirty water contains electrically charged impurities which get coagulated on adding alum which contains Al^{3+} ion. These impurities settle down after coagulation and are then filtered.

Ans.8 Application of colloids-

1. Colloidal antimony is used in curing kalaazar.
2. Paints, synthetic plastics, rubber etc. all are colloidal solutions.
3. Rubber is obtained by coagulation of latex.

Ans.9 The two types of emulsions are-

(a) Oil dispersed in water (o/w type)

(b) Water dispersed in oil (w/o type)

Ans 10. An emulsifying agent is added to emulsions for its stabilization. It forms an interfacial film between suspended particles and the medium eg. For o/w emulsions, Proteins, gums soaps etc. can be used an emulsifying agent whereas for w/o long chain alcohols lamp black etc. can be used.

Ans 7. (a) hydrophobic sol : Gold, platinum

(b) hydrophilic sol : starch, proteins in water.

Ans 8.

Macromolecular colloid	Multimolecular colloid
1. It consist of aggregates of atoms or molecules with diameter less then 10^{-9}m.	1. They are themselves Large.
2. The atoms or molecules are held together by weak Vander Waal's forces .	2. Since the molecules are flexible. They can take Various shapes.
3. Example - Gold sol, sulphur sol.	3. Example – starch, proteins.

Ans 9. The substances, which at low concentration behave as normal electrolyte but at higher concentration exhibit colloidal behavior due to formation of aggregates, are called associated colloids. For example – soaps and detergents. They are also called micelle.

Ans.10 CMC or critical micelle concentration and Kraft's temperature are the concentration and temperature above which micelle formation or associated colloid formation takes place.

Ans.11 (a) $SO_2 + 2H_2S \xrightarrow{Oxidation} 3S + 2H_2O$

(Sol)

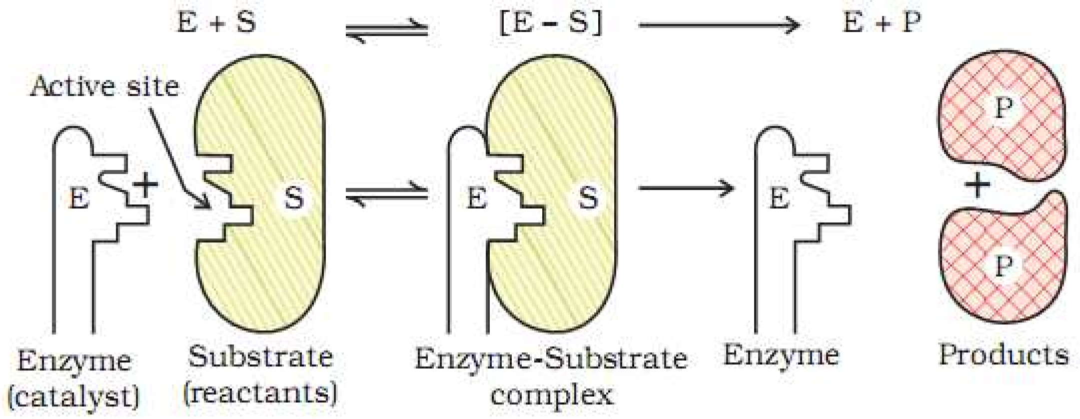
(b) $FeCl_3 + 3H_2O \xrightarrow{Hydrolysis} Fe(OH)_3 + 3HCl$

(Sol)

Ans.12 The process of converting a precipitate into colloidal sol by shaking it with dispersion medium in the presence of small amount of electrolyte is called peptisation.

Ans 6. Mechanism of enzyme catalysed reactions-

There are active centres or cavities on the surface of enzyme particles. The molecules of the reaction or substrate which have complementary shape fit into these just like a key fits into a lock. This forms an activated complex which decomposes to yield products.



The reactions proceed in two steps –

Step 1: Binding of enzymes to substrate to form activated complex.

$E+S \text{ -----}\rightarrow ES$

Step 2 : Decomposition of complex to form products.

$ES \text{ -----}\rightarrow E + P.$

Ans 7.

Process	Catalyst
1. Haber's process for preparation of ammonia.	Iron , Molybdenum
2. Ostwald's process for manufacture of nitric acid.	Platinised asbestos.
3. Contact process for manufacture of sulphuric acid.	Vanadium pentaoxide (V_2O_5).

Ans 8. The metal ions like Na^+, Mn^{2+}, Co^{2+}, Cu^{2+} etc. can bind weakly to enzyme molecules. This increases their catalytic activity and therefore metal ions can act as activators.

Ans 9. The optimum temperature is 298K – 310K and optimum pH is 5 – 7 for enzyme – catalysed reactions.

Ans 10. Example of zeolite catalysed reactions are:

(a) Cracking of hydrocarbons in petroleum industries.

(b) Conversion of alcohols into gasoline.

(c) Silica gel.

7. (a) The phenomenon in which a small quantity of a substance known as catalyst alters the rate of a reaction is known as catalysis.
   (b) The substance which alter the rate of a reaction and themselves remain chemically and quantitatively unchanged after the reaction are known as catalysts.

8. A catalyst which increases the rate of a reaction is positive catalyst and which decrease the rate is a negative catalyst.

9. Promoters are substances that enhance the activity of a catalyst e.g. molybdenum acts as a promoter in Haber's process.

10. <u>Homogeneous catalysis –</u>

When reactant and catalyst are in the same phase, the process is said to be homogeneous catalysis.

Examples –

(1) Oxidation of sulphur dioxide in the presence of oxygen gas and nitric oxide gas as catalyst.

$$2\ SO_2\ (g) + O_2(g) \xrightarrow{NO(g)} 2\ SO_3\ (g)$$

(2) Hydrolysis of methyl acetate catalysed by H^+ ions.

$$CH_3COOCH_3\ (\ell) + H_20\ (\ell) \xrightarrow{H_2SO_4(\ell 0)} CH_3COOH(aq) + CH_3OH\ (aq)$$

(3) Hydrolysis of sugar catalysed by H_2S0_4.

<u>Hetrogeneous Catalysis</u> –

The catalytic process in which the reactant and catalyst are in different phases is known as heterogeneous catalysis.

Examples:-

(1) Oxidation of sulphur dioxide in presence of platinum.

$$O_2\ (g) + 2SO_2(g) \xrightarrow{pt(s)} 2SO_3\ (g)$$

(2) Preparation of ammonia by Haber's process

$$N_2(g) + 3H_2\ (g) \xrightarrow{Fe(S)} 2NH_3(g)$$

(3) Oxidation of ammonia in Ostwald's process.

$$4NH_3(g) + 5O_2(g) \xrightarrow{Pt(s)} 4NO(g) + 6H_2O\ (g)$$

2. Chemical adsorption or chemisorption .

8.

Physical Adsorption	Chemical Adsorption
1. It is caused by Vander Waals forces.	1. It is caused by chemical bond formation.
2. It is not specific in nature.	2. It is highly specific in nature.
3. It is reversible in nature.	3. It is irreversible.
4. Enthalpy of adsorption is low.	4. Enthalpy of adsorption is high.

9. During adsorption, there is always a decrease in residual forces of the surface. Therefore the surface energy decreases which appears as heat. Therefore adsorption is exothermic process.

10. Adsorption arises due to presence of unbalanced forces or residual attractive forces on the particles of the surface. These forces are responsible for attracting the adsorbate particles on its surface and they cause the adsorption.

11. ΔH is negative, ΔS is negative and ΔG is negative.

12. (a) Ammonia gets adsorbed more readily because it is polar molecule and easily liquifiable.

(b) Charcoal powder adsorbs more of carbon monoxide because it has larger surface area than charcoal lump.

$i = \frac{0.050}{0.10} = 0.50$

Since $i = \frac{1}{2}$, acetic acid exist an dimer in solution.

5. Degree of dissociation × of AB = $\frac{5}{100} = 0.05$.

$AB \text{ ----> } A^+ + B^-$

M 0 0

No. of moles dissolved

No. of moles after dissociations $m(1-\alpha)$ $m\alpha$ $m\alpha$

$0.1\ (1 - 0.05)$ 0.1×0.05 0.1×0.05

Total moles = $[0.1(1- 0.05)] + (0.1 \times 0.05) + (.1 \times 0.05)$

$= 0.095 + 0.005 + 0.005 = 0.105\text{m}$

$\Delta T_f = K_f\ .m$

$= 1.86 \times 0.105$

$= 0.1953$ deg.

$T_f = 0^0C - 0.1953 = 0.1953^0C$

6. i = 2.76 The solute is dissociated in solution.

7. When the solute under goes association in solution , I is less then unity.

8. Abnormal molecular mass = $\frac{\text{Normal moleculer mass}}{i}$

$$= \frac{120}{4} = 30 \text{ g/mol}.$$

6. 250 ml = 250g as density of water = 1g/ml
Freezing pt of water = 273k
Freezing point of solution = - 0.90C+273 = 272.1k

$$\Delta T_f = 273\text{ k} - 272.1\text{k} = 0.9\text{k}$$

$$M_{solute} = \frac{K_f \times W_{solute} \times 1000}{\Delta T_f \times W_{solvent}}$$

$$= \frac{1.86 \times 26 \times 1000}{0.9 \times 250} = 165.3\text{ g/mol}.$$

7. Water from NaCl solution passes into cells &they swell. Finally they will burst.

8. Osmotic pressure, π = CRT
C = concentration , R = gas constant.
T= temperature

9. T = 37^0C = 310k

$$T_1 = CRT = \frac{n}{v}RT$$

$$= 0.25 \times 0.083 \times 310 = 6.43\text{ bar}.$$

10. 0.111 mol.

8. According to Raoult's Law –

$P_1 = x_1 p_1^0$

$\Delta P = P_1^0 - P = P_1^0 - P_1^0 X1$

$= \Delta P_1 = P_1^0 (1 - X_1)$

$\Delta P_1 = P_1^0 X_2 \ (X_1 + X_2 = 1)$

$$\frac{\Delta P_1}{P_1^0} = X_2$$

$$= \frac{P_1^0 - P_1}{P_1^0} = X_2$$

Relative lowering of vapour pressure.

9. $P_A^o = 854$ mm $P_A = 848.$ m , $W_B = 2.0$g ,

$W_A = 100$ g $M_B = ?$

$M_A = 12 + 2(32) = 76$ g/mol /CS2)

$$\frac{P_A^{\ 0} - P_A}{P_A^{\ 0}} = X_B = \frac{W_B}{M_B} / \frac{W_A}{M_A}$$

$$= M_B = W_B \times \frac{W_A}{M_A} \times \frac{P_A^{\ 0}}{P_A - P_A}$$

$$= 2 \times \frac{100}{76} \times \frac{854}{854 - 848.9}$$

$= 254.5$ g/mol.

Let the formula = Sx

$X \times 32 = 254.5$ g/mol

$$X = \frac{254.5}{32}$$

$= 7.95$

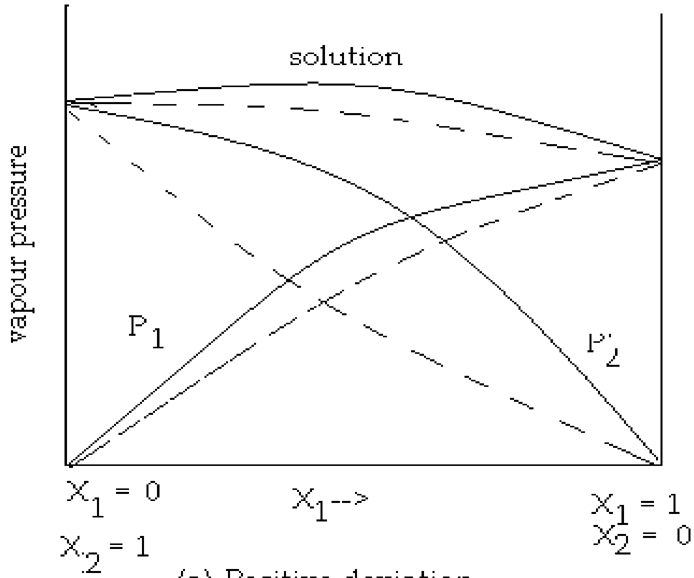
$= 8.$

$=$ Formula $= S_8$

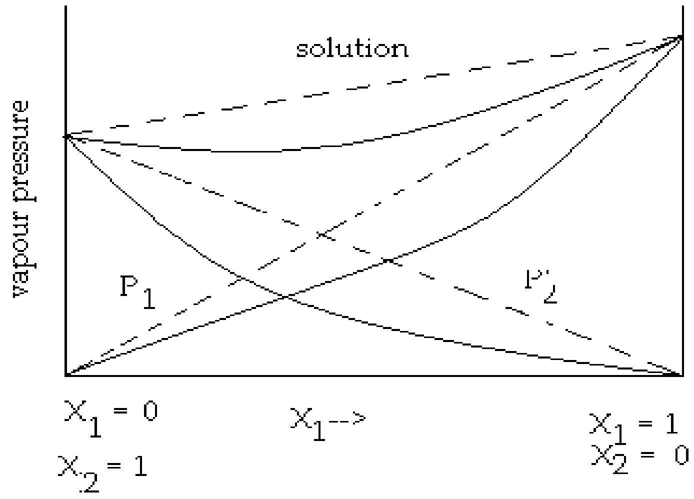
10. 53.48 mm Hg.

11. 41.7 g .

12.



(a) Positive deviation.



(b) Negative deviation

7. Mass of ethanol = 46g

Mass of water = 100 – 46 = 54g

Mole fraction of ethanol ,$X_A = \dfrac{X_A}{X_A + X_B}$

$$= \frac{\frac{46}{46}}{\frac{46}{46} + \frac{54}{18}} = \frac{1}{1+3} = \frac{1}{4} = 0.25.$$

Mole fraction of water = 1-0.25 = 0.75

8. mass of solute in 400g of 40% = $\dfrac{40}{100} \times 400 = 160g$

Total mass of solute = 160+75 = 235g

Total mass of solution = 400+300 = 700g

Mass% of solute = $\dfrac{\text{mass of solute}}{\text{Total mass of solution}} \times 100$

$$= \frac{235}{700} \times 100 = 33.57\%$$

Mass % of solvent = 100 – 33.57 = 66.43%

9. mass of $O_2 = 6\times10^{-3}g$

ppm of O_2 in 1030 g sea water = $\dfrac{\text{mass of } o_2}{\text{mass of sea water}} \times 10^6 = \dfrac{6\times10^{-3}}{1030} \times 10^6 = 5.8$ ppm.

10. 85g phosphoric acid is present in 100g of solution.

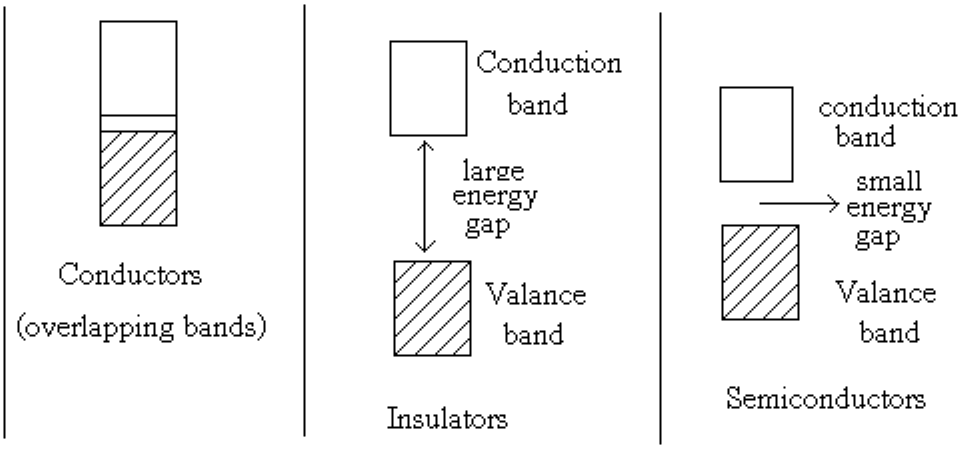
17g of phosphoric acid is present in $\dfrac{100}{85} \times 17 = 20g$ of soution

Volume of 17g of 85% acid = $\dfrac{mass}{density}$

$$= \frac{20g}{1.70 glcm^3} = 11.8 \text{ cm}^3 .$$

Solids	Conductivities
1. Conductor	10^4 to 10^7 $\Omega^{-1}m^{-1}$
2. Insulators	10^{-20} to 10^{-10} $\Omega^{-1}m^{-1}$
3. Semi – conductor	10^{-6} to 10^4 $\Omega^{-1}m^{-1}$

Ans 08: The conductivity of metals depend upon the no. of valance electrons available per atom. The atomic orbitals of metal atoms form molecular orbitals which are so close in energy to each other as to form a band. If this band is partially filled & overlaps with a higher energy unoccupied, conduction band, then electrons can flow easily under an applied electric field & metal is a conductor. If the gap between filled valance band and conduction band is large, electron cannot jump to it & the substance is an insulator where as if the gap is small & on heating, can be overcome, the substance acts as semiconductor



Ans 09: (i) Ferromagnetic substances –Fe, Co, Ni, CrO_2, Gadolinium.

(ii) Ferrimagnetic substance – Fe_3O_4, Magnetite and Ferrites.

Ans 10: Application –

(i) A combination of both p – type and n – type semiconductors is used in diode which is used as rectifiers.

(ii) npn & pnp types of transistors are used as amplifiers.

Ans 06: When crystals of LiCl are heated in an atmosphere of Li vapour the Lithium atoms are deposited on the surface of crystal. The Cl^- ions diffuse to the surface of crystal & combine with Li atoms to from LiCl which happens by loss of electrons by Li atoms to form Li^+ ions. These released elements diffuse into the crystal & electrons get excited after absorbing light from visible region & emit pink colour.

Ans 07: F – centre is the position of an anion in an ionic crystal which is occupied by a trapped electron

Ans 08: The crystal becomes paramagnetic and coloured due to presence of f – centre

Ans 09: AgBr.

Ans 10: (a) Schottky defect – ionic substances in which the cation and anion are of almost similar sizes eg. NaCl, KCl, CrCl.

(b) Feenkel Defect – Ionic substances in which there is large difference in size of ions eg. ZnS, AgCl, AgBr.

Ans 10: Suppose no. of anions, C = 100

Suppose no. of cations, A = $\frac{50}{100}\times$ no. of tetrahedral voids

$$= \frac{1}{2}(2\times C)$$

No. of cations, B = $\frac{50}{100}\times$ no. of octahedral voids

$$= \frac{1}{2}\times(C)$$

$$= \frac{1}{2}\times 100 = 50$$

Ratio of ions A : B : C = 100 : 50 : 100

= 2 : 1 : 2

Formula = A_2BC_2

Ans 9:

Property	Crystalline solids	Amorphous solids
1. Melting point	They have sharp melting point	They have a range of melting point.
2. Cleavage property	They split into pieces of plain and smooth surfaces when cut with a sharp edged tool.	When cut with a sharp edged tool, pieces of irregular surfaces are obtained.
3. Nature	They are true solids.	They are pseudo solids or super cooled liquids.

Ans 10: Classification of crystalline solids.

1. **Molecular solids:** The forces operating between molecules are dispersion or London forces, dipole – dipole interactions, hydrogen bounding e.g. CCl_4, HCl, ice etc.

2. **Ionic solids:** The intermolecular forces are coulomibic or electrostatic forces, e.g. NaCl, MgO etc.

3. **Metallic solids:** The forces operating is metallic bonding e.g. Fe, Cu, Ag etc.

4. **Covalent or network solids:** The attractive forces are covalent bonding e.g. Diamond, Quartz etc.

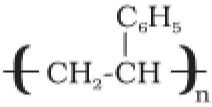
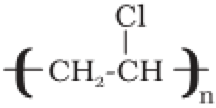
Ans6:

Homopolymer	Copolymer
PVC	Buna – S
Polystyrene	Buna – N
Neoprene	
Teflon	

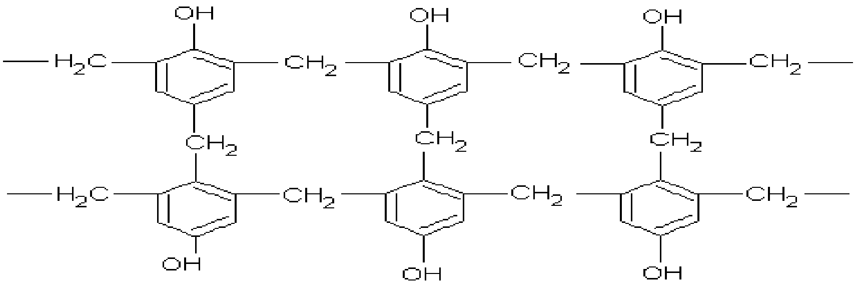
Ans7:

Addition polymer	condensation polymers
Polythene	Dacron
Polyacrylonitrite	Nylon – 6, 6, Bakelite

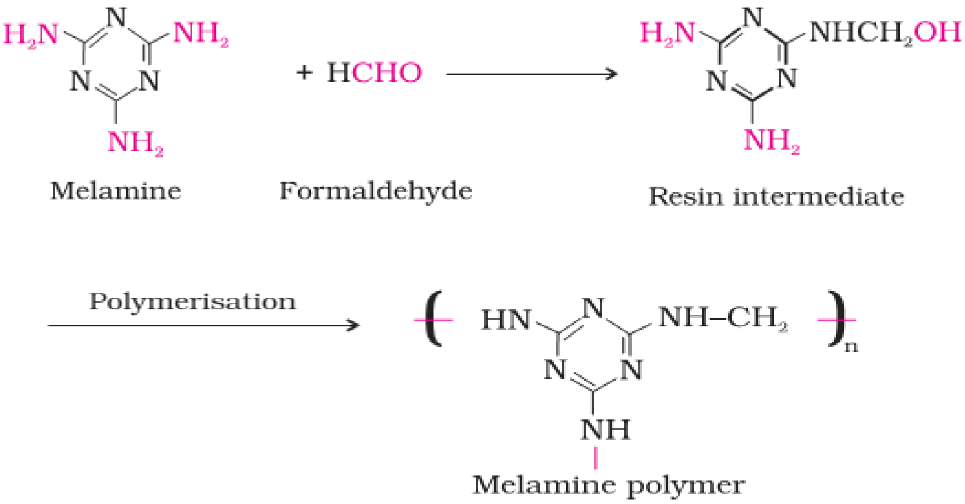
Ans8:

Polymer	Monomer	
1. Polystyrene	Styrene,	 $\left(\mathrm{CH_2\text{-}\underset{}{\overset{C_6H_5}{\overset{\vert}{C}}}H}\right)_n$
2. PVC	Vinyl Chloride,	 $\left(\mathrm{CH_2\text{-}\overset{Cl}{\overset{\vert}{C}}H}\right)_n$

Ans6 Bakelite – It is phenol – formaldehyde polymer.



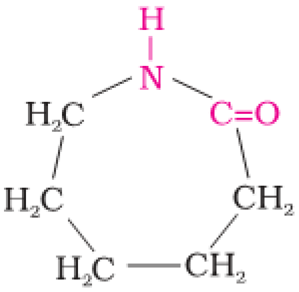
Melamine – It is melamine – formaldehyde polymer



Ans7: Bakelite is used for making combs, phonograph records, electrical switches, handles.

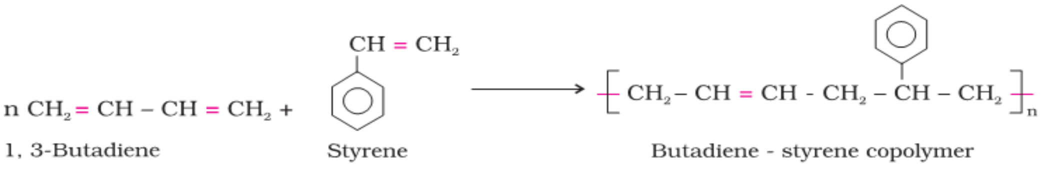
Melamine is used in manufacture of unbreakable crockery.

Ans8: Monomer of Nylon -6 is caprolactum



Ans9: The reaction in which a mixture of more than one monomeric species is allowed to polymerise & form a copolymer is called copolymerisation e.g. Buna -S.

Ans10: Preparation of Buna – S



Ans5:

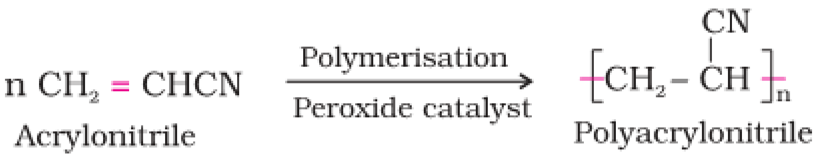
(LDP) Low Density Polythene	**(HDP) High Density Polythene**
1. It is obtained by polymerisation of ethane under pressure of 1000 to 2000 atm. & temperature of 350K to 570K.	1. It is formed when polymerisation takes place in a hydrocarbon solvent in presence of a catalyst e.g. Ziegter-natta catalyst at 333K-343K and 6-7atm pressure.
2. It is prepared in the presence of dioxygen or a peroxide initiator.	2. It requires Ziegler – Natta catalyst.
3. It has highly branched structure.	3. It has a linear structure.
4. It is chemically inert, tough and flexible.	4. It in more tougher and harder.
5. It is a poor conductor of electricity.	5. It is used for making buckets, dustbins, pipes etc.
6. It is used in toys, flexible pipes etc.	

Ans6: Teflon

Monomer = Tetrafluoroethene

$CF_2 = CF_2$

Ans7: Polyacrylonitrite



$$n\,CH_2 = CHCN \xrightarrow[\text{Peroxide catalyst}]{\text{Polymerisation}} \left[CH_2 - \overset{\overset{\displaystyle CN}{|}}{CH} \right]_n$$

Ans8: Uses:

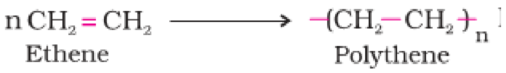
(1) Teflon is used in making oil seals & for non – stick surface coated utensils.

(2) Polyacrytonitrile is used for wool in making commercial fibres an orlon or acrilan.

Ans6: Linear polymers : Polythene, Polyvinylchloride

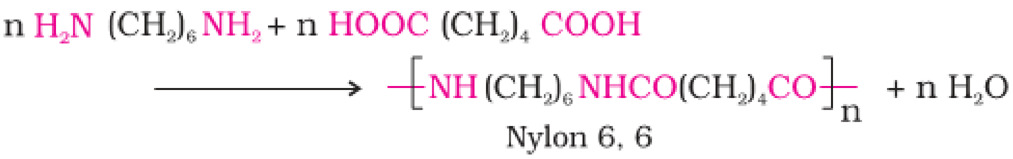
Network polymers : Bakelite, Melamine

Ans7: Addition Polymers: - They are formed by the repeated addition of monomer molecules possessing double or triple bonds e.g. polythene



$$\underset{\text{Ethene}}{n\,CH_2=CH_2} \longrightarrow \underset{\text{Polythene}}{-\!\!(CH_2-CH_2)\!\!-_n}$$

Condensation polymer:- They are formed by repeated condensation reaction between two different bifunctional or trifunctional monomeric unit, with elimination of small molecules such as water e.g. Nylon – 6, 6.



$$n\,H_2N\,(CH_2)_6\,NH_2 + n\,HOOC\,(CH_2)_4\,COOH \longrightarrow \underset{\text{Nylon 6, 6}}{\left[NH\,(CH_2)_6\,NHCO(CH_2)_4CO\right]_n} + n\,H_2O$$

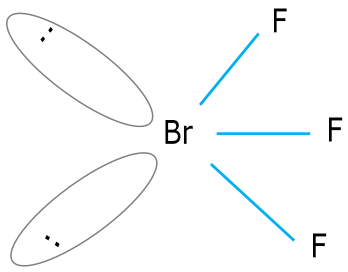
Ans8:(a)

Elastomers	**Fibres**
1. These are rubber like solids with elastic properties 2. The polymer chains are held together by weakest intermolecular forces e.g. Buna – S	1. There are thread forming solids with high tensile strength 2. The polymer chains are closely packed due to strong intermolecular forces like Hydrogen bond e.g. Nylon – 6, 6

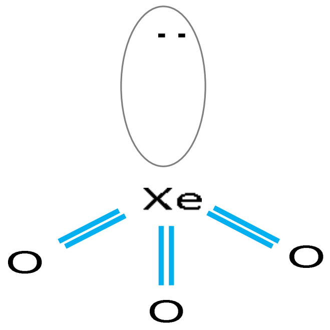
(b)

Thermoplastic	**Thermosetting polymers**
1. They are linear or slightly branched molecules. 2. They are capable of repeatedly softening on heating and hardening on cooling e.g. PVC.	1. They are cross – linked or heavily branched molecules. 2. They undergo extensive cross linking on heating & can not be reversed e.g. bakelite.

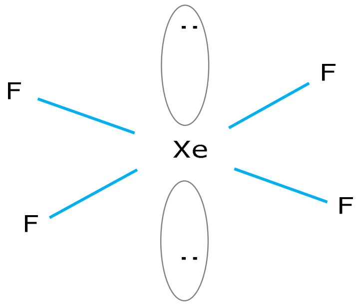
iii) BrF$_3$



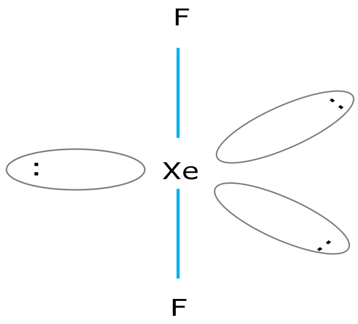
iv) XeO$_3$



v) XeF$_4$



vi) XeF$_2$



Ans. 3 When two different halogens react with each other, inter-halogen compounds are formed e.g.

$$Cl_2 + F_2 \xrightarrow{437k} 2ClF$$

They are more reactive than halogens due weak bond between different halogens and high electronic repulsion.

Ans. 4 In noble gases, the only types of inter-atomic forces are weak dispersion forces which results in very low melting and boiling points.

Ans. 5

(a) Helium

(b) Neon

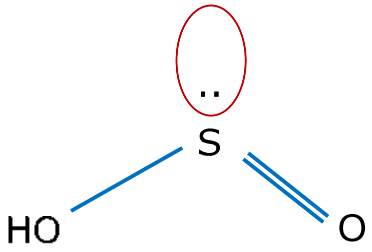
(c) Argon

(d) Helium.

Ans. 7 When SO_2 (g) is passed through a violet coloured acidified potassium permanganate solution , it gets decolourised.

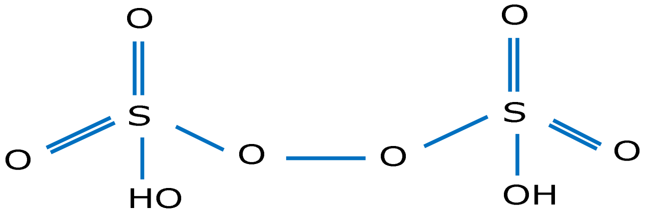
$5SO_2 + 2MnO_4^- + 2H_2O \rightarrow 5SO_4^{2-} + 4H^+ + 2Mn^{2+}$

Ans. 8 (i) Sulphurous acid



H_2SO_3

(ii) Peroxodisulphuric acid



H_2SO_8

Ans. 9 Contact process for sulphuric acid:-

Step 1: Burning of sulphur in air to give SO_2.

$S + O_2 \rightarrow SO_2$

Step 2: Conversion of SO_2 to SO_3 by reacting it with oxygen in presence of V_2O_5.

$2SO_2 + O_2 \xrightarrow{V_2O_5} 2SO_3$

Step 3: Absorption of SO_3 in H_2SO_4 to give of oleum ($H_2S_2O_7$)

$SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$ (oleum)

Step 4: Dilution of oleum with water to get H_2SO_4 of desired concentration

$H_2S_2O_7 + H_2O \rightarrow 2H_2SO_4$

Ans. 10 The two type of sulphates are –

i) Normal sulphate eg. Na_2SO_4 , $CuSO_4$

ii) acid sulphate eg. $NaHSO_4$.

Ans 5. (a) $2Ag_2O(s) \rightarrow 4Ag(s) + O_2(g)$

(b) $2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$

(c) $2Zns + 3O_2 \rightarrow 2ZnO + 2SO_2$

(d) $4HCl + O_2 \xrightarrow{CuCl_2} 2\mathrm{Cl}_2 + 2\mathrm{H}_2\mathrm{O}$

(e) $Al_2O_3(s) + 6HCl(aq) + 9H_2O(l) \rightarrow 2[\mathrm{Al(H_2O)_6}]^{3+}\mathrm{(aq)} + 6\mathrm{Cl}^-$

(f) $Al_2O_3(s) + 6NaOH(aq) + 3H_2O(l) \rightarrow 2\mathrm{Na_3[Al(OH)_6](aq)}$

Ans 6. A binary compound of oxygen with another element is called oxide. Oxides can be simple or mixed . Simple oxides can be classified as acidic, basic Amphoteric or neutral.

An oxide that combines with water to give an acid is termed acidic oxide e.g. CO_2, SO_2 etc.

An oxide that combines with water to give a base is called basic oxide e.g. Na_2O, CaO, BaO etc.

An oxide that shows characteristics of both acids and bases is Amphoteric oxide e.g. Al_2O_3 .

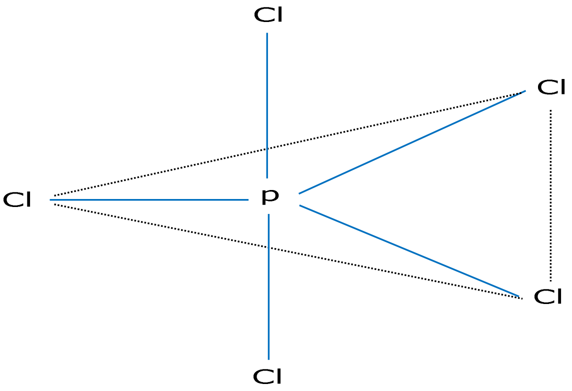
An oxide that shows characteristic of neither acid nor base is called neutral oxide e.g. CO, NO and N_2O.

Ans.7 Oxygen is used-
(a) In oxyacetylene welding.
(b) In manufacture of steel.
(c) In hospitals and mountaineering as oxygen cylinders.

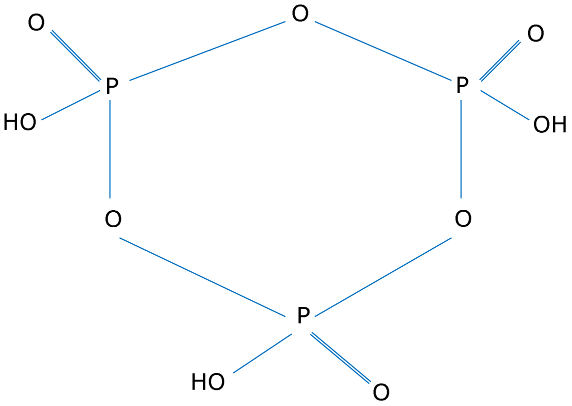
Ans.8 The isotopes of oxygen are ^{16}O, $^{17}\mathrm{O}$, $^{18}\mathrm{O}$.

(iii)

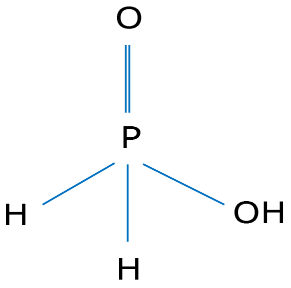
(iv)



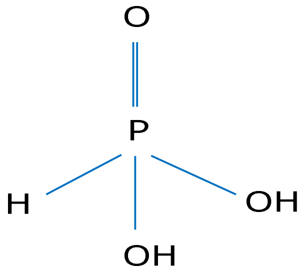
(v)



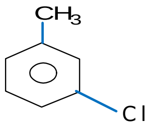
(vi)



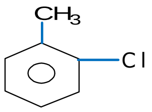
(vii)



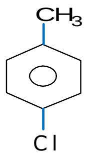
Ans6. C_7H_7Cl - Three aromatic isomers are possible.



2 - methylcholorobenzene

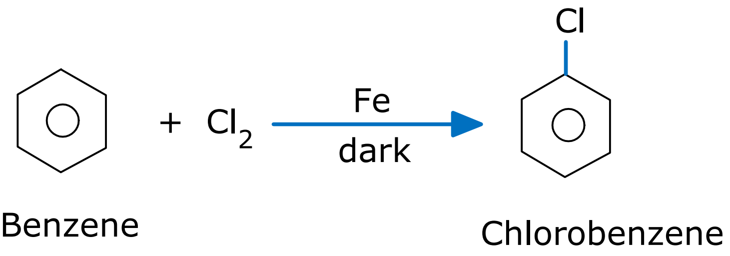


3 - methylcholorobenzene

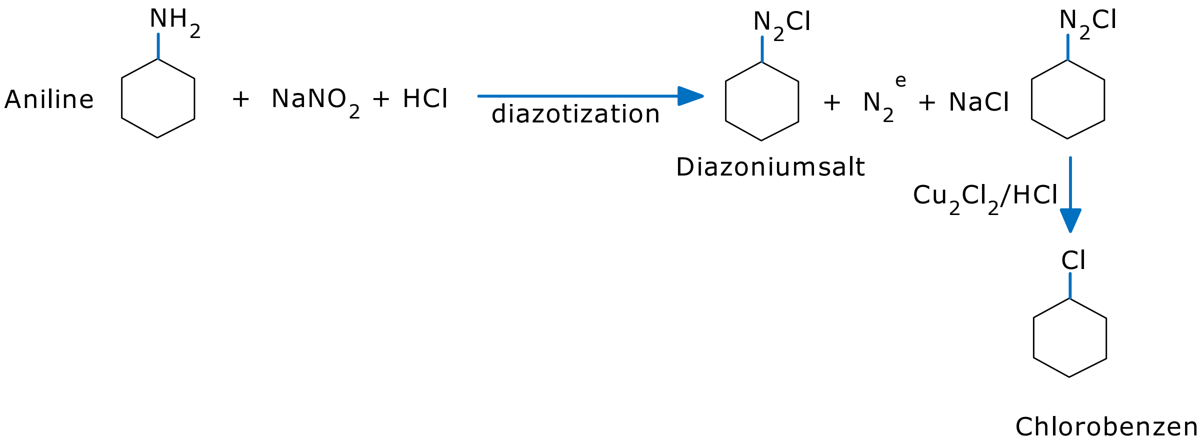


4 - methylcholorobenzene

Ans7 (a) by direct chlorination-



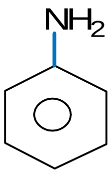
(b) by diazotization method.

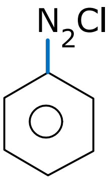


Ans8. Alkyl halide e.g. C_2 H_5X, $C_6H_5CH_2X$ etc. can be distinguished from aryl halide, C_6H_5X, by $AgNO_3$ test.

$$\text{Alkyl halide} + \text{aqKOH} + AgNO_3 \xrightarrow{HNO_3} \text{AgX ppt.}$$

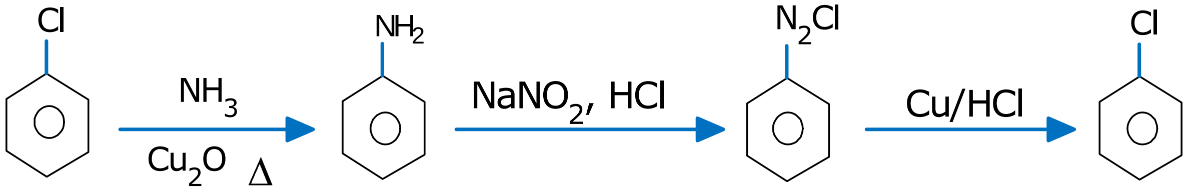
$$\text{Alylk halide} + \text{aqKOH} + AgNO_3 \xrightarrow{HNO_3} \text{NO ppt.}$$

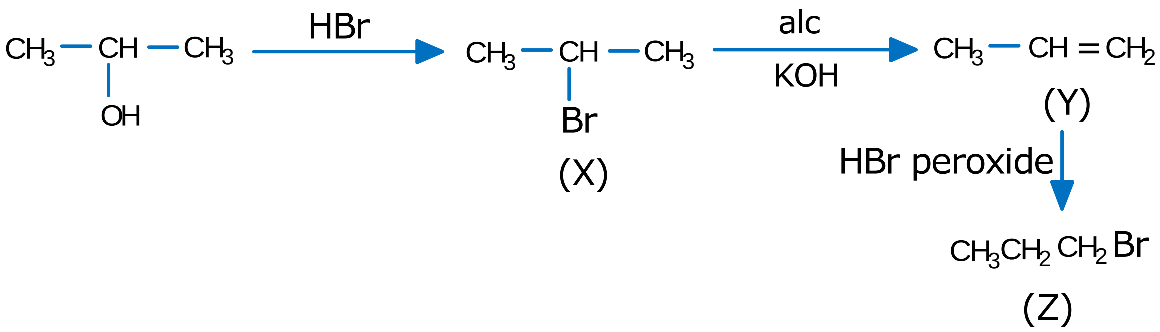
B = 

Aniline C = 

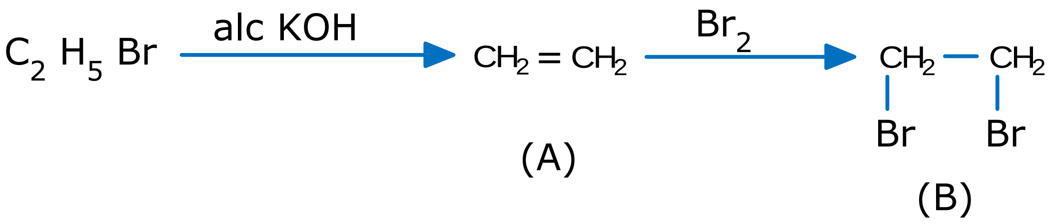
Bengene diazonium chloride

The reactions are

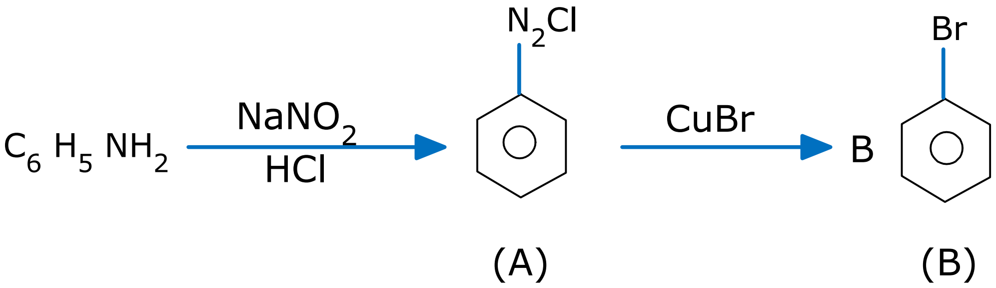


Ans4. 

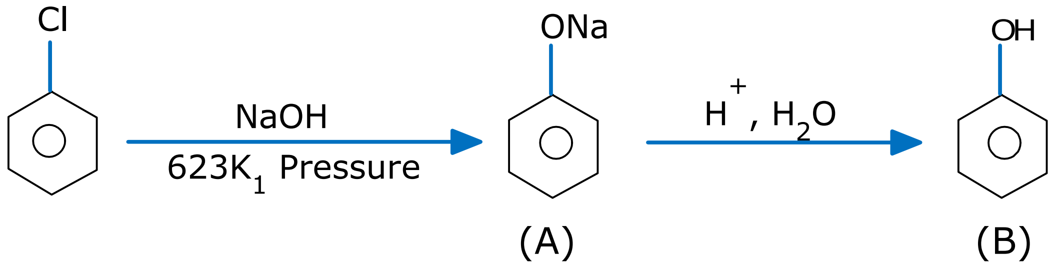
$$CH_3-\underset{OH}{\underset{|}{CH}}-CH_3 \xrightarrow{HBr} \underset{(X)}{CH_3-\underset{Br}{\underset{|}{CH}}-CH_3} \xrightarrow[KOH]{alc} \underset{(Y)}{CH_3-CH=CH_2} \xrightarrow{HBr\ peroxide} \underset{(Z)}{CH_3CH_2CH_2Br}$$

Ans5. 

$$C_2H_5Br \xrightarrow{alc\ KOH} \underset{(A)}{CH_2=CH_2} \xrightarrow{Br_2} \underset{(B)}{\underset{Br\qquad Br}{\underset{|\qquad\ |}{CH_2-CH_2}}}$$

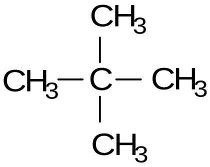
Ans6. 

Ans7.



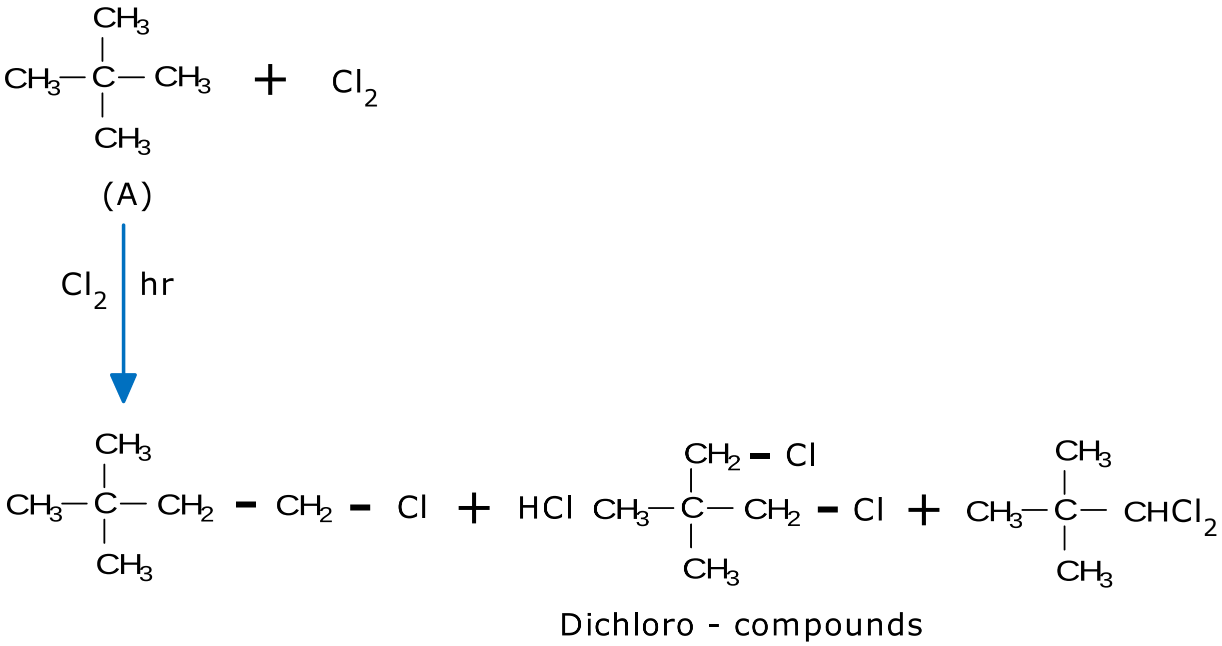
Ans8. A is C_5H_{12} (mol. Wt. 72)

Since its gives one mono chloro and two dichloro derivatives on photochemical chlorination, it is

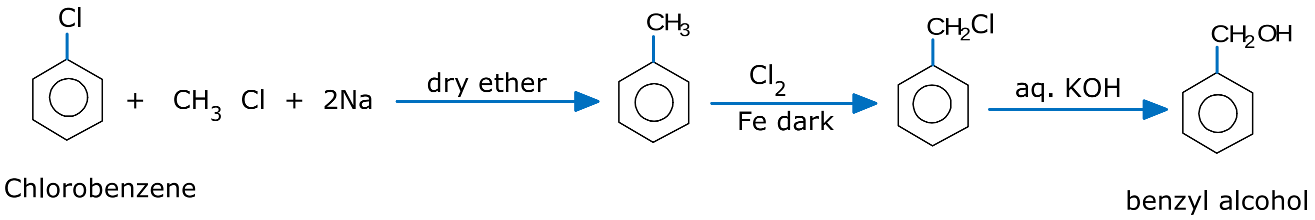


$$CH_3-\underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}-CH_3$$

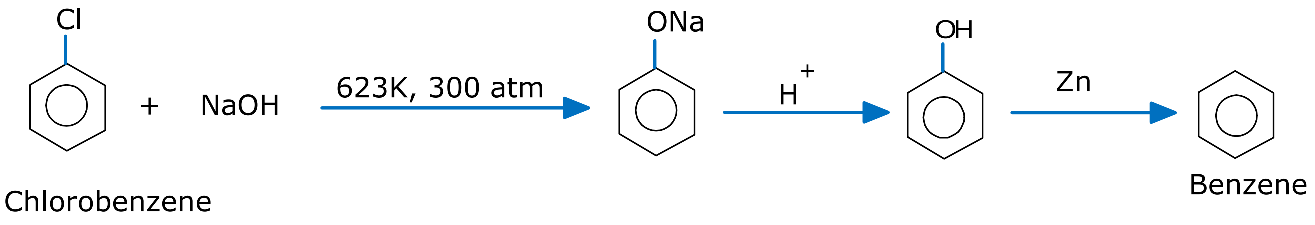
The reactions are



Ans.6



Ans.7



Ans.8

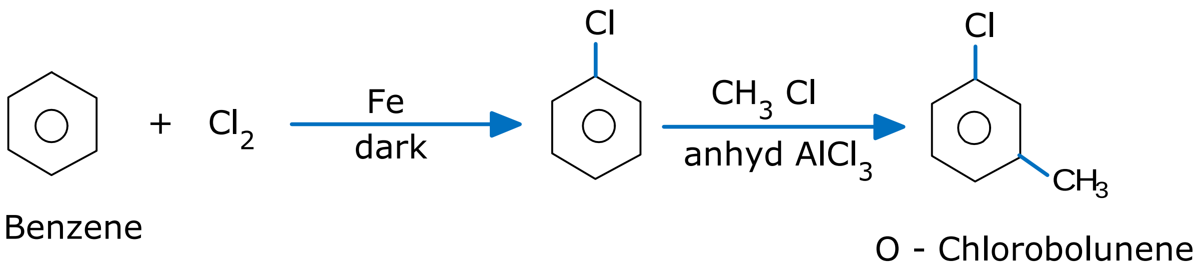
$$CH_4 \xrightarrow{Cl_2\ \text{UV Light}} CH_3Cl$$

Methane

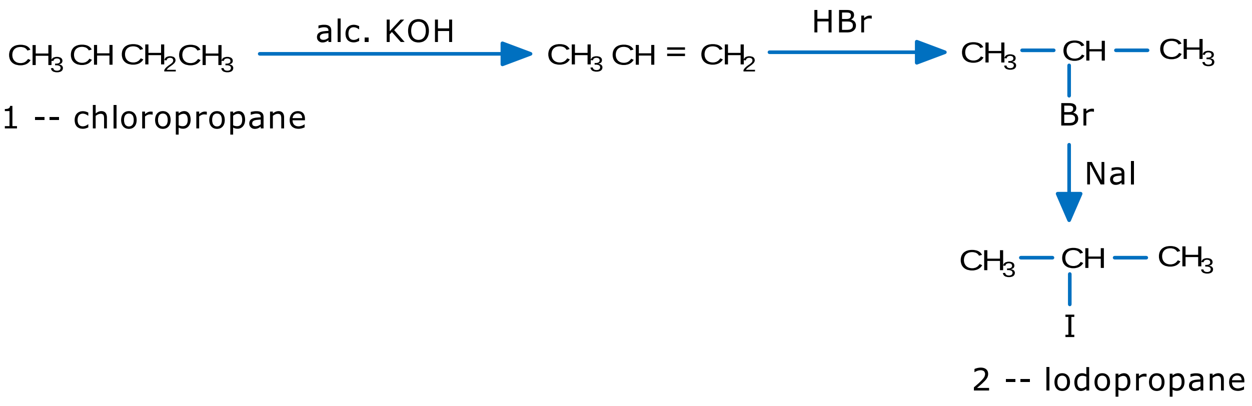
$$2\ CH_3\ Cl + 2Na \longrightarrow CH_3CH_3$$

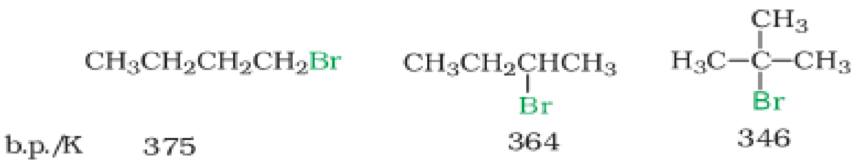
Ethane

Ans.9

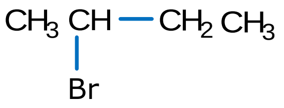


Ans.10





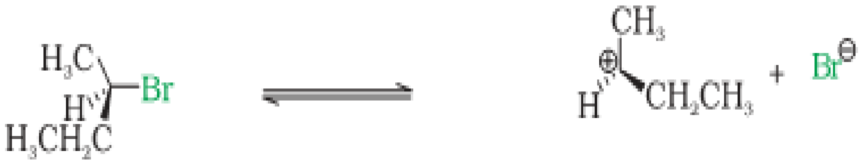
Ans.6



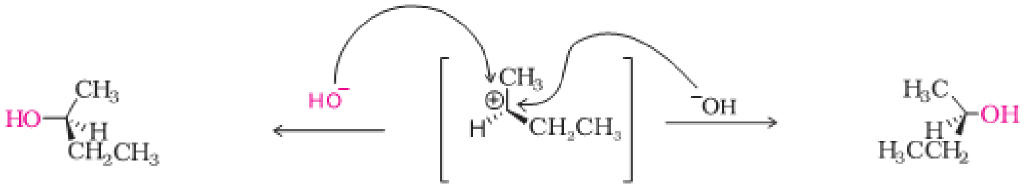
$CH_3CH(Br)CH_2CH_3$

2 - Bromo butane

The compound undergoes hydrolysis by S_N1 mechanism via the formation of carbocation which is planar.



The attack of nucleophile can result in product which is a mixture of compounds both with same configuration and inverted configuration.



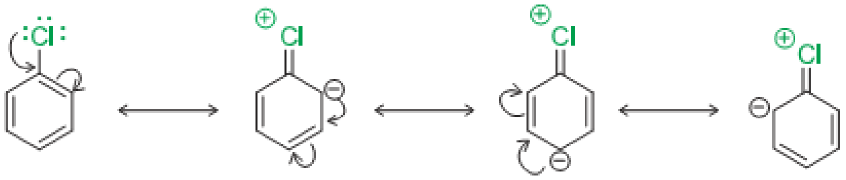
(+)-Butan-2-ol

(–)Butan-2-ol

Therefore it results in the formation of racemic mixture which is optically inactive.

Ans.7 Chlorobenzene is less reactive towards nucleophillic substitution due to –

1. resonance , C- Cl bond acquires a double bond character



and becomes stronger than a single bond.

2. SP^2 hybridisation in C of C-X bond, the carbon becomes more electronegative and holds the electron pair of C-X bond more tightly decreasing the bond length .

3. Instability of phenyl cation.
4. Repulsion for incoming nucleophile from electron rich ring.

Ans.8 Chloroform gets oxidsed slowly by air in the presence of light to an extremely poisonous gas phosgene. Therefore to avoid any exposure to air and sunlight, it is kept in dark coloured bottles.

$$2CHCl_3 + O_2 \xrightarrow[light]{} 2COCl_2 + 2HCl$$

Ans.9 The boiling points of alkyl halides depends on dipole and van-der-waal's interaction. These attractions get stronger as the molecules get bigger in size and have more electrons. As the size of halogens increases in the order –

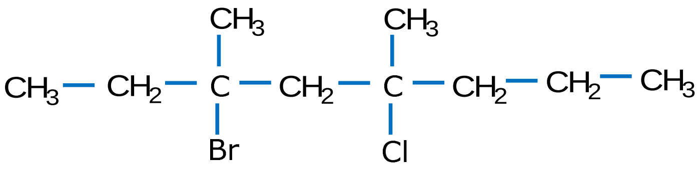
$Cl < Br < I$

The boiling points also follow the order

$RCl < RBr < RI$

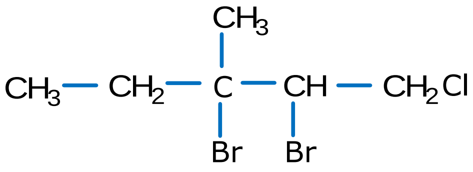
Ans.10 Due to resonance C- Cl bond gets double bond character and becomes stronger than a single bond, making vinyl chloride less reactive than allyl chloride.

Ans5.



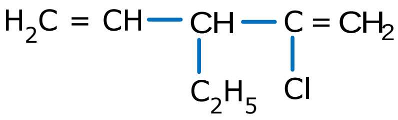
$CH_3-CH_2-\underset{Br}{\overset{CH_3}{C}}-CH_2-\underset{Cl}{\overset{CH_3}{C}}-CH_2-CH_2-CH_3$

Ans6.



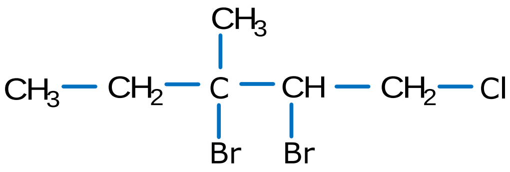
$CH_3-CH_2-\underset{Br}{\overset{CH_3}{C}}-\underset{Br}{CH}-CH_2Cl$

Ans7.



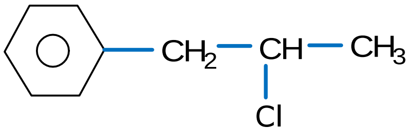
$H_2C=CH-\underset{C_2H_5}{CH}-\underset{Cl}{C}=CH_2$

Ans8.

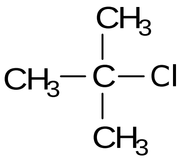


$CH_3-CH_2-\underset{Br}{\overset{CH_3}{C}}-\underset{Br}{CH}-CH_2-Cl$

Ans9.

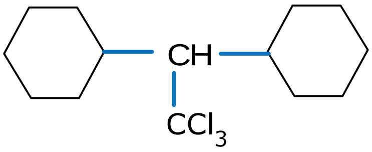


Ans10.

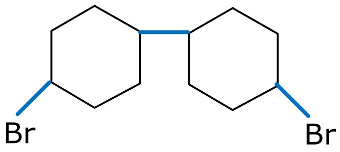


$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-Cl$

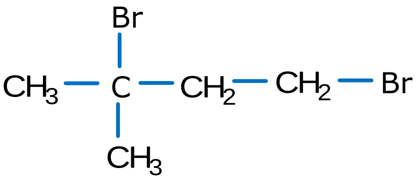
8.



9.



10.



$$CH_3-\overset{Br}{\underset{CH_3}{C}}-CH_2-CH_2-Br$$

(2). Give the structures of following.: 1x10=10

1. 1,3-Dichloro -2-(bromomethyl) propane
2. Isobutylchloride
3. Ortho bromotoluene
4. 1 – Bromo – 4 – chlorobutane
5. 3 – Bromo – 5 – chloro – 3,5 – dimethyloctane
6. 2,3 – Dibromo – 1 – chloro -3- methylpentane
7. 2 – Chloro – 3 – ethyl -1, 4- pentadieme
8. 2,3 – Dibromo – 1 – chloro -3- methylpentane
9. 2 – Chloro – 1 – phemylpropane
10. Tert – butylchloride

Ans.7. The two requirements of vapour phase refining are :-

1) The metal should from a volatile compound with an available reagent,
2) The volatile compound should be easily decomposable so that recovery is easy.

Ans.8 Mond's Process-

In this process, nickel is heated in a stream of carbon monoxide to give a volatile complex, nickel tetra carbonyl.

$$Ni + 4CO \xrightarrow[-350K]{330K} [Ni(CO)_4]$$

The carbonyl is heated to higher temperature

$$[Ni(CO)_4] \xrightarrow{450-470K} \text{Ni+4CO}$$

Ans.9 Zirconium and Titanium are refined by van Ankle process, Here the crude metal is heated in an evacuated vessel with iodine.

$$Zr + 2I_2 \rightarrow \text{Zr I}_4$$

The metal iodide is decomposed on a tungsten filament, electrically heated to about 1800K and pure metal is deposited on the filament.

$$ZrI_4 \rightarrow \text{Zr +2I}_2$$

Ans10. The principle behind chromatography is that different components of a mixture are differently adsorbed on an adsorbent. Some of the chromatographic techniques are paper chromatography, column chromatography, gas chromatography etc.

Ans 5. When ΔS is entropy change , ΔH is enthalpy change , than at temperature T, the change is Gibbs free energy is given by

$$\Delta G = \Delta H - T\Delta S.$$

Ans 6. When the value of ΔG is negative , the reduction reaction is said to be spontaneous

1) It ΔS is positive , on increasing the temperature, the value of $T\Delta S$ would increase & ΔG will become negative.
2) For a process which is otherwise having ΔG positive & is non- spontaneous, , it can be coupled with a reaction having highly negative ΔG value so that the overall ΔG is negative and the process can take place.

Ans.7. Ellingham diagrams are graphical representation of variation of ΔG vs T for the formation of oxides of elements i.e., for the reaction

$$2xM(S) + O_2(g) \rightarrow 2MxO(gs)$$

Ans.8 Ellingham diagrams only tell us about the feasibility of a reaction. They do not tell anything about the reaction kinetics.

Ans.9 Depressant adjusts the proportion of oil and water so as to separate two sulphide ores. e.g. in case of an ore containing ZnS and PbS, NaCN is used an depressant which selectively prevents ZnS from coming to the froth.

Ans 10. Pine oil, fatty acids or xanthate can be used as collectors to enhance the non- wettability of mineral particles whereas cresols or aniline can be used as froth stabilizer to stabilize the froth in froth floatation process.

Ans 11. Leaching is used if the ore is soluble in suitable solvent. e.g. Aluminum is leached from bauxite by using a conc. solution of NaOH at 473-523 K and 35-36 bar pressure. Al_2O_3 is leached out an sodium aluminates leaving behind impurities-

$$Al_2O_3\ (S) + 2NaOH(aq) + 3H_2O \rightarrow 2Na[Al(OH)_4]$$

The aluminate solution is centralised by passing CO_2 gas & hydrated Al_2O_3 is precipitated which is filtered, dried and heated to give pure Al_2O_3.

$$2Na[Al(OH)_4] + CO_2 \rightarrow Al_2O_3.xH_2O(s) + 2NaHCO_3\ (aq)$$

$$Al_2O_3.xH_2O(S) \xrightarrow{1470K} Al_2O_3(s) + xH_2O\ (g)$$

Ans.12 A dil. Solution of NaCN or KCN in the presence of air is used as reagent for leaching of silver and gold. The equations are-

$$4M(s) + 8CN^-(aq) + 2H_2O(aq) + O_2(g) \rightarrow 4[M(CN)_2]^-(aq) + 4OH^-\ (aq)$$

(Where M= Ag or Au)

$$2[M(CN)_2]^-(aq) + Zn(s) \rightarrow [Zn(CN)_4]^{2-}(aq) + 2M(s)$$

Second Law: The amount of different substances liberated by the same quantity of electricity passing through the electrolytic solution is proportional to their chemical equivalent weights.

7. Faraday's constant is the quantity of electricity carried by one mole of electrons.
1 F = 96500 C/mol

8. $Cu^{2+} + 2e^- \rightarrow Cu$
Two faradays are needed to reduce 1g mole Cu^{2+} $\therefore$ 6 Faradays will be needed to reduce 3g mole of Cu^{2+}.

9. Q = It = 1× 15 × 60 = 900C
The reaction is $2Cl^- \rightarrow Cl_2 + 2e^-$
2mol 1mol 2mol
$\therefore$ 2F . produces 1 mol of Cl_2
1mol of Cl_2 = 71g
$\therefore$ $2\times$ 96500 C produces 71g of Cl_2
900 C will produce $\frac{71}{2}\times\frac{900}{96500}$ g = 0.331 g of Cl_2.

10. Q = It = 5X 193 = 965 C
96500C = 1 mol of electrons = $6.022X10^{23}$ mol^{-1}
965 C = $6.022 \text{ X } 10^{23} \frac{\times 965}{96500}$
= 6.022×10^{21} electrons.

11. Zn^{2+} has higher reduction potential (-0.76v) Than H_2O (- 0.83v) and therefore Zn^{2+} is reduced to Zn preferentially at cathode.

12. 2.417 g of silver.

7. Specific conductivity = $\frac{\text{cell constant}}{\text{Resistance}}$

Or cell constant = conductivity × Resistance

$= 92\ \Omega^{-1}\ \text{cm}^{-1} \times 247.8\ \Omega$

$= 22797.6\ \Omega^{-1}$

8. $\lambda m = \frac{\kappa}{C} \times 1000\ \text{S cm}^2\ \text{mol}_{-1}$

$= \frac{1000\ \kappa}{M}$

$\kappa = \frac{\lambda m \times M}{1000}$

$= \frac{4.6\ S\ cm^2 / mol\ \times 0.1\text{m}}{100}$

= 0.00046 s/cm

Resistivity = $\frac{1}{\kappa}$

$= \frac{1}{0.00046\ \text{S cm}^{-1}} = 2174\ \Omega\ \text{cm}$.

9. With increase in temperature, the K.E. of metal cation increases and obstructs the free flow of electrons decreasing the conducts of metal while in case of electrolytes, increased temperature increases the mobility of ions this increases the conductance of ions.

10. $\kappa = 1.2\ 2/3 \times 10^{-3}\ \Omega^{-1}\ \text{cm}^{-1}$

$\lambda m = 165.7\ \Omega^{-1}\ \text{cm}^2\ \text{mol}^{-1}$.

F = Faraday's Constant

E^0_{cell} = Standard electrode Potential of cell.

6. $Fe^{3+} + 3e^- \rightarrow Fe$

According to Nernst Equation –

$$E_{Fe^{3+}/Fe} = E^0_{Fe^{3+}/Fe} - \frac{0.059}{n} \log \frac{1}{[Fe^{3+}]}$$

$$= 0.771\ V - \frac{0.059}{3} \log \frac{1}{0.1}$$

$$= 0.771\ V - 0.0197\ V$$

$$= +0.7513V$$

7. $P^H = -\text{Log}\ [H^+]$

The cell reaction is –

$$H^+ + e^- \rightarrow \frac{1}{2} H_2\ (g)$$

According to Nearest Equation

$$E = E^0 - \frac{0.059}{n} \log \frac{1}{[H^+]}$$

$$0.03V = 0 + \frac{0.059}{1} \left(- \log \frac{1}{[H^+]}\right)$$

$$= 0 + 0.059\ P^H$$

$$PH = \frac{0.03V}{0.059} = 5.07\ V$$

8. The cell reaction is

$$2\ Cr + 3\ Fe^{2+}\ 6e^- \rightarrow 2\ Cr^{3+} + 3Fe$$

Nernst Equation –

$$E_{cell} = (E^0_{Fe^{2+}/Fe} - E^0_{cr^{3+}/cr}) - \frac{0.059}{6} \log \frac{\left[Cr^{3+}\right]^2}{\left[Fe^{2+}\right]^3}$$

$$=(-0.44v - (-0.74v) - \frac{0.059}{6} \log \frac{(0.10)^2}{(0.01)^3}$$

$$= 0.3V - \frac{0.059}{6} \log 10^4$$

$$= 0.3V - 0.0394V$$

$$= +0.2606\ V$$

9. The half cell reactions are

Anode : $Zn(s) \rightarrow Zn^{2} + (aq) + 2e^{-}$

Cathode : $Cd^{2}+ (aq) + 2e^{-} \rightarrow Cd\ (s)$

Nernst Equation

$$E_{cell} = (E^{0}_{Cathode} - E^{0}_{anode}) - \frac{0.059}{n} \log \frac{\left[Zn^{2+}\right]}{\left[Cd^{2+}\right]}$$

$$= (-0.403 - (-0.763) - \frac{0.059}{2} \log \frac{0.0004}{0.2}$$

$$= 0.36V - 0.0798V = 0.4398V$$

$$\Delta G^{0} = -n F E^{0}_{cell}$$

$$= -2mol \times 96500\ C/mol \times 0.4398V$$

$$= -8488\ J\ mol^{-1}$$

10. From the reaction, n =2

$$E^{0}_{cell} = E^{0}cu^{2}+/cu - E^{0}Zn^{2}+/Zn$$

$$= +0.34v - (-0.76v) = 1.10V$$

$$E^{0}_{cell} = \frac{2.303RT}{nF} \log k_{c}$$

At 298k , $E^{0}_{cell} \times \frac{n}{0.059} \log k_{c}$

$$\text{Log } k_{c} = E^{0}_{cell} \times \frac{n}{0.059}$$

$$= 1.10 \times \frac{2}{0.059} = 37.29$$

K_{c} = Antilog 37.29

$= 1.95 \times 10^{37}$

11. $[Ag^{+}] = 5.3 \times 10^{-9}$ M

12. $E^{0}_{cell} = 0.03V$

$\Delta G^{0} = -2895J$

9. Calculate ΔG^0 for the reaction at 25^0C

   Zn (s) 1 Zn^2 + [0.0004m] 11 cd^2+ (0.2m) 1 cd (s)

   $E^0_{Zn^{2+}/Zn}$ = -0.763V , $E^0_{cd}{}^{2+}$/cd = -0.403v , F=96500 C Mol^{-1} , R = 8.314 J/K. [3]

10. Calculate Equilibrium constant K for the reaction at 298K

    Zn (s) + Cu^{2+} (aq) $\rightleftharpoons$ Zn^{2+}/aq) +Cu

    $E^0_{Zn}{}^{2+}$1Zn = -0.076v ; E^0Cu^2+/Cu = +0.34v. [3]

11. For what concentration of Ag+ (aq) will the emf of the given cell be zero at 25^0C
    if the concentration of CU^{2+} (aq) is 0.1 M ? Cu (s) / Cu^{2+} (0.1M)// Ag^+ (aq) / Ag(s)

    E^0 Ag^+ /Ag = +0.80V; $E^0_{Cu^{2+}/Cu}$ = 0.34 V [3]

12. Calculate the standard free energy change for the cell- reaction.

    Fe^{2+} (aq) + Ag^+ (s) →Fe^3+ (aq) + Ag(s)

    How is it related to the equilibrium constant of the reaction?

    $E^0_{Fe}{}^{3+}/Fe^{2+}$ = + 0.77V , $E^0_{Ag}{}^{+1/Ag}$ = +0.08V F= 96500 C/mol. [3]

Working – The reaction taking place in SHE is $H^+ (aq) + e^- \dashrightarrow \frac{1}{2} H_2 (g)$

At 298 K , the emf of the cell constructed by taking SHE as anode and other half cell as cathode ,gives the reduction potential of the other half cell where as for a cell constructed by taking SHE as anode gives the oxidation potential of other half cell as conventionally the electrode potential of SHE is zero.

8. The positive value of standard electrode potential indicates that the element gets reduced more easily than H^+ ions and its reduced form is more stable than Hydrogen gas.

9. The arrangement of metals and ions in increasing order of their electrode potential values is known as electrochemical series.

   The reduction half reaction for which the reduction potential is lower than the other will act as anode and one with greater value will act as cathode .Reverse reaction will not occur.

10. Electrochemical cells are used for determining the

    a) pH of solutions
    b) solubility product and equilibrium constant
    c) in potentiometric titrations

Ans.5 Some extraction processes make use of complex formation e.g. during metallurgy of Gold, it combines with cyanide in the presence of oxygen and water to form the complex $[Au\,(CN)_2]^-$ in aqueous solution by addition of zinc.

Ans. 6 Examples of complexes in biological system.-

1. Chlorophyll is a complex of Mg.
2. Haemoglobin is a complex of iron.
3. Cyanocobalamine , Vit B_{12}, is a complex of cobalt.

Ans. 7 Excess of copper and iron are removed by chelating Ligands D – penicillamine and desferrioxime B through the formation of coordination compounds.

Ans. 8 (a) Chemical analysis –

Qualitative and Quantitative analysis methods involve use of Ligands like EDTA, DMG etc.

(b) Industries.

Hydrogenation of alkenes is done by using a sodium complex called Wilkinson catalyst. In black and white photography, silver complexes are used.

Excited state configuration $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{}$ $\boxed{}$ $\boxed{}\boxed{}\boxed{}$

3d 4S 4P

dsp^2 hybridization $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}$ $\boxed{XX}\boxed{XX}\boxed{XX}\boxed{XX}$ $\boxed{}$

dsp^2 4P

Since the hybridization of Ni here is dsp^2 the complex has square planar geometry.

$[NiBr_4]^{2-}$

Orbitals of Ni^{2+} $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow}\boxed{\uparrow}$ $\boxed{}$ $\boxed{}\boxed{}\boxed{}$

(*ground* state) 3d 4s 4p

Excited state configuration $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow}\boxed{\uparrow}$ $\boxed{}$ $\boxed{}\boxed{}\boxed{}$

Sp^3 hybrid orbitals $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow}\boxed{\uparrow}$ $\boxed{XX}\boxed{XX}\boxed{XX}\boxed{XX}$

SP^3

Since the hybridsation of Ni in this complex is Sp^3, it has tetrahedral geometry.

Ans4. Limitations of valence bond theory-

1. It involves a number of assumptions.
2. It does not give quantitative interpretation of magnetic data and kinetic stabilities of complexes.
3. It does not explain the colour of complexes.
4. It does not distinguish between strong field and weak field ligands.

Ans5. According to crystal field theory-

1. The metal ligand bond is ionic.
2. Ligands are point charges in case of anions or dipoles in case of neutral molecules
3. When the asymmetrical negative field of ligands surrounds the metal atom or ion, the degeneracy of its d- orbiltals is lifted and they split into two sets.
4. The pattern of splitting depends on the nature of crystal field.
5. In general ligands can be arranged in a series in the order of increasing field strength called spectrochemical series-

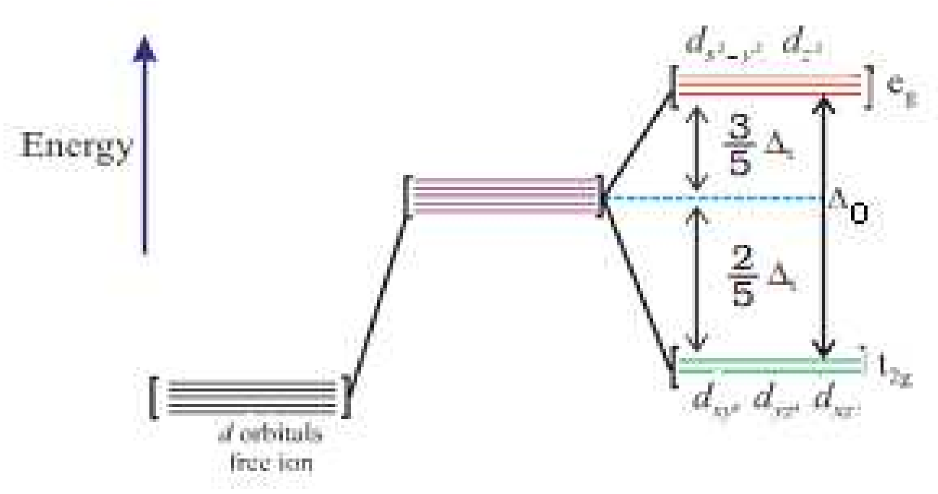
$$I^- < Br^- < SCN^- < Cl^- < S^{2-} < F^- < OH^- < C_2O_4^{2-} < H_2O < NCS^- < edta^{4-} < NH_3 < en < CN^- < CO$$

Ans6 The splitting of otherwise degenerate d- orbitals into two sets in the effect of asymmetrical negative field of ligands is called crystal field splitting.

Ans7. When the crystal field splitting energy, $\Delta o >$ pairing energy ,P, then the fourth electron of d^4 configuration gets paired and the actual configuration becomes $t_{2g}{}^4$ eg^0

When $\Delta 0 < P$, the fourth electron of d4 configuraion goes to higher eg level and the actual configuration becomes t_2g^3 eg^1

Ans8.



Crystal field splitting in an octahedral field.

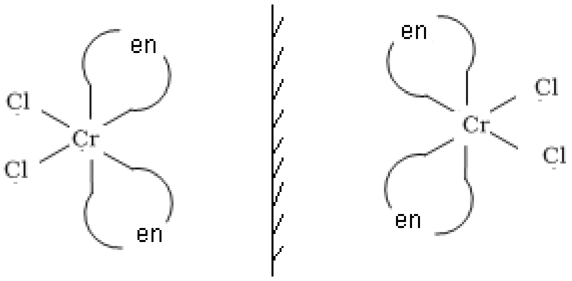
Ans9. The colours of complexes are due to d – d transitions.

Ans10. The substance will be colourless if

a. There is no splitting of orbitals.

b. The configuration of metal ion or atom in d^{10} or d^0

The cis form will be optically active.



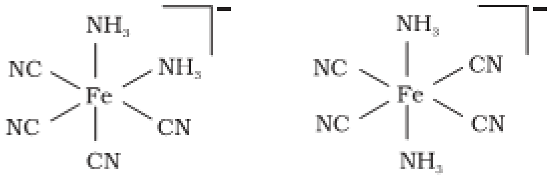
mirror

Ans5. A complex having ambident ligand will show linkage isomerism e.g $[Cr(NH_3)_5(NO_2)]Cl_2$ has NO^{-}_{2} as ambident Ligand and its Linkage isomer will be $[Cr(NH_3)_5(ONO)]Cl_2$.

Ans6. Ionisation isomerism arises when the counter ion in a complex salt is itself a potential Ligand and can displace a Ligand which can then become counter ion e.g. $[CO(NH_3)_5SO_4]Br$ and $[CO(NH_3)_5Br]SO_4$ are ionization isomer.

Ans7. The solvate isomers differ by wether or not a solvent molecule is directly bonded to the metal ion or is merely present on free solvent molecules in the crystal.

Ans8. Geometrical isomers



cis trans

Ans9. Both geometrical and optical isomerisms will be present.

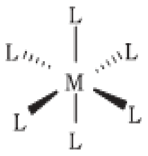
Ans10. Example of coordination isomerism is

$[Cr(NH_3)_6][Co(CN)_6]$ and $[Co(NH_3)_6][Cr(CN)_6]$

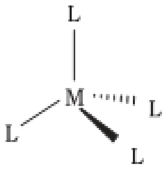
(3) Ligands which can ligate through two different atoms are called ambidentate ligands eg. NO_2^- and SCN^- ions. Whereas when a di^- or polydentate ligand uses its two or more donor atoms to bind a single metal ion, it is called chelate ligand.

Ans7. The total number of ligand donor atoms to which a metal is directly bonded is called its coordination number e.g. in complex $[PtCl_4]^{2-}$, the coordination number of dt is 4.

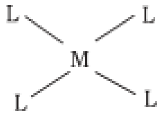
Ans8. The various coordination polyhedra are –



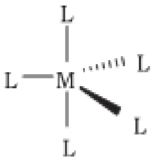
Octahedral



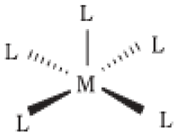
Tetrahedral



Square planar



Trigonal bipyramidal



Square pyramidal

Ans9. The oxidation number of a metal is the charge it would carry if all the ligands are removed along with the electron pairs that are shared with the metal atom or ion.

Ans.10 Homoleptic complexes are those in which only one type of ligand or donor group is present e.g. $[Pt(NH_30_6]^{3+}$ has only NH_3 as ligand. Whereas hetroleptic complexes are those in which different types of ligands are present eg. $[Pt(NH_3)_4 Cl_2]^+$ has two type of ligands- NH_3 and Cl^-.

Ans6: Antibiotics are the drugs used to treat infections because of their low toxicity for humans & animals. They are the substances produced wholly or partly by chemical synthesis, which in low concentration inhibit the growth or destroys the microorganisms by intervening in their metabolic processes.

Ans7: Antibiotics are classified on the basis of –

(1) Their cidal (killing) or. Static (inhibitory) effect. They can be Bactericidal (inhibits the actinty) e.g. penicillin in bactericidal white Tetracycline is bactereostatic.

(2) Their spectrum of action i.e. the range of bacteria or other microorganisms that are affected by them. Antibiotics which are effective against a wide range of Gram – positive are broad spectrum antibiotics, those effective mainly against Gram – positive or gram negative bacteria are narrow spectrum antibiotics wherever those effective against only a single bacteria are limited spectrum antibiotics. e.g. Penicillin G is narrow spectrum while Arnpicillin in broad spectrum antibiotic.

Ans8: Antiseptics are those antimicrobials which are applied to the living tissues such an wounds cuts, ulcers and diseased skin surfaces e.g. sofracmicine etc. these are not ingested like antibiotics. Disinfectants are applied to inanimate objects such as floors, drainage system instruments etc. e.g. phenol.

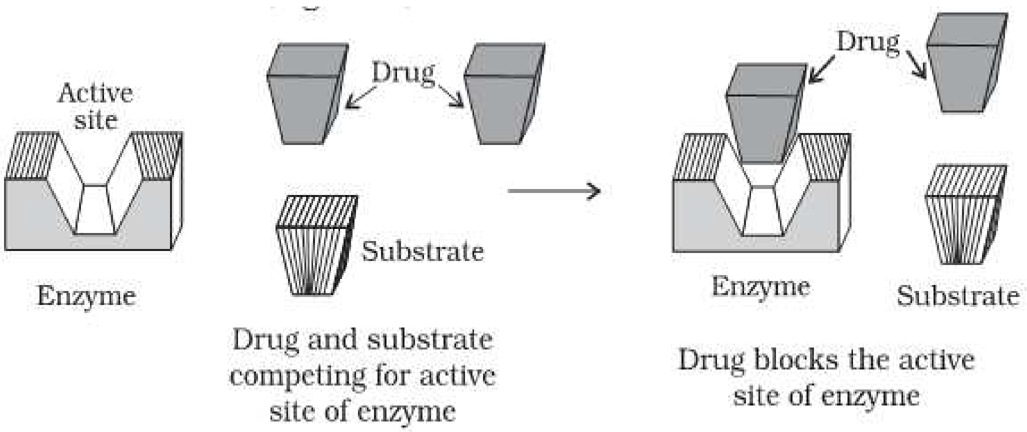
Ans9: Drugs used antiseptics on well on disinfectants –

(1) 0.2% solution of phenol is an antiseptic while its one % solution disinfectant.

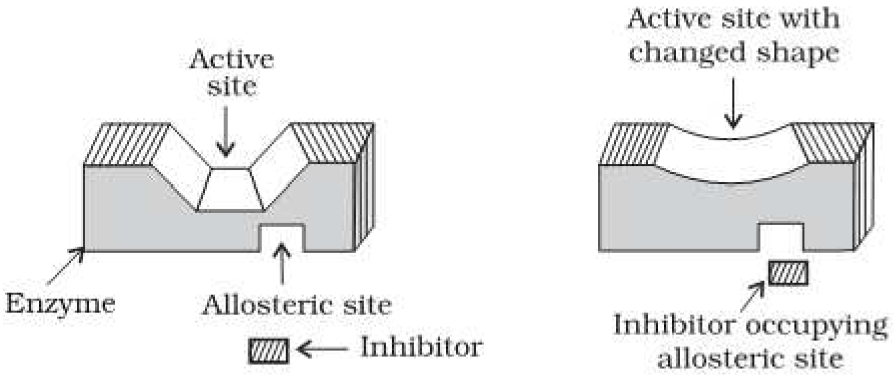
(2) Dettol.

Ans10: Antifertility drugs –

1. Norethindrone
2. Novestcof (ethrynylestrediol)



(ii) Some drugs bind to a different site, called allosteric site so as to change the shape of active site in such a way that substrate cannot recognise it.



If the bond formed between an enzyme & an inhibitor is a strong covalent bond, the enzyme is blocked permanently & is degraded by the body.

Ans6: Drugs that bind to the receptor site & inhibit its natural action are called antagonists whereas the drugs that mimic the natural messenger by switching on the receptor are agonists.

Ans7: Excessive hydrogen carbonates can make the stomach alkaline and trigger the production of even more acid. Therefore metal hydroxides are better antacids as they are insoluble & do not increase pH above neutrality.

Ans8: Antihistamines prevent the interaction of histamine with the receptors present in the stomach wall e.g. Rantidine, Soldane etc.

Activation energy, $E_a = E_t - E_r$

= 350-150

= 200 KJ/Mol.

(b) The curve B is for catalysed reaction.

(C) In the presence of catalysts ,

Threshold energy E_r = 250KJ/Mol

Activation energy, E_a = 250-150

= 100 KJ/Mol.

9. Let the rate constant in the absence of catalyst be K_1, Let the rate constant in the presence of catalyst be K_2 Activation energy in the absence of catalyst, E1 = 75.2 KJ/Mol Activation energy in the presence of catalyst, E2 = 50.14 KJ/Mol.

$$\log\frac{K_2}{K_1} = \frac{E_1 - E_2}{2.303RT}$$

$$= \frac{(75.2 - 50.14)\times 10^3 J/Mol}{2.303\times 8.314 J/K/mol \times 298K}$$

= 4.391.

$$\frac{K_2}{K_1} = \text{Antilog } 4.391$$

$$\frac{K_2}{K_1} = 24604$$

Or $K_2 = 24604\ K_1$

10. 52.86 KJ/mol

$= A.\ e^0$

$K = A$

$\therefore$ Rate of reaction will not depend upon the temperature if activation energy is zero.

8. $T_1 = 295K$ $T_2 = 305K$

$$Ea = 2.303\ R\left[\frac{T_2T_1}{T_2 - T_1}\right]\left[\log\frac{k_2}{k_1}\right]$$

$K_2 = 2k_1$

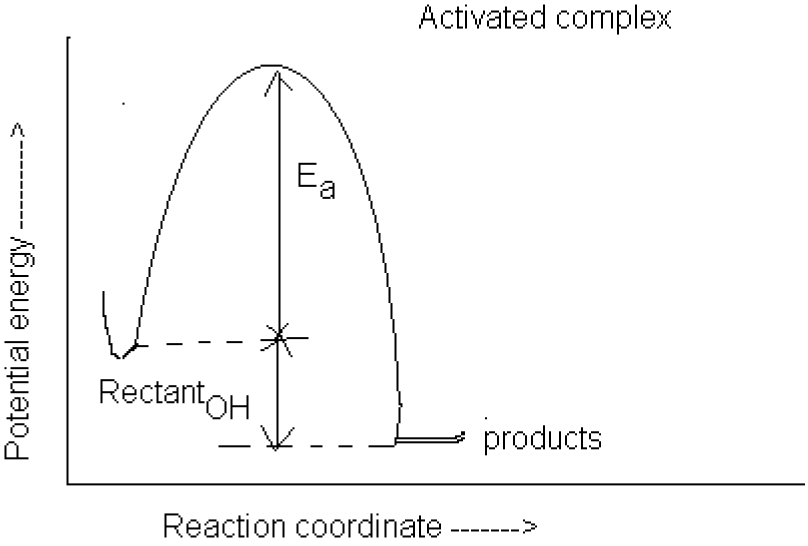
$$E_a = 2.303\times 8.314\times\left[\frac{305\times 295}{305-295}\right]\ \log\ \frac{2k_1}{k_1}$$

$= 2.303 \times 8.314 \times 8997.5K \log 2$

$= 51855.2$ J/mol (log2 = 0.3010)

9. 22.0 KJ/mol.

10.



$18\times10^{-5} = (0.62\times10^{-2})^x$ ----------------3)

Dividing 1) by 2)

$$\frac{34\times10^{-5}}{25\times10^{-5}} = (\frac{1.13\times10^{-2}}{0.84\times10^{-2}})^x$$

$(1.36) = (1.35)^x$

X=1

The order of reaction with respect with respect to N_2O_5 is 1

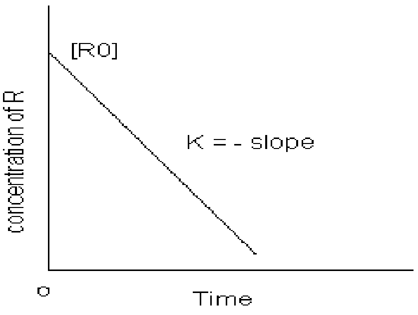
ii) Rate law R = K $[N_2O_5]$

iii) Rate constant , K = $\frac{Rate}{[N_2O_5]} = \frac{18\times10^{-5}\ \text{mol/L/min}}{0.62\times10^{-2}\ \text{mol/L}}$ = 0.29 min^{-1}

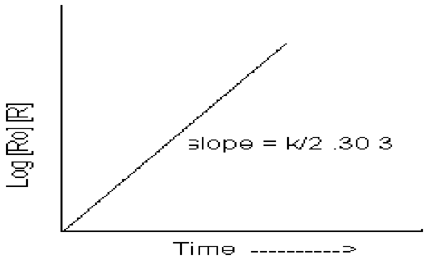
7. Order of NO is 2

Rate law = K $[Cl_2]$ $[NO]^2$

8.



(a)



(b)

9. Use of integrated rate equation -

1. The value of rate constant can be known when concentration of reactant at different times are known-

2. Order of a reaction can be determined by the knowledge of reaction concentration at different times.

10. For the reaction A $\rightarrow$ B , if the order =1

(i) Differential rate law is $\frac{-d[A]}{dt}$ = K [A]

(ii) Integrated rate law is $t = \frac{2.303}{K} \log \frac{[R]_o}{[R]}$

6. The reaction $2N_2O_5\,(g) \rightarrow 2NO_2\,(g) + O_2\,(g)$ was studied and the following data were collected :

s.no (mol/L/min	$[N_2O_5]$ mol L^{-1}	Rate of disappearance of $[N_2O_5]$
1.	1.13×10^{-2}	34×10^{-5}
2.	0.84×10^{-2}	25×10^{-5}
3.	0.62×10^{-2}	18×10^{-5}

Determine
i) The order
ii) The rate law.
iii) Rate constant for the reaction. [3]

7. The following experimental data was collected for the reaction:

$$Cl_2\,(g) + 2NO\,(g) \rightarrow 2\,NOCl(g)$$

Trial	Intial conc. Of Cl_2 (mol/L)	[NO] mol/L	Initial Rate,(mol/L/s)
1	0.10	0.010	1.2×10^{-4}
2	0.10	0.030	10.8×10^{-4}
3	0.20	0.030	21.6 X 10

Construct the rate equation for the reaction. [3]

8. Draw a graph for
a) Concentration of reactant against time for a zero order reaction.
b) Log [Ro]/ [R] against time for a first order reaction. [2]

9. What is the use of integrated rate equation? [2]

10. For first order reaction –

$$A \rightarrow B$$

Write (1) Differential rate law.
(2) Integrated rate law. [2]

7.

Order	Molecularity
i) it is an experimental parameter and cannot be predicted theoretically.	i) It can be predicted from equation theoretically
ii) It can be zero.	ii) It cannot be zero.
iii) It can be a whole number as well as a fraction.	iii) It cannot be a fraction. It can only be a whole number.

8. Rate = $k[A]^x\,[B]^y$

Order = x +y

50 order = $\frac{5}{2} + \frac{3}{2} = 4$.

i.e; reaction is fourth order reaction.

9. i) First order reaction –

Units of rate constant , k = sec^{-1}

ii) For nth order reaction

the units of rate constant, k = $\text{mol}^{(1-n)\ (n-1)}\text{Ls}^{-1}$

10. $A+B \rightarrow C+D$

Rate α $[A]^x$

Rate = 1 when [A] = 1 ---------- 1)

Rate = 2 when [A] = 2 -----------2)

Dividing equation 2) by 1)

$$\frac{2}{1}\alpha\frac{(2)^x}{1^x}$$

$2^1\,\alpha\,(2)^x$

$\therefore x=1$

The reaction is first order reaction.

II) In terms of reactant

$$R1 = -\frac{\Delta[N_2O_5]}{\Delta t}$$

In terms of product

$$R_2 = \frac{\Delta[NO_2]}{\Delta t}$$

$$R_3 = \frac{\Delta[O_2]}{\Delta t}$$

$$\frac{1}{2}R_1 = \frac{1}{2}R_2 = R_3 \qquad -\frac{\Delta[N_2O_5]}{\Delta t} = \frac{1}{2}\frac{\Delta[NO_2]}{\Delta t} = \frac{\Delta[O_2]}{\Delta t}$$

7. Rate of reaction = $\frac{\text{change in concentration}}{\text{time interval}}$

$$= \frac{(0.8420 - 0.2105)\ \text{mol/L}}{2hr} = \frac{0.6315}{2} = 0.3158\ \text{mol /L/hr}.$$

8. While writing the expression for rate of a reaction is terms of reactants, there is a negative sign which indicates a decrease in concentration of reactants with time.

9. From the equation $2O_3\ (g) \rightleftarrows 3O_2\ (g)$

$$-\frac{1}{2}\frac{\Delta[O_3]}{\Delta t} = \frac{1}{3}\frac{\Delta[O_2]}{\Delta t}$$

$$\frac{\Delta[O_2]}{\Delta t} = \frac{-3}{2}\frac{\Delta[O_3]}{\Delta t} = \frac{-3}{2} \times (-5.0\times10^{-4}\ \text{atms}^{-1}) = 7.5\times10^{-4}\ \text{atms}^{-1}$$

10. $2A \rightarrow 4B + C$

$$-\frac{1}{2}\frac{d[A]}{dt} = \frac{1}{4}\frac{d[B]}{dt} = \frac{d[C]}{dt}$$

i) Rate of disappearance of B

$$= \frac{5\times10^{-3}}{10\ 5}\text{mol /L}^{-1} = 5\times\ 10^{-4}\ \text{mol L}^{-1}\ \text{s}^{-1}$$

ii) $\frac{-\text{d}[A]}{dt} = \frac{2}{4}\frac{d[B]}{dt} = \frac{1}{2}\frac{d[B]}{dt}$

$$= \frac{1}{2}\times5\times10^{-4}\ \text{mol L}^{-1}\ \text{s}^{-1} = 2.5\ \times10^{4}\ \text{mol L}^{-1}\ \text{s}^{-1}$$

Ans6. Primary structure of proteins tells about the sequence in which various amino acids are linked with each other.

Ans7.

α - helical structure	β - pleated sheet structure
1. In this structure, formation of hydrogen Bonding between amide groups within the same chain causes the peptide chains to coil up into a spiral structure like a right handed screw. e.g. α - keratin, skin, wool etc.	1. In this structure, the long peptide chains lie side by side in a zig-zag manner to form a flat sheet. Each chain is held to the two neighboring Chains by hydrogen bonds. These sheets can slide upon one another in three dimensional structures. e.g. fibroin present in silk etc.

Ans8. The secondary structure of protein refers to the shape in which a long polypeptide chain can exist arising due to regular folding of the backbone of poly peptide chain due to hydrogen bonding between $> C = O$ and , $- N - H$ group of poly peptide chain.

Ans9. The forces which are responsible for tertiary structure of proteins are hydrogen bonds, disulphide linkage, vanderwalls and electrostatic forces of attraction.

Ans10. Disruption of the native conformation of a protein by changing its environment like PH value, temperature etc. resulting into loss of its biological activity is called dehaturation of proteins. During denaturation, secondary and tertiary structures get destroyed while primary structure remains same e.g., coagulation of egg albumin by boiling.

Ans3. The letter 'D' written before the name of glucose represents its relative configuration whereas (+) represents dextrorotatory nature of the molecule.

Ans4. The penchant structure of glucose cannot explain that glucose despite having aldehyde group –

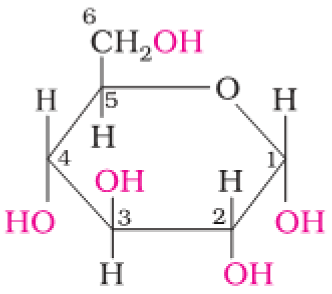
(a) does not give 2,4- DNP test, schiffs test and does not react eith $NaHSO_3$.

(b) Its penta acetate does not react with hydroxyl – amine indicating the absence of free CHO group.

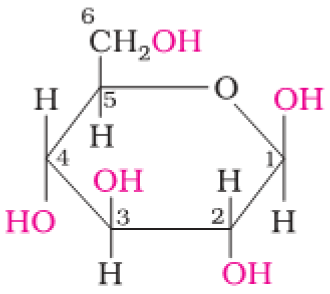
Ans5. Anomers are a pair of diasteomers of adoses or ketoses which differ in configuration about C-l, C-2 carbon atom.

The two anomers of glucose are α - glucose and β - glucose.

Ans6. $\alpha - D - (+) - glucopranose$ $\beta - D - (+) - glucopyranose$



α – D – (+) – Glucopyranose



β – D – (+) – Glucopyranose

Ans7. Products of hydrolysis of

i. Sucrose = α - D- Glucose & β - D- Fructose

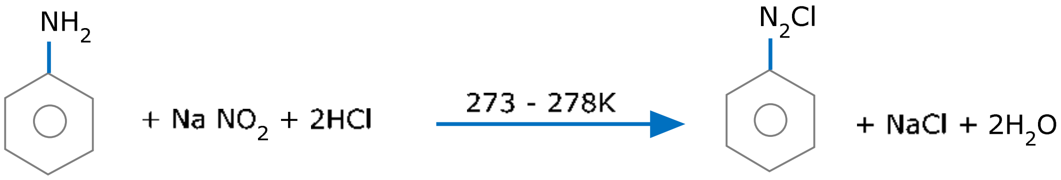
ii. Lactose = β - D- Galactose & β - D- Glucose

Ans8. Animal starch is glycogen. It is present in liver, muscles and brain.

Ans9. Examples of polysaccharides = starch, glycogen and cellulose.

Ans10. Other Hexoses = Fructose, Galactose.

6. During diazotization benzene diazonium chloride is prepared by the reaction of aniline with nitrous acid at 273 – 278 K



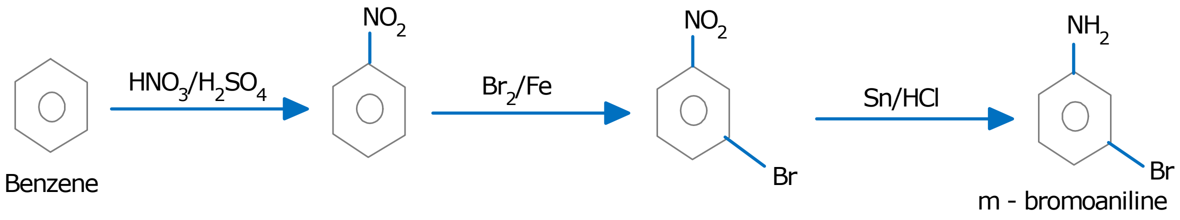
7. Diazonium salts are used in preparation of substituted aromatic compounds.

8. The reactivity of aromatic amines can be controlled by acylation.

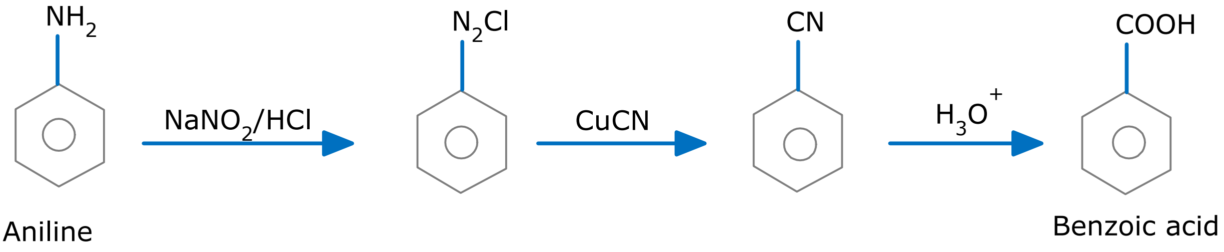
9. Tertiary amines like trimethylamine are used as insect attractants.

10. P- Toluenesulphonyl chloride Hinsberg reagent can be used as a distinguishing reagent for primary, secondary and tertiary amines.

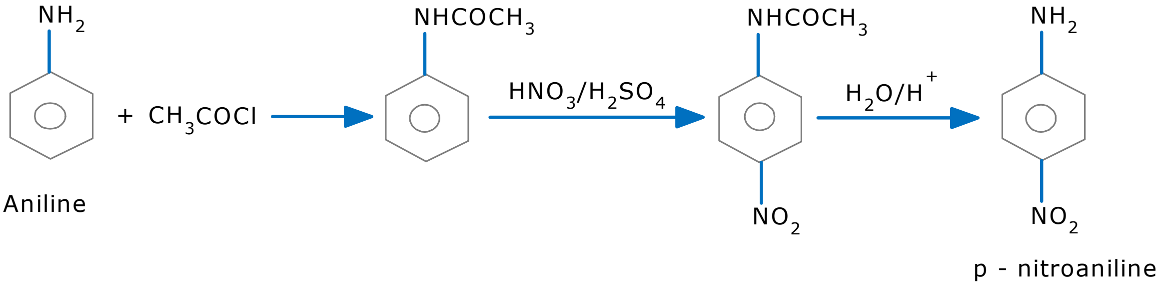
Ans5.



Ans6.



Ans7.



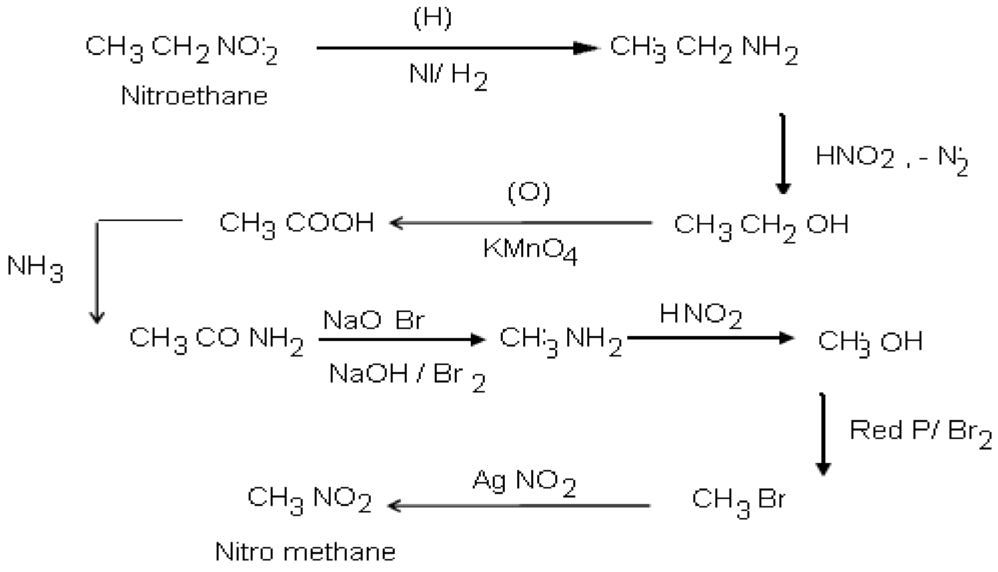
Ans8.

$$CH_3NH_2 \xrightarrow[-N2]{HONO} CH_3OH \xrightarrow{\text{Red } P/I_2} CH_3I \xrightarrow{KCN} CH_3CN \xrightarrow{H_2/NI} CH_3CH_2NH_2$$

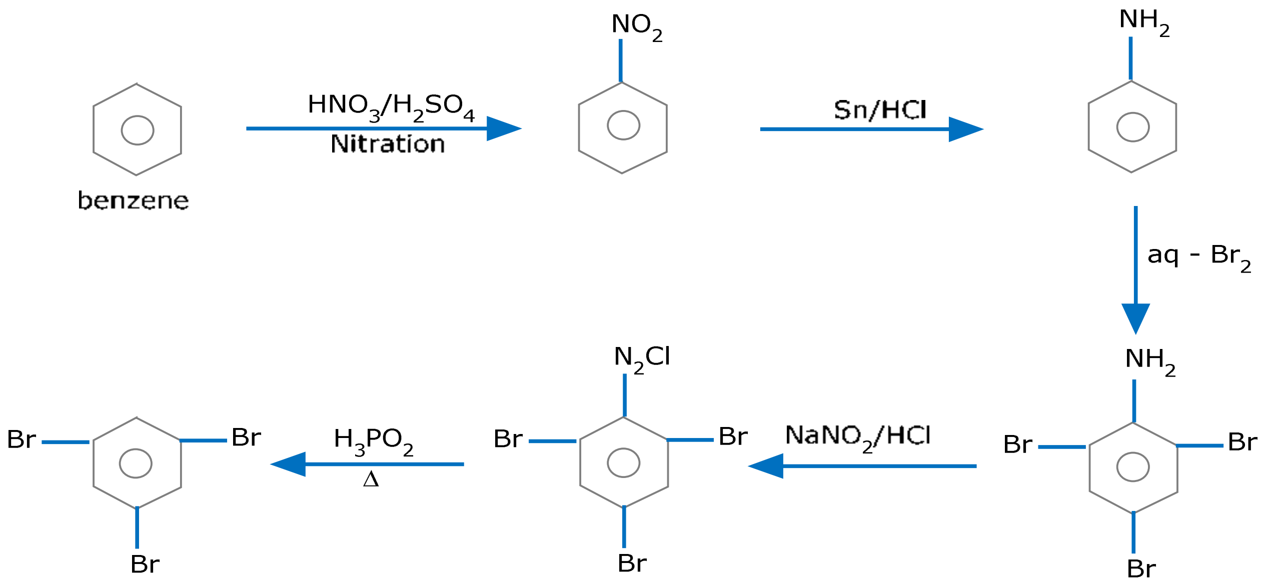
Methylamine

Ethylamine

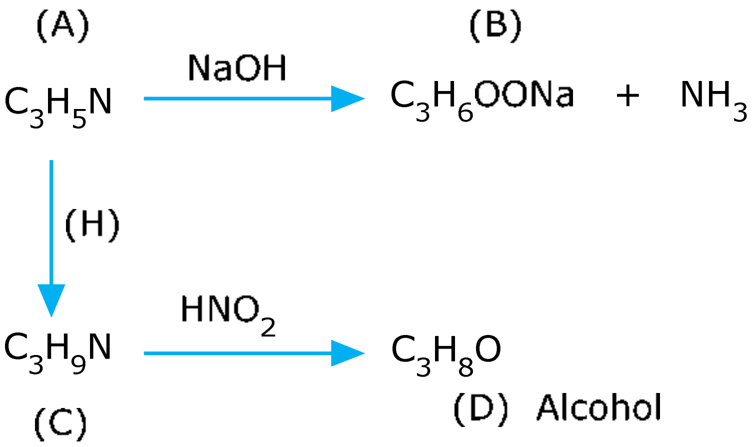
Ans9.


CH3 CH2 NO2
Nitroethane
(H)
NI/ H2
CH3 CH2 NH2
HNO2 , - N2
CH3 CH2 OH
(O)
KMnO4
CH3 COOH
NH3
CH3 CO NH2
NaO Br
NaOH / Br 2
CH3 NH2
H NO2
CH3 OH
Red P/ Br2
CH3 Br
Ag NO2
CH3 NO2
Nitro methane

Ans10.


benzene
HNO3/H2SO4
Nitration
NO2
Sn/HCl
NH2
aq - Br2
NH2
Br
Br
Br
NaNO2/HCl
N2Cl
Br
Br
Br
H3PO2
Δ
Br
Br
Br

Ans 3.

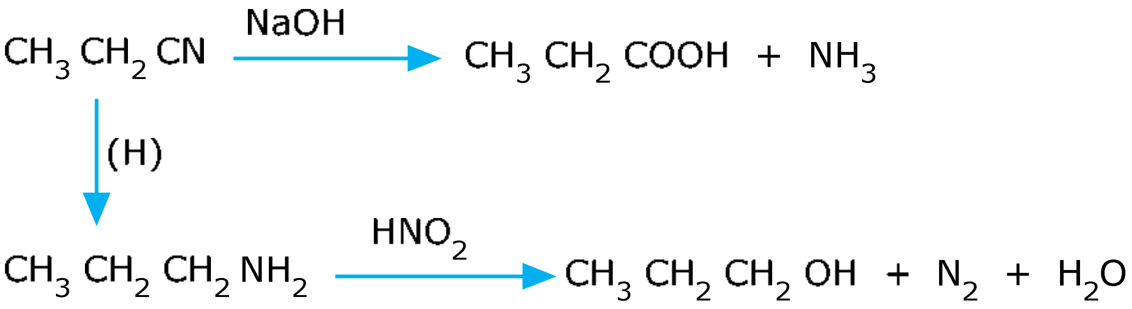


Since the compound (A) gives sodium salt and ammonia, (A) is cyanide. The compound (C) is a primary amine as it reacts with HNO_2 and forms an alcohol (D) Therefore

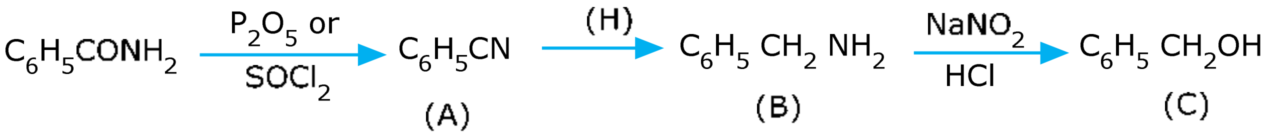
A= CH_3 CH_2 CN , B= CH_3 CH_2 COOH,

C= CH_3 CH_2 CH_2 NH_2 , D= CH_3 CH_2 CH_2 OH

Equations are-



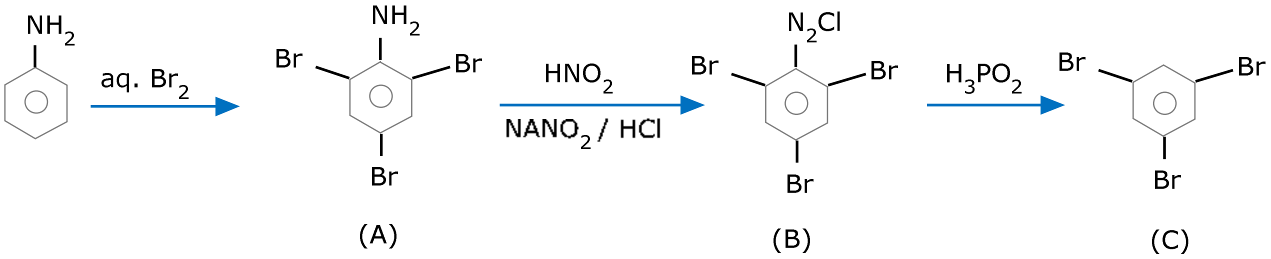
Ans 4.



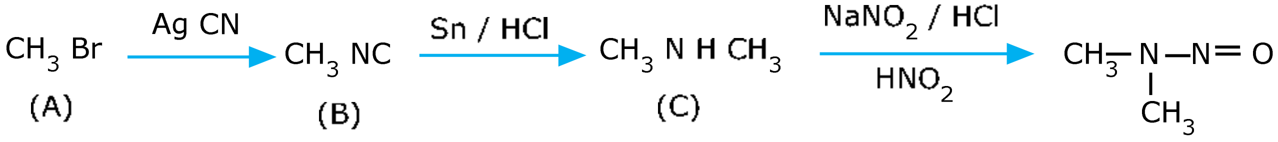
Ans 5.

$$\underset{(A)}{CH_3CONH_2} \xrightarrow{Br_2/KOH} \underset{(B)}{CH_3NH_2} \xrightarrow[HNO_2]{NaNO_2/HCl} \underset{(C)}{CH_3OH} \xrightarrow[Br_2]{Red\ P/} CH_3Br$$

Ans 6.

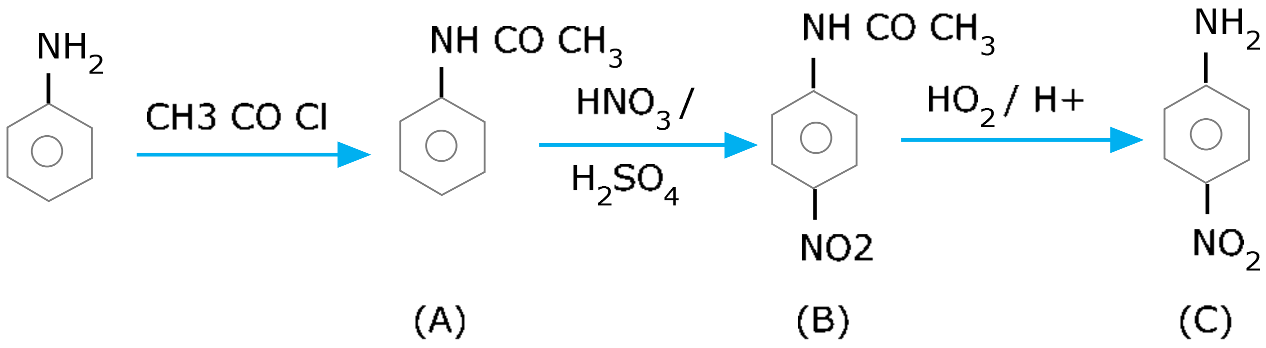


Ans 7.

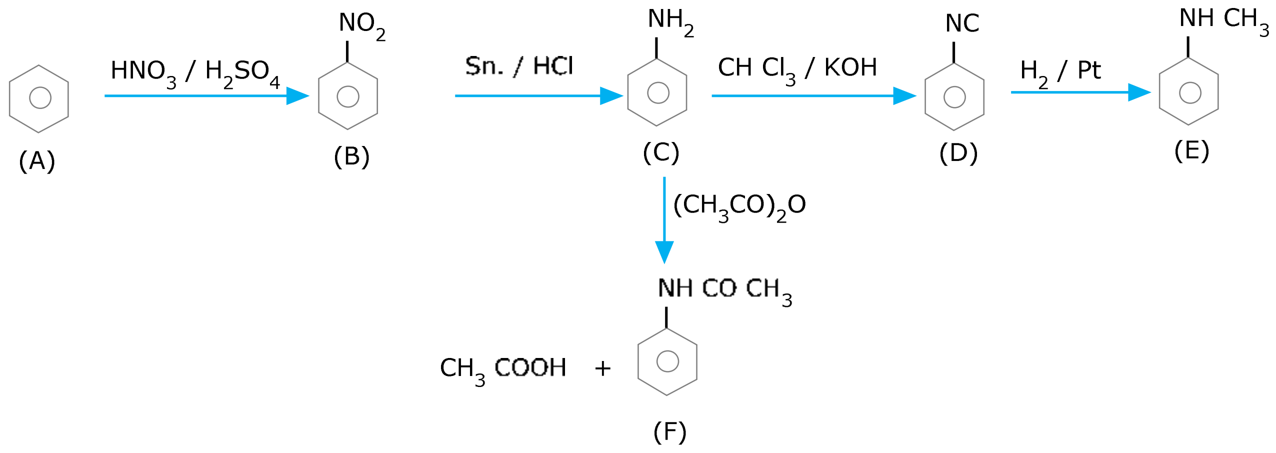


$$\underset{(A)}{CH_3Br} \xrightarrow{Ag\ CN} \underset{(B)}{CH_3NC} \xrightarrow{Sn\ /\ HCl} \underset{(C)}{CH_3NHCH_3} \xrightarrow[HNO_2]{NaNO_2/HCl} CH_3-\underset{CH_3}{\underset{|}{N}}-N=O$$

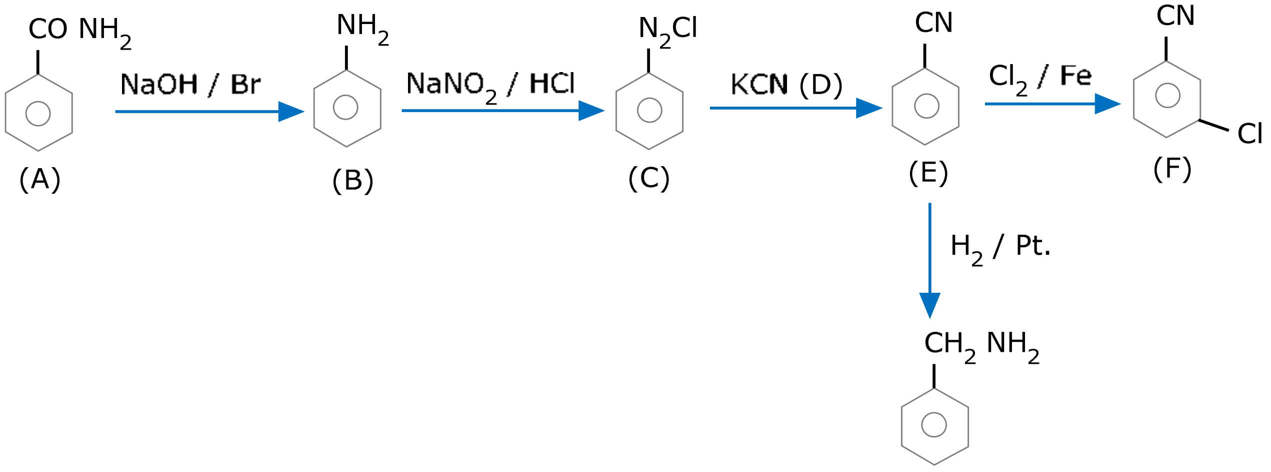
Ans 8.



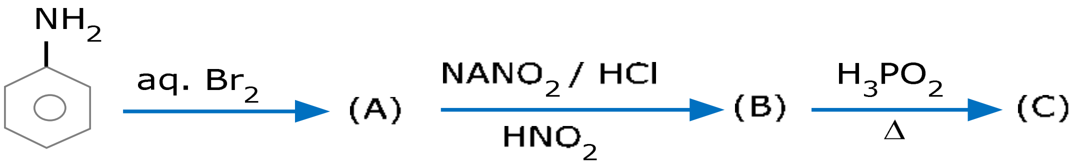
Ans 9.


NO2
NH2
NC
NH CH3
HNO3 / H2SO4
Sn. / HCl
CH Cl3 / KOH
H2 / Pt
(A)
(B)
(C)
(D)
(E)
(CH3CO)2O
NH CO CH3
CH3 COOH +
(F)

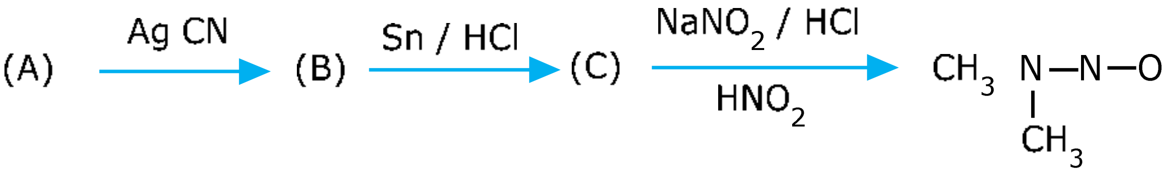
Ans 10.


CO NH2
NaOH / Br
NH2
NaNO2 / HCl
N2Cl
KCN (D)
CN
Cl2 / Fe
CN
Cl
(A)
(B)
(C)
(E)
(F)
H2 / Pt.
CH2 NH2

6.



7.

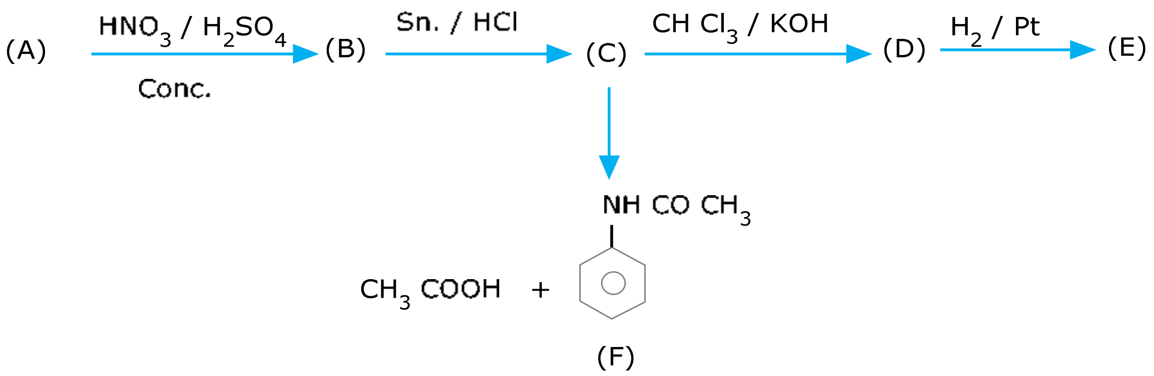


$$(A) \xrightarrow{Ag\ CN} (B) \xrightarrow{Sn\ /\ HCl} (C) \xrightarrow[HNO_2]{NaNO_2\ /\ HCl} CH_3\ \underset{\substack{|\\ CH_3}}{N}-N-O$$

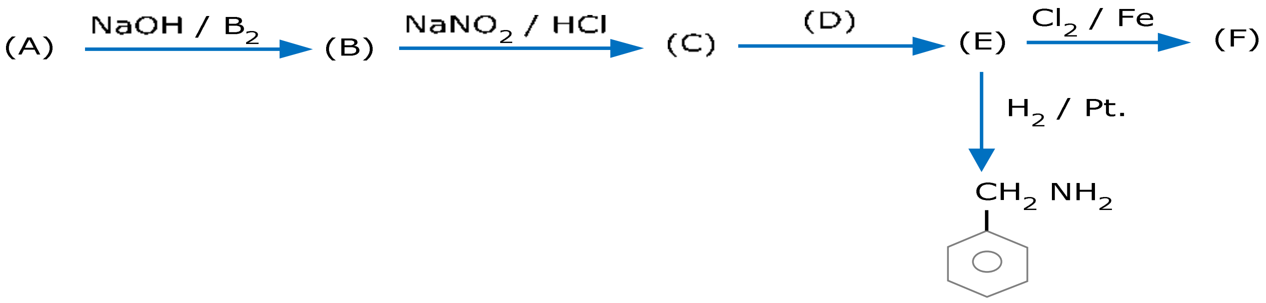
8.

$$C_6H_5\,NH_2 \xrightarrow{CH3\ CO\ Cl} (A) \xrightarrow[H_2SO_4]{HNO_3\ /} (B) \xrightarrow{HO_2\ /\ H+} (C)$$

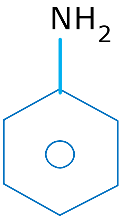
9.



10.



4. Due to electron donating nature of CH_3, group, electron pair. Availability at N- atom in methyl amine is much higher than that in aniline; in aniline the benzene ring decreases the electron density at N- atom in aniline. Thus CH_3NH_2 is a stronger base than aniline.



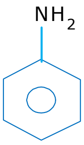
Aniline

$CH_3 \longrightarrow NH_2$

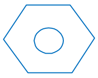
Methylamine

5. Aniline is very much susceptible to nitration and nitric acid is a strong oxidizing agent. Therefore to avoid oxidation of aniline, $-NH_2$ group is protected by its acetylation to acetanilide which undergo nitration smoothly without any oxidation.

6. In aniline, due to +R effect of $-NH_2$ group the benzene ring gets activated to a large extent and it becomes easier to brominates aniline as compared to benzene.



Aniline



Benzene

7. For reduction of nitro compounds to aniline, iron scrap and HCl is preferred because $FeCl_2$ formed gets hydrolysed to release HCl during the reaction & therefore only a small amount of HCl is required to initiate the reaction.

8. Aromatic amines cannot be prepared by Gabriel pythalimide synthesis as aryl halides do not undergo nucleophilic substitution with the anion formed by pythalimide.

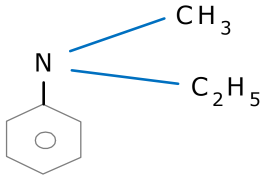
9. Acylation of amines is carried out in presence of pyridine or another base stronger than amines as it removes HCl so formed and shifts the equilibrium in forward direction.

$$C_2H_5NH_2 + CH_3COCl \overset{\text{Base}}{\rightleftharpoons} C_2H_5NHCOCH_3 + HCl$$

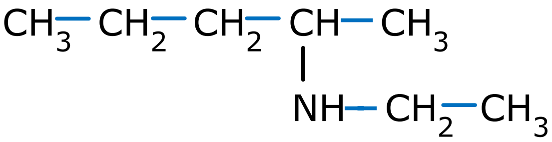
10. During Fridel Craft's reaction, aniline forms salt with aluminum chloride, the catalyst of reaction due to which nitrogen acquires a positive charge and acts as a strong deactivating group for further reaction.

2 (i) $NH_2\ CH_2\ CH = CH\ CH_3$

2 (ii)

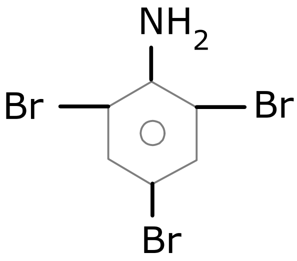


2 (iii)

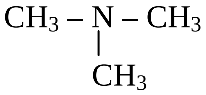


$CH_3-CH_2-CH_2-\underset{\underset{\displaystyle NH-CH_2-CH_3}{|}}{CH}-CH_3$

2 (iv)

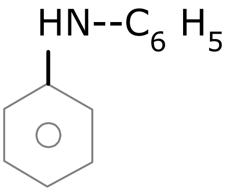


2 (v)

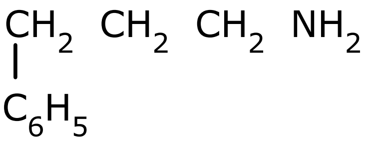


$CH_3-\underset{\underset{CH_3}{|}}{N}-CH_3$

2 (vi)

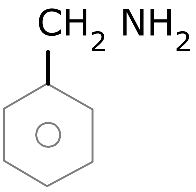


2 (vii)



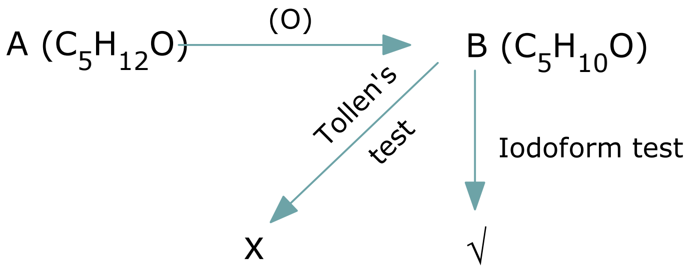
$\underset{\underset{C_6H_5}{|}}{CH_2}\ CH_2\ CH_2\ NH_2$

2 (viii)



IUPAC name - 1- Phemylmethamine

Ans2.



$$B \xrightarrow[HCl]{Zn\ -\ Hg} C\ (C_5H_{12})$$

Since B gives a negative Tollen's test but positive Iodoform test, it is methyl ketone, i.e, CH_3CO CH_2 CH_2 CH_3. Also it is formed by oxidation of A.

Therefore A is secondary alcohol i.e, $CH_3\ \underset{\overset{|}{OH}}{CH}\ CH_2\ CH_2\ CH_2CH_3$ on reduction B gives pentane with Zn –Hg/ HCl.

Therefore C is CH_3 CH_2 CH_2 CH_2 CH_3

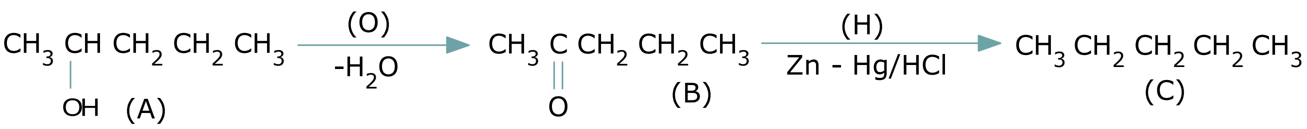
Therefore

A = CH_3 CHOH CH_2 CH_2 CH_3

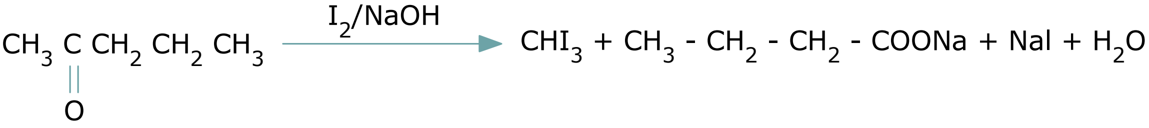
B = CH_3 CO CH_2 CH_2 CH_3

C= CH_3 CH_2 CH_2 CH_2 CH_2 CH_3

Reactions:-



$$CH_3\ \underset{\overset{|}{OH}}{CH}\ CH_2\ CH_2\ CH_3\ (A) \xrightarrow[-H_2O]{(O)} CH_3\ \underset{\overset{\|}{O}}{C}\ CH_2\ CH_2\ CH_3\ (B) \xrightarrow[Zn\ -\ Hg/HCl]{(H)} CH_3\ CH_2\ CH_2\ CH_2\ CH_3\ (C)$$



$$CH_3\ \underset{\overset{\|}{O}}{C}\ CH_2\ CH_2\ CH_3 \xrightarrow{I_2/NaOH} CHI_3 + CH_3 - CH_2 - CH_2 - COONa + NaI + H_2O$$

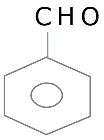
Ans3.

$$\begin{tikzcd}
A \arrow[r, "NaOH"] & \underset{(C_7H_8O)}{B} \arrow[d, "(O)"] & + & C\text{ (Sodium salt of acid)} \arrow[d, "NaOH + CaO"] \\
& A & & D\text{ (aromatic)}
\end{tikzcd}$$

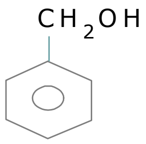
The molecular formula of (B) and characteristic odour of (A) suggests that (A) is an aromatic aldehyde, C_6H_5 CHO and (B) is alcohol, $C_6H_5CH_2OH$. As (C) is a sodium salt of an acid & gives hydrocarbon (D) on heating with soda lime, (C) is sodium benzoate and (D) is benzene.

Therefore:-

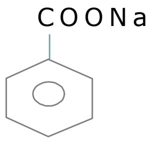
A = benzaldehyde ,



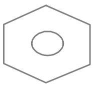
, B = benzylalcohol



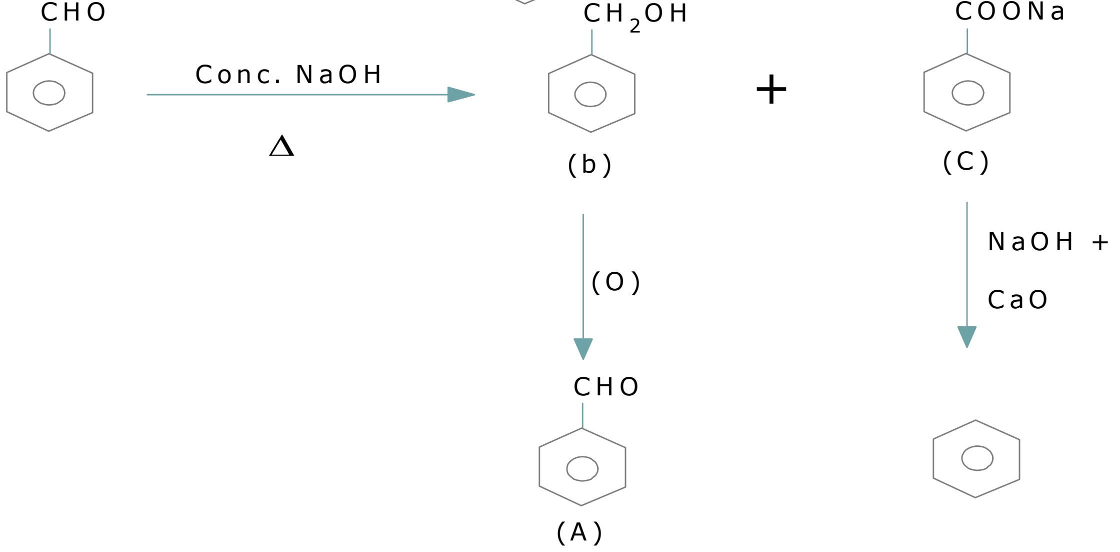
, C = Sodium benzoate ,

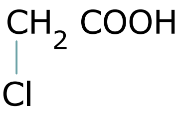
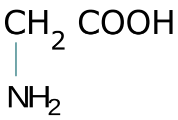


D = benzene

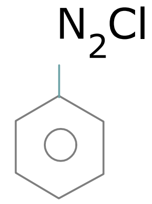


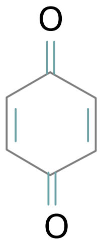
The reaction are



Ans4. A = 
$\underset{\displaystyle Cl}{CH_2}COOH$, B = 
$\underset{\displaystyle NH_2}{CH_2}COOH$

Ans5. (A) = $C_6H_5CH_2NH_2$

(B) = 

(C) = 

Ans6. (A) = CH_3CN

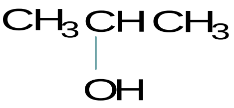
(B) = CH_3COOH

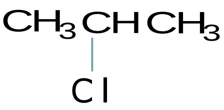
(C) = CH_3COCl

Ans7. (A) = $(CH_3COO)_2Ca$

(B) = CH_3COCH_3

(C) = CHI_3

Ans8. X = 
$CH_3\underset{\displaystyle OH}{CH}CH_3$

Y = 
$CH_3\underset{\displaystyle Cl}{CH}CH_3$

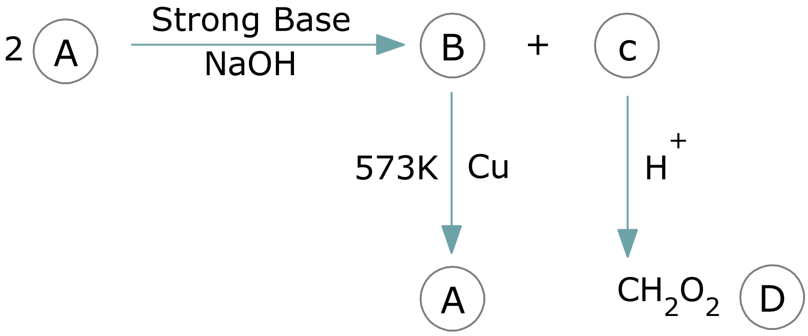
Z = $CH_3\text{-}CH = CH_2$

Ans9. A = CH_3CHO

B = CH_3COOH

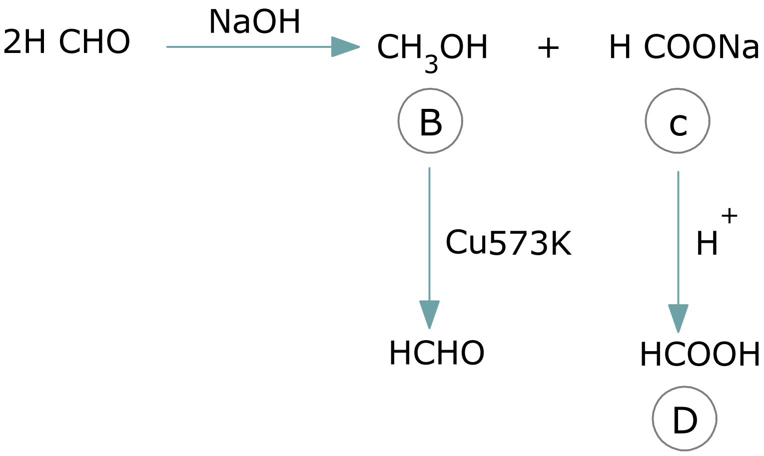
C = CH_3COCH_3

Ans10.

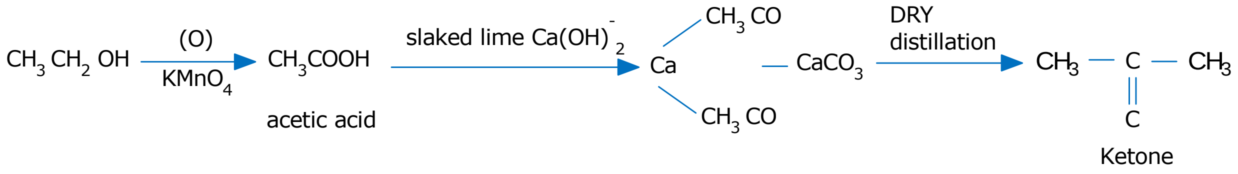


Since (D) is a carboxylic acid with one carbon only, it is HCOOH. As it is obtained from (C) acidification, (C) COONa and (A) is HCHO which on treatment with strong base (NaOH) gives CH_3OH & HCOONa (cannizaro's reaction).

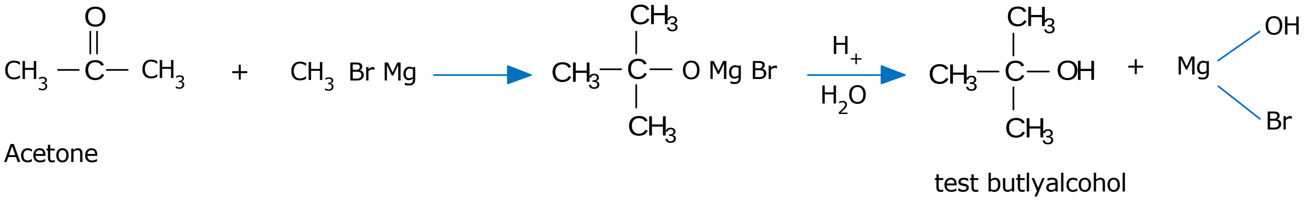
The reactions are :-



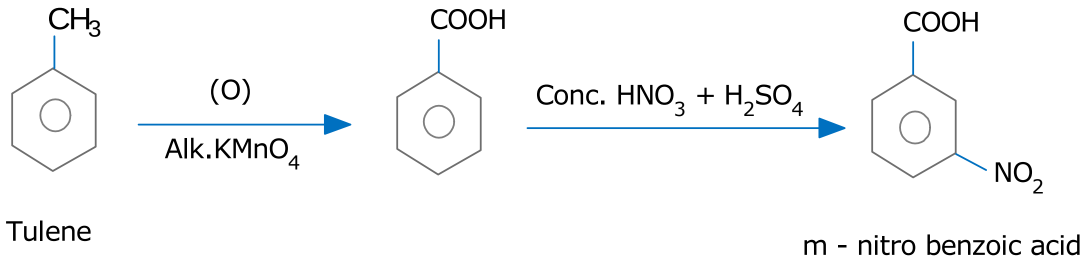
Ans6.



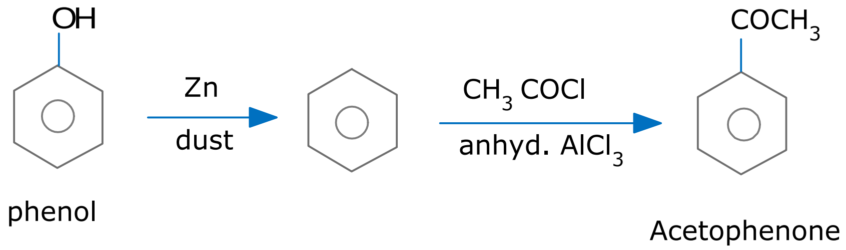
Ans7.



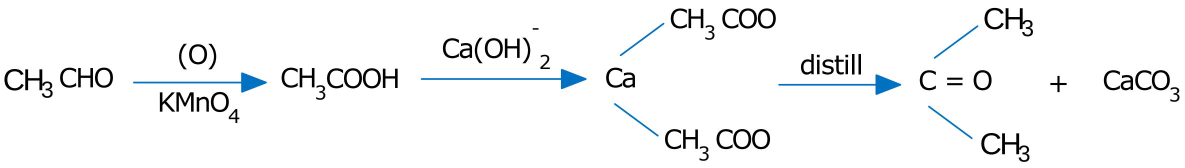
Ans8.



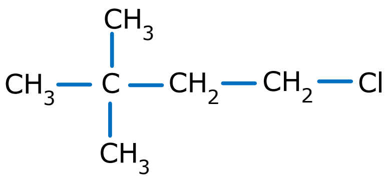
Ans9.



Ans10.

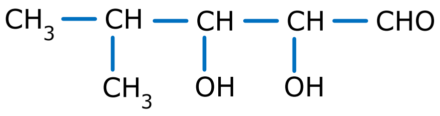


Ans 2(iii).



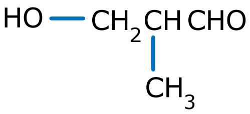
$CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_2-CH_2-Cl$

Ans 2(iv).



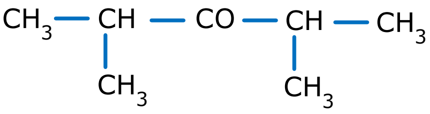
$CH_3-\underset{\underset{CH_3}{|}}{CH}-\underset{\underset{OH}{|}}{CH}-\underset{\underset{OH}{|}}{CH}-CHO$

Ans 2(v).



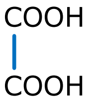
$HO-CH_2\underset{\underset{CH_3}{|}}{CH}CHO$

Ans 2(vi).



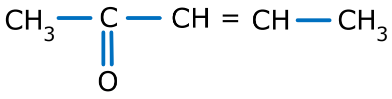
$CH_3-\underset{\underset{CH_3}{|}}{CH}-CO-\underset{\underset{CH_3}{|}}{CH}-CH_3$

Ans 2(vii).



$\begin{array}{c}COOH\\|\\COOH\end{array}$

Ans 2(viii).



$CH_3-\underset{\underset{O}{\|}}{C}-CH=CH-CH_3$

Ans 2(ix). $COOH-CH_2-COOH$

DISCLAIMER

Although all precaution has been taken in editing these sample papers we regret for any typing error.

Your suggestion are invited for improvements.

Students you are requested to use these papers for practice and proper time management.

Best of luck for your examination. God Bless You All.

From
The Team of MAGIC BOX