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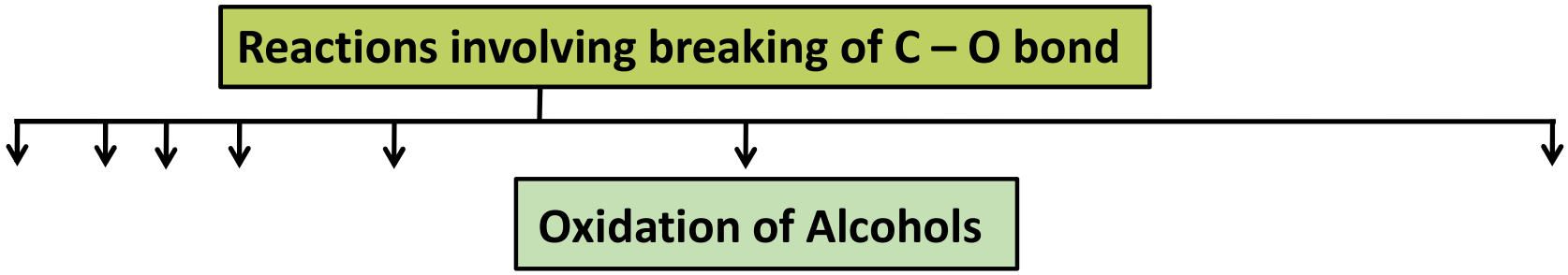
An Initiative by अमर उजाला

OXIDATION OF ALCOHOLS



Distinguishable reaction Between 1^0, 2^0 and 3^0 alcohols

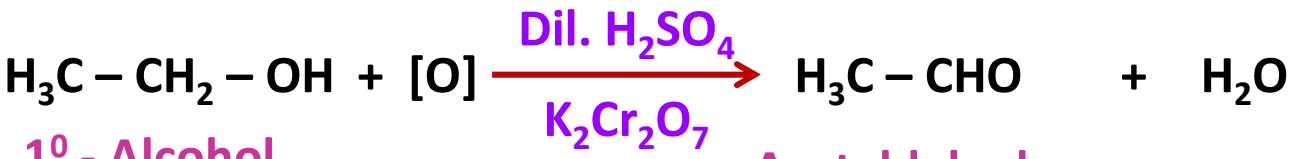
Oxidati

p

Oxidation of alcohols is used to differentiate between 1^0, 2^0 and 3^0 alcohols

dichromate (PDC)

(i) Oxidation of 1^0 alcohol



1^0 - Alcohol

Ethanol

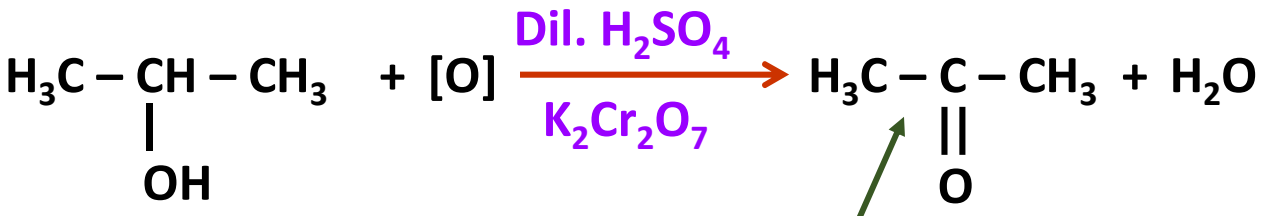
2 – Carbons

Acetaldehyde

or Ethanal

2 – Carbons

(ii) Oxidation of 2^0 alcohol



Iso/sec – propyl alcohol

or

Propan – 2 – ol

2^0 -Alcohol

3 – Carbons

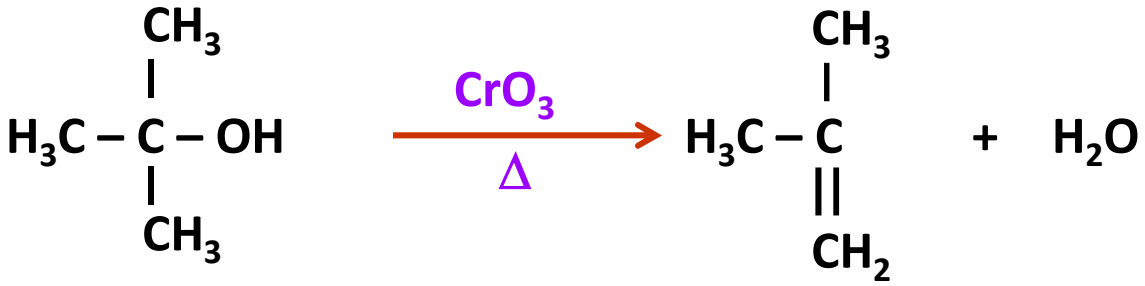
Acetone

Propan-2-one

Dimethyl ketone

3 – Carbons

iii) Oxidation of 3^0 alcohol



tert – butyl alcohol (3^0)
(4 – C)

isobutylene
(4 – C)

Note :

1^0, 2^0 and 3^0 alcohol on vigorous oxidation gives carboxylic acid but 1^0 alcohol gives carboxylic acid with same no. of 'C' atom, 2^0 alcohol gives carboxylic acid with one 'C' atom less and 3^0 alcohol gives carboxylic acid with two 'C' atoms less.

MCQs

1. Oxidation of alcohols is carried out by using…

a) dilute H_2SO_4 and $K_2Cr_2O_7$

b) pyridinium chlorochromate

c) pyridinium dichromate

d) All of these ✓

2. Primary alcohol on oxidation gives…

a) aldehyde

b) ketone

c) Both a & b

d) None of these

3. Secondary alcohol on oxidation gives…

a) aldehyde

b) ketone

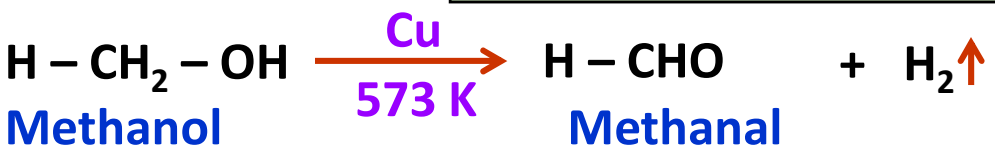
c) Both a & b

d) None of these

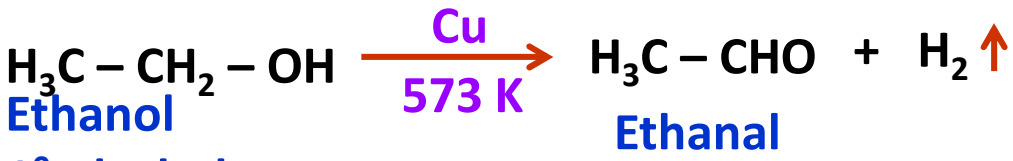
DEHYDROGENATION OF ALCOHOLS WITH ‘Cu’ AT 573 K

Reactions involving breaking of C – O bond

Dehydration of alcohols with Cu at 573 K (300^0C)

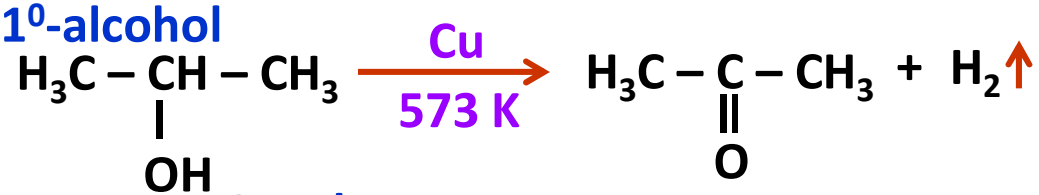


Methanol → Methanal



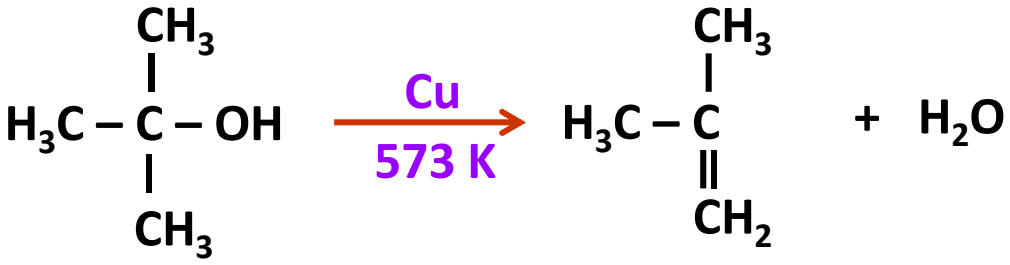
Ethanol → Ethanal

1^0-alcohol



Propan – 2 – ol → Acetone

2^0-alcohol



Tert–butyl alcohol

3^0-Alcohol

Isobutylene

What will be the product ?

Catalytic dehydrogenation is also useful to distinguish 1^0, 2^0 and 3^0 alcohols

MCQs

1. Primary alcohols on dehydrogenation with Cu at 573 K gives

a) ketone

b) aldehyde ✓

c) acid

d) None of these

2. Ethanol on dehydrogenation gives…

a) Methanol

b) Ethanal ✓

c) Both a & b

d) Ethyl chloride

3. Propan – 2– ol on dehydrogenation gives --

a) acetaldehyde

b) Formaldehyde

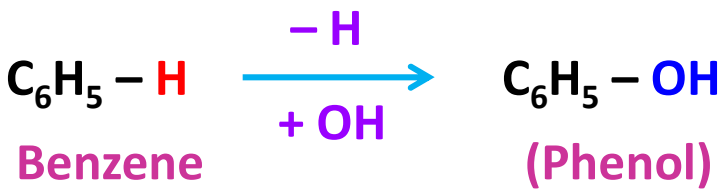
✔ acetone

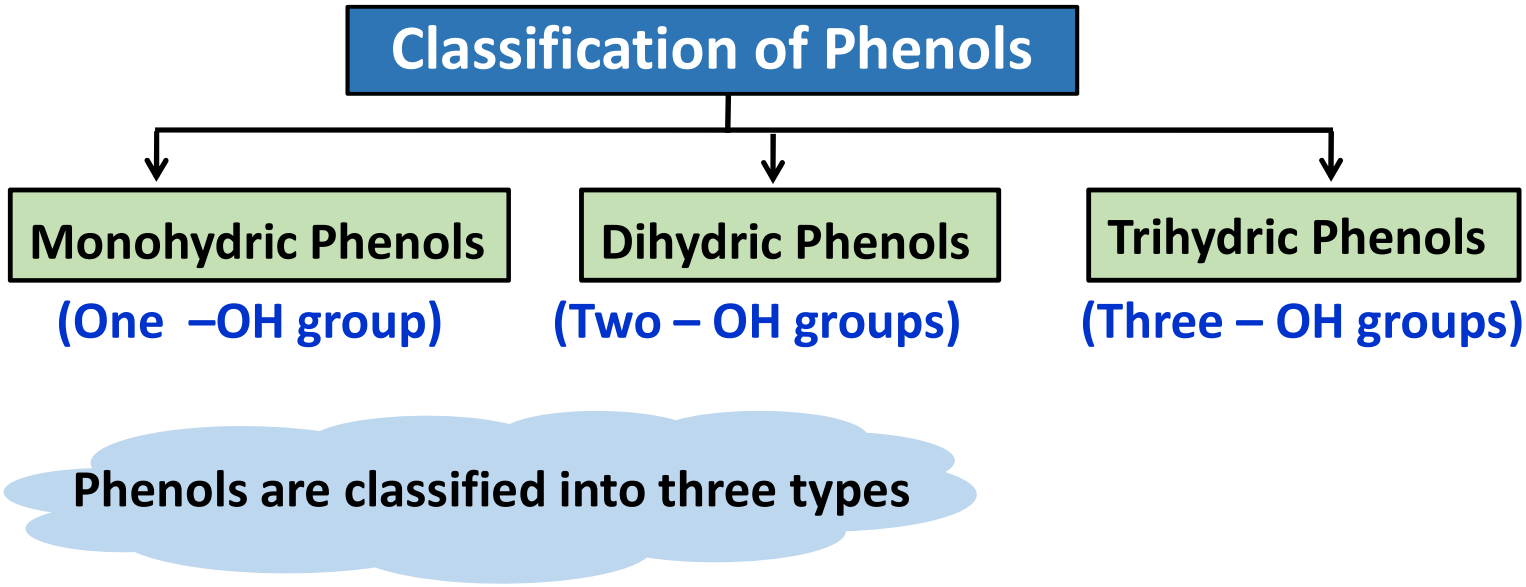
d) All of these

INTRODUCTION OF PHENOLS

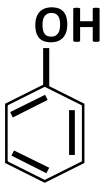
Phenols

The aromatic hydroxyl compounds in which one or more hydroxyl groups are directly attached to the aromatic nucleus (i.e. Benzene ring) are called Phenols.

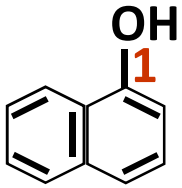



Classification of Phenols
Monohydric Phenols
(One –OH group)
Dihydric Phenols
(Two – OH groups)
Trihydric Phenols
(Three – OH groups)
Phenols are classified into three types

Monohydric phenols

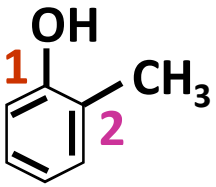


Phenol
Carbolic acid



α – Naphthol

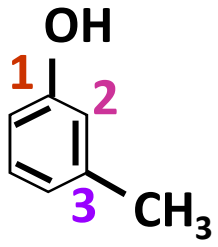
1 – Naphthol



o – Cresol

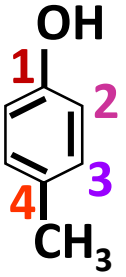
2–Methylphenol

Monohydric phenols



m – Cresol

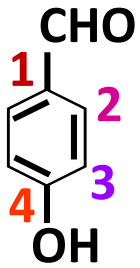
3 – Methylphenol



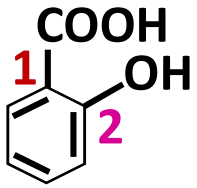
p – Cresol

4 – Methylphenol

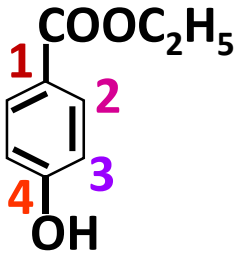
Monohydric phenols



(4 – Hydroxybenzaldehyde)

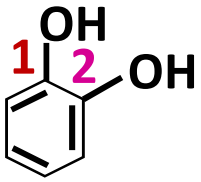


(2 – Hydroxybenzoic acid)



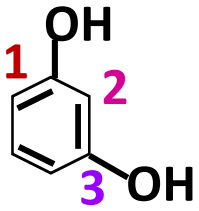
(4 – Hydroxyethylbenzoate)

Dihydric phenols



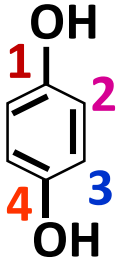
Catechol

Benzene–1,2–diol



Resorcinol

Benzene –1,3– diol



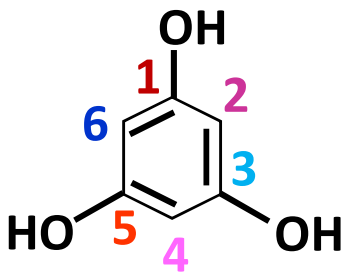
Hydroquinone

(or)

Quinol

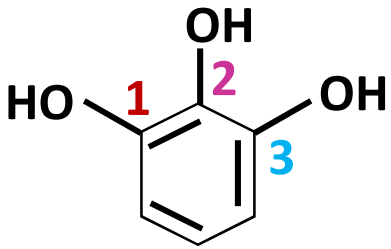
Benzene –1,4–diol

Trihydric phenols



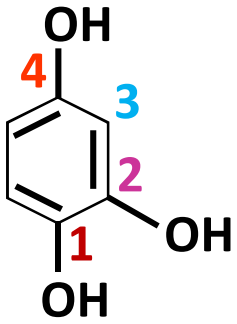
Phloroglucinol

Benzene –1,3,5 – triol



Pyrogallol

Benzene–1,2,3–triol



Benzene – 1, 2, 4 – triol

MCQs

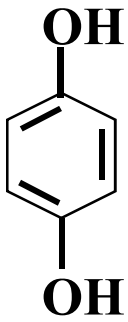
1. Phenols are classified as..

a) Monohydric Phenols

b) Dihydric Phenols

c) Trihydric Phenols

d) all of these ✓

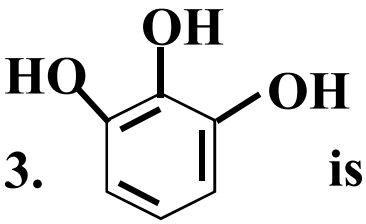
2.  Is…

a) Benzene–1,4–diol

b) Hydroquinone

c) Both (a) and (b)

d) None of these

3.  is…

a) trihydric phenol

b) dihydric phenol

c) benzene–1,2,3–triol

d) both (a) and (c)

4. p-cresol is an example of…

a) dihydric phenol

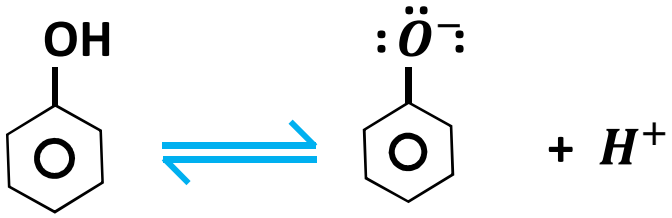
b) trihydric phenol

c) monohydric phenol ✓

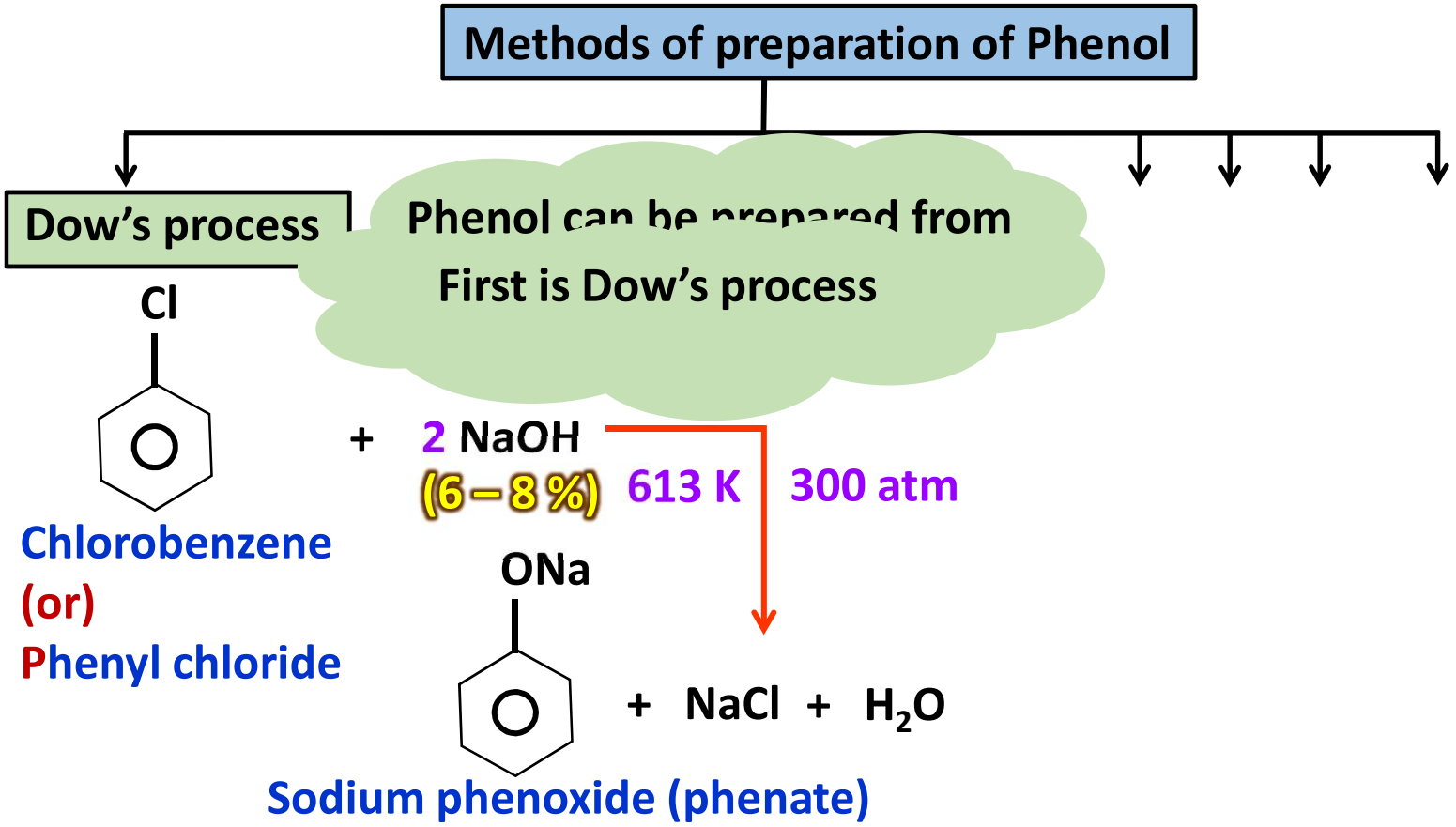
d) monohydric alcohol

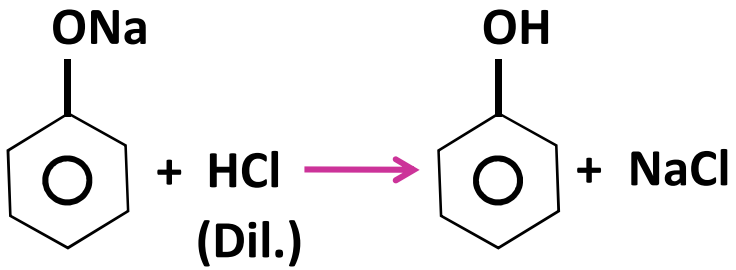
PREPARATION OF PHENOLS

Acidic character of phenol (According to Lowry - Bronsted)



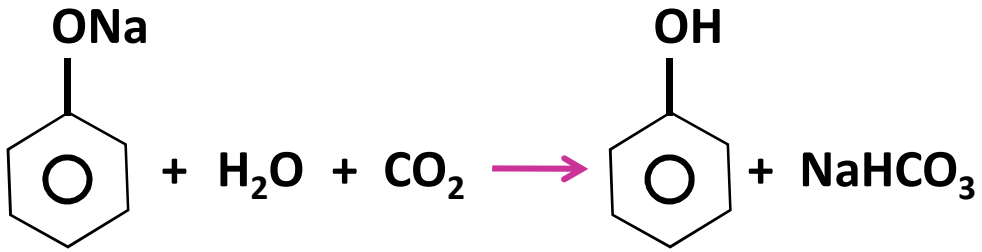
(Phenoxide (Phenate) ion)


Methods of preparation of Phenol
Dow's process
Phenol can be prepared from
First is Dow's process
Cl
+ 2 NaOH
(6 – 8 %)
613 K
300 atm
Chlorobenzene
(or)
Phenyl chloride
ONa
+ NaCl + H_2O
Sodium phenoxide (phenate)



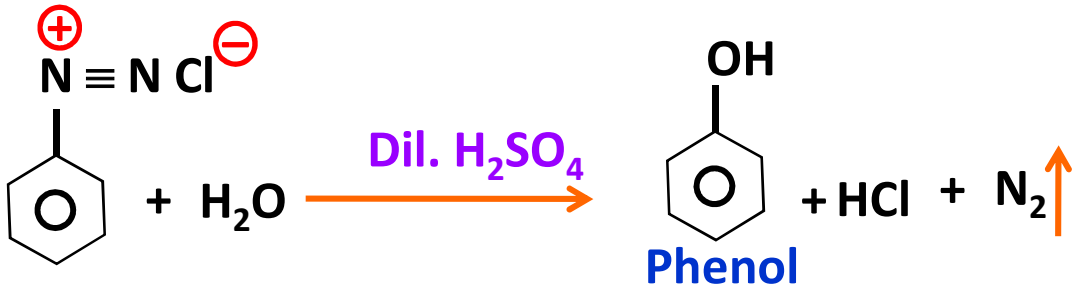
Phenol

or



Phenol

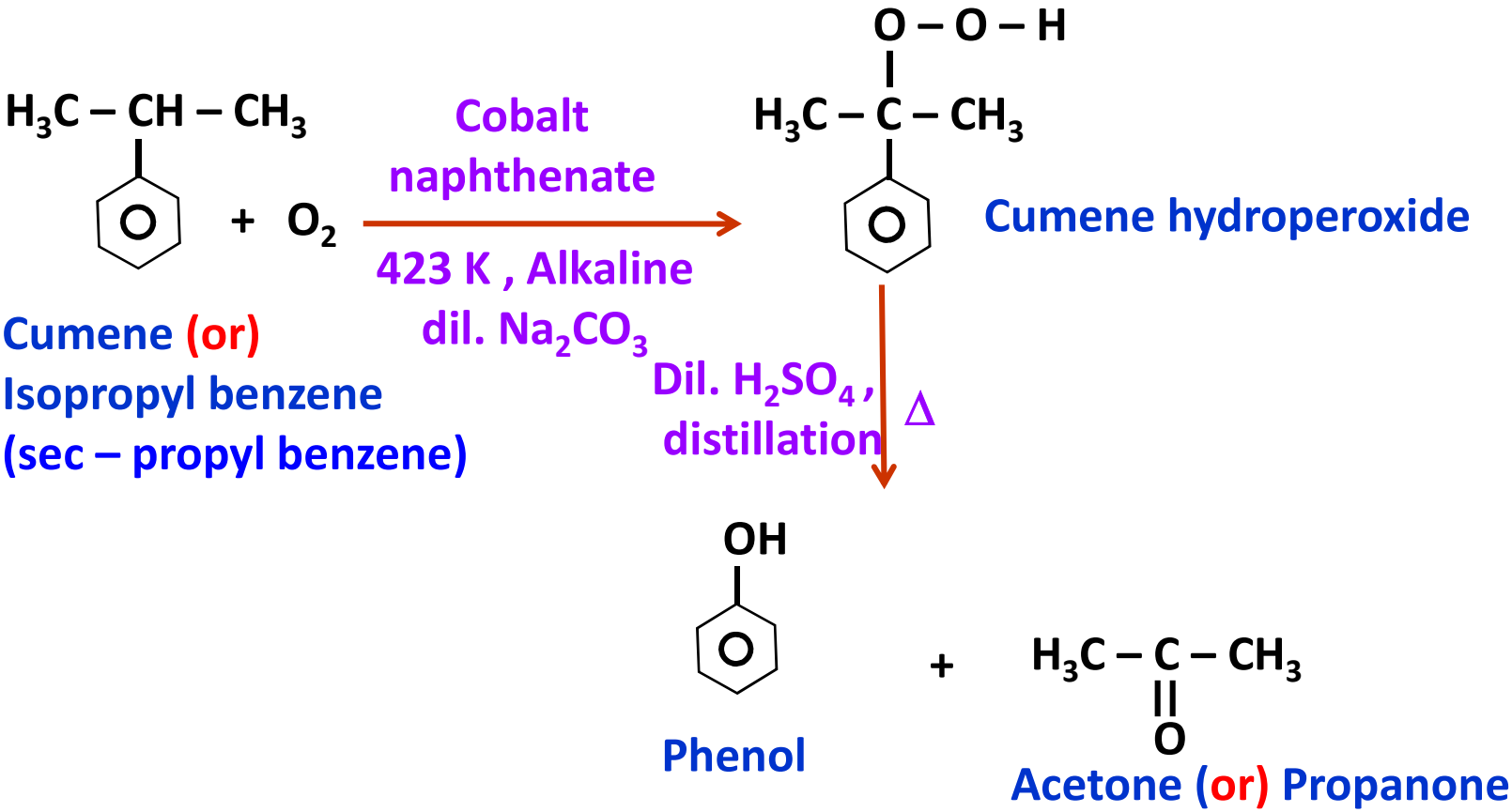
Phenol can be prepared from diazonium salt



From Cumene

Commercial method

Phenol can be prepared commercially from Cumene. Cumene is Isopropyl benzene


H3C – CH – CH3
+ O2
Cobalt naphthenate
423 K , Alkaline dil. Na2CO3
O – O – H
H3C – C – CH3
Cumene hydroperoxide
Cumene (or) Isopropyl benzene (sec – propyl benzene)
Dil. H2SO4 , distillation
Δ
OH
Phenol
+
H3C – C – CH3
O
Acetone (or) Propanone

MCQs

1. Cumene is nothing but…

a) Isopropyl benzene

b) n-propyl alcohol

c) sec-propyl benzene

d) Both a & c ✓

2. Phenol can be obtained commercially from…

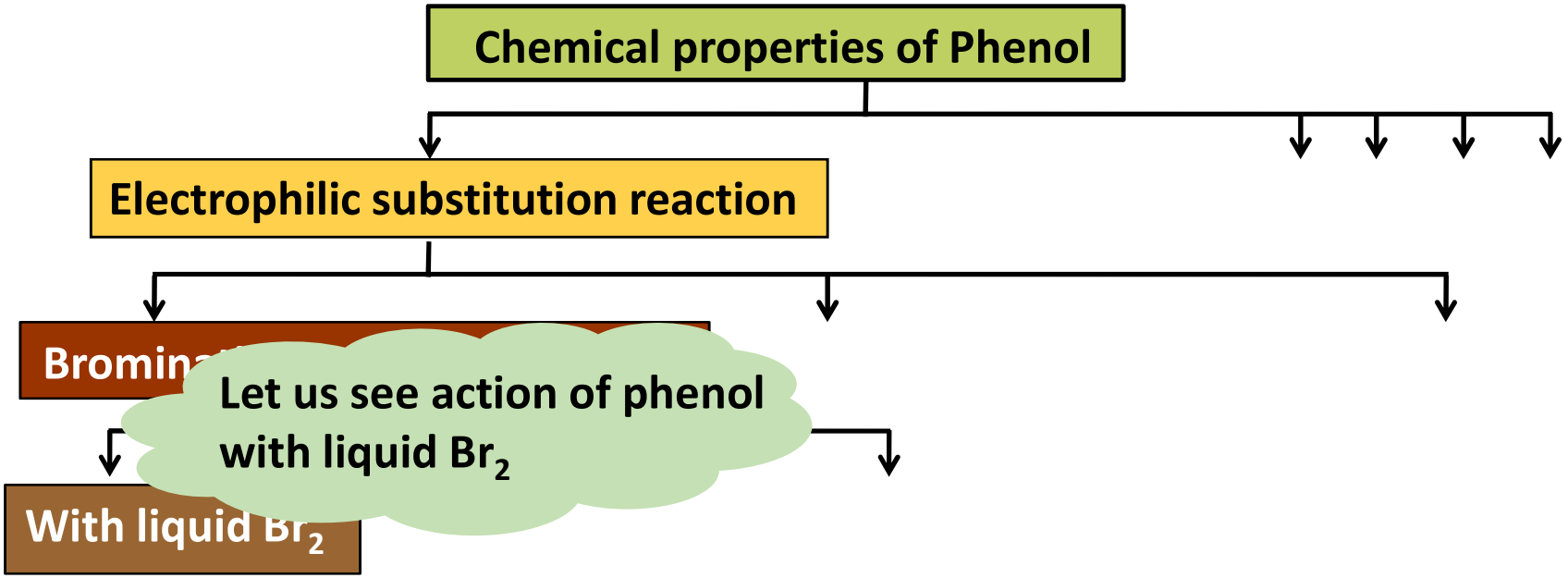
a) chlorobenzene

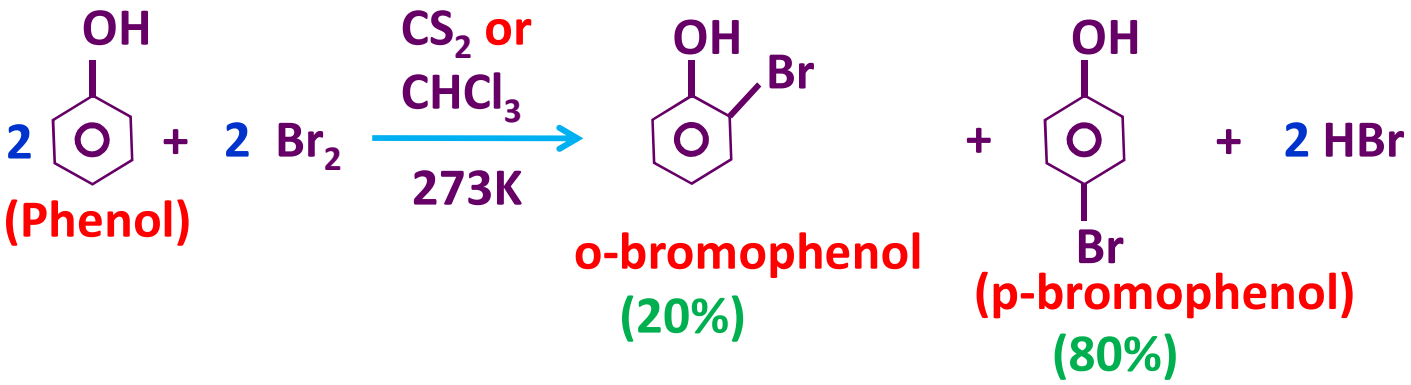
b) aniline

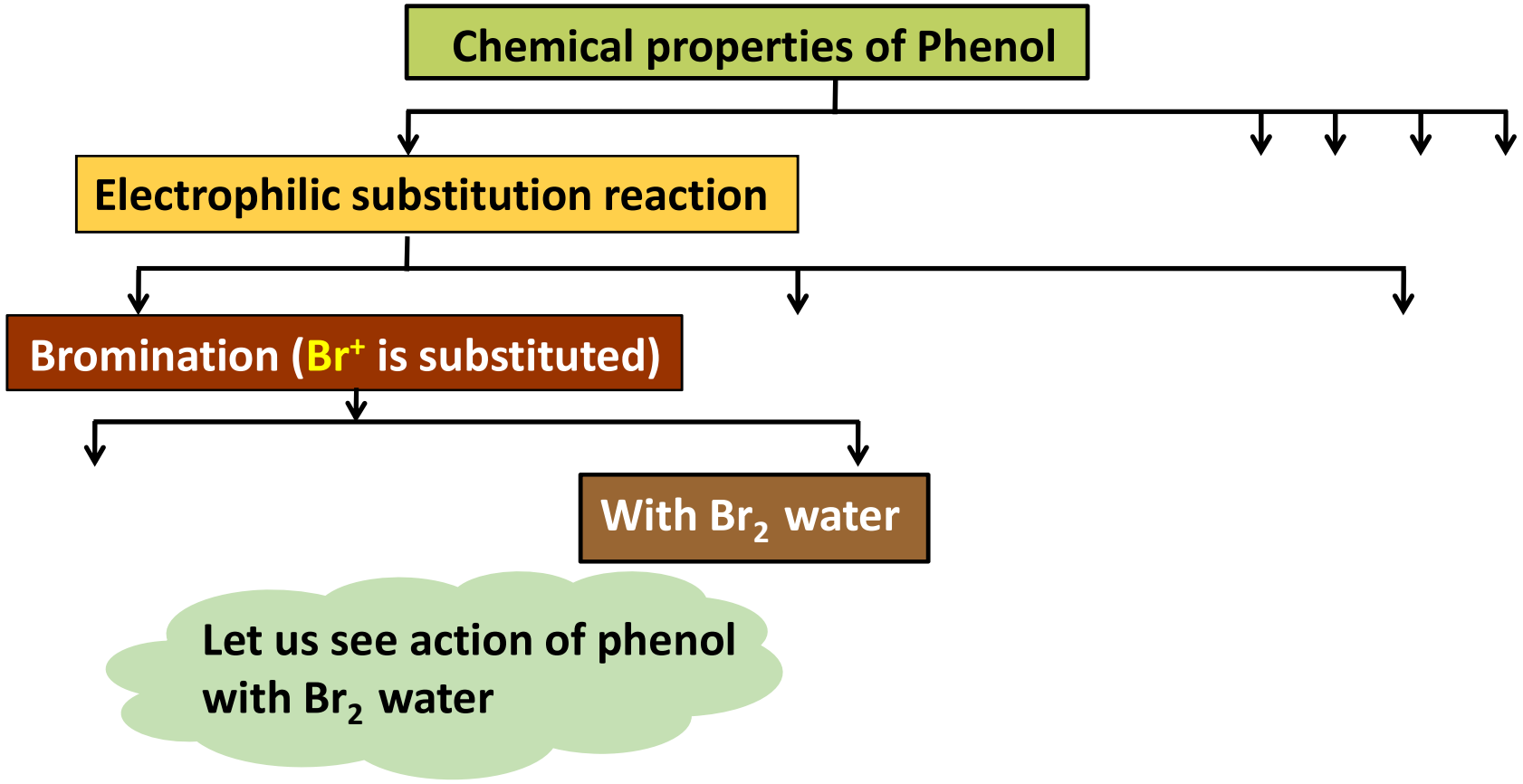
c) cumene ✓

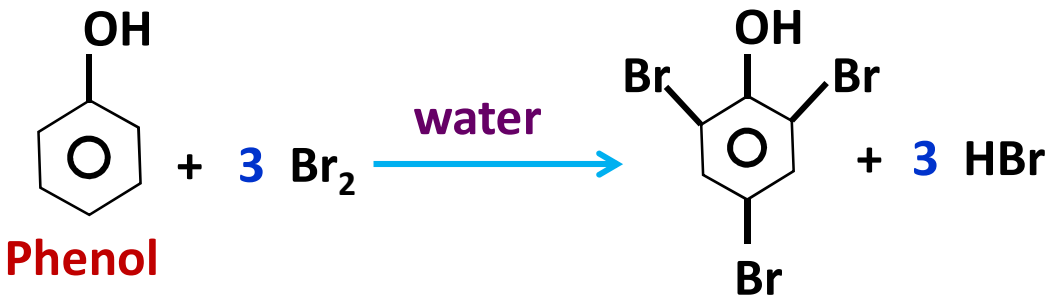
d) benzene sulphonic acid

ELECTROPHILIC SUBSTITUTION REACTION, BROMINATION & NITRATION


Chemical properties of Phenol
Electrophilic substitution reaction
Let us see action of phenol with liquid Br_2
With liquid Br_2


OH
2
+ 2 Br2
CS2 or
CHCl3
273K
OH
Br
+
OH
+ 2 HBr
Br
(Phenol)
o-bromophenol
(20%)
(p-bromophenol)
(80%)

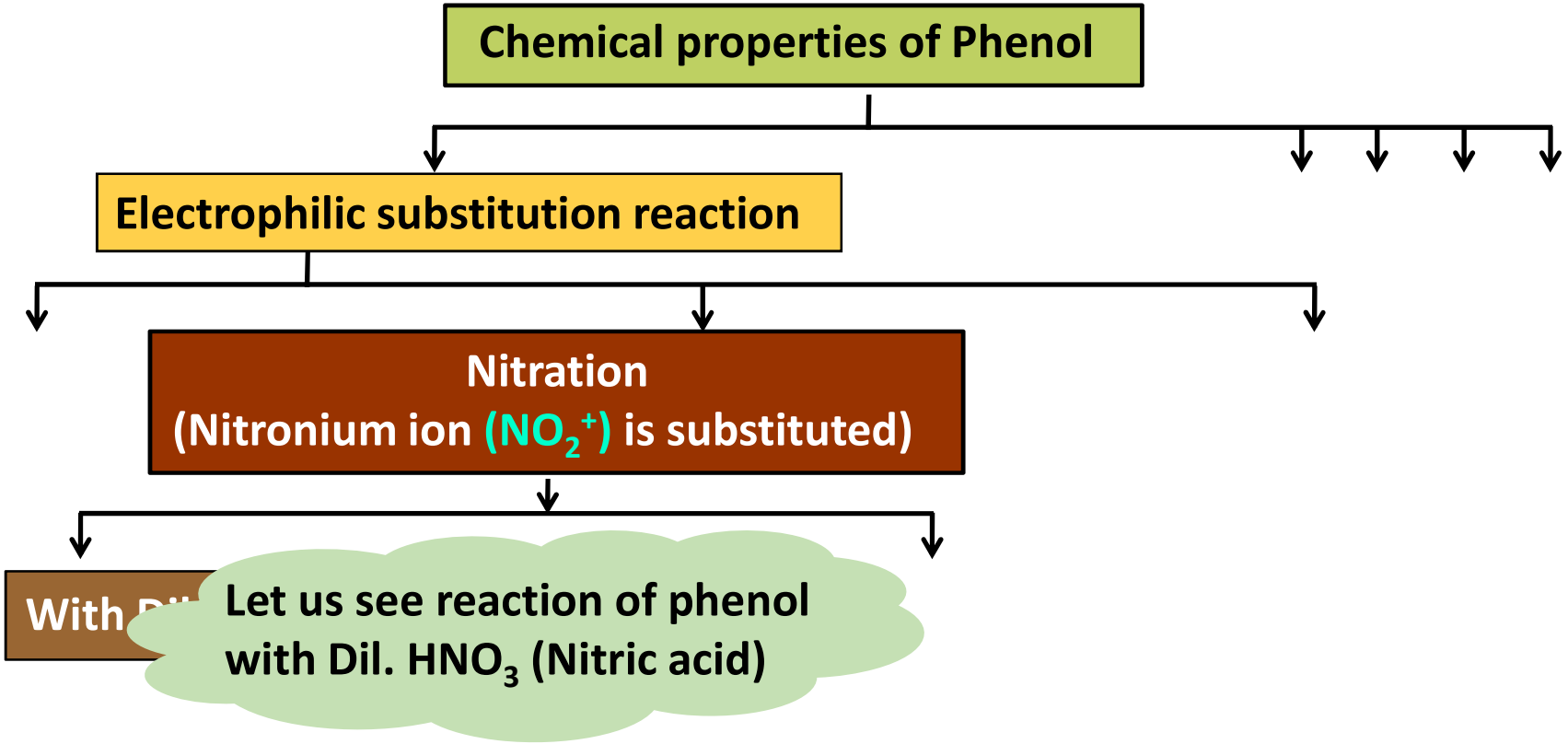

Chemical properties of Phenol
Electrophilic substitution reaction
Bromination (Br^+ is substituted)
With Br_2 water
Let us see action of phenol with Br_2 water

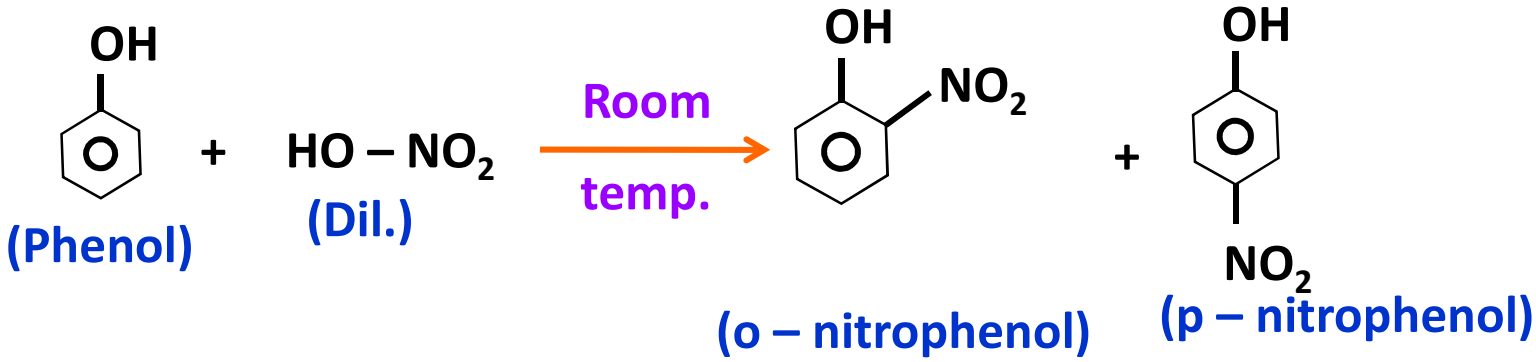


Phenol

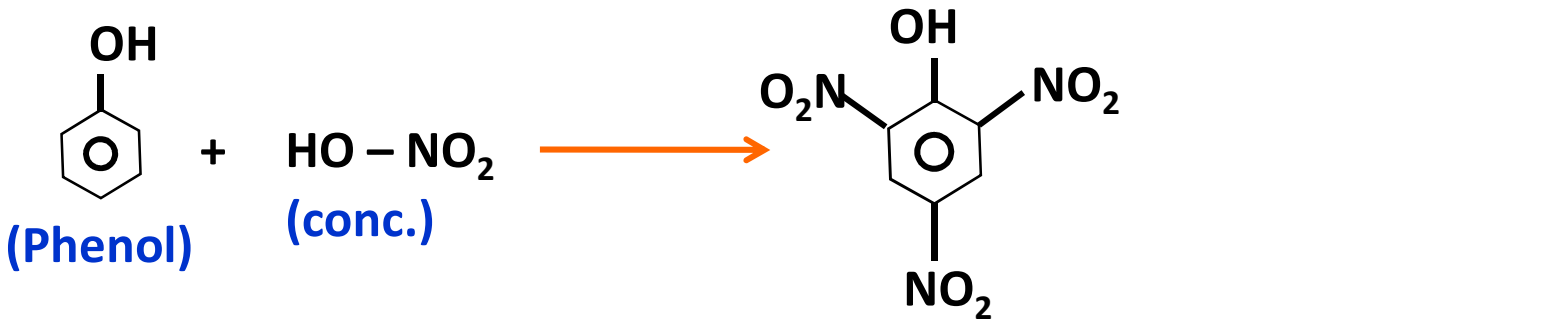
2,4,6 – tribromophenol

white ppt


Chemical properties of Phenol
Electrophilic substitution reaction
Nitration
(Nitronium ion (NO_2^+) is substituted)
With Dil
Let us see reaction of phenol with Dil. HNO_3 (Nitric acid)



o – nitrophenol is steam volatile due to intramolecular hydrogen bonding , while p – nitrophenol is less volatile due to intermolecular hydrogen bonding.

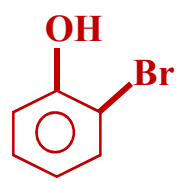
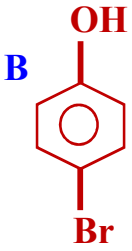


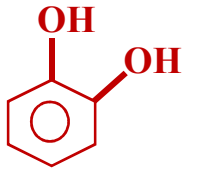
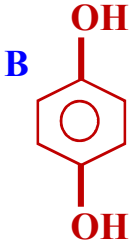
(Phenol)

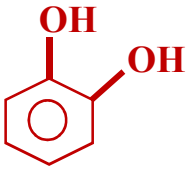
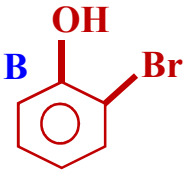
2, 4, 6 – trinitro phenol (picric acid)

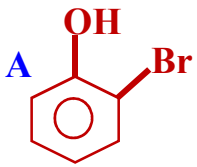
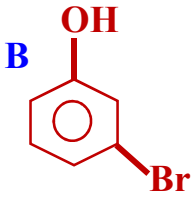
MCQs

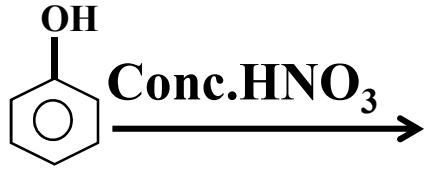
1. Phenol $\xrightarrow[Cs_2]{Br_2}$ A + B identify A & B

a) A  B 

b) A  B 

c) A  B 

d)  

2. 

A. Identify ‘A’ in the following…

a) 2,4,6 – Trihydroxy nitro benzene

b) 2,4,6 – Trihydroxy benzene

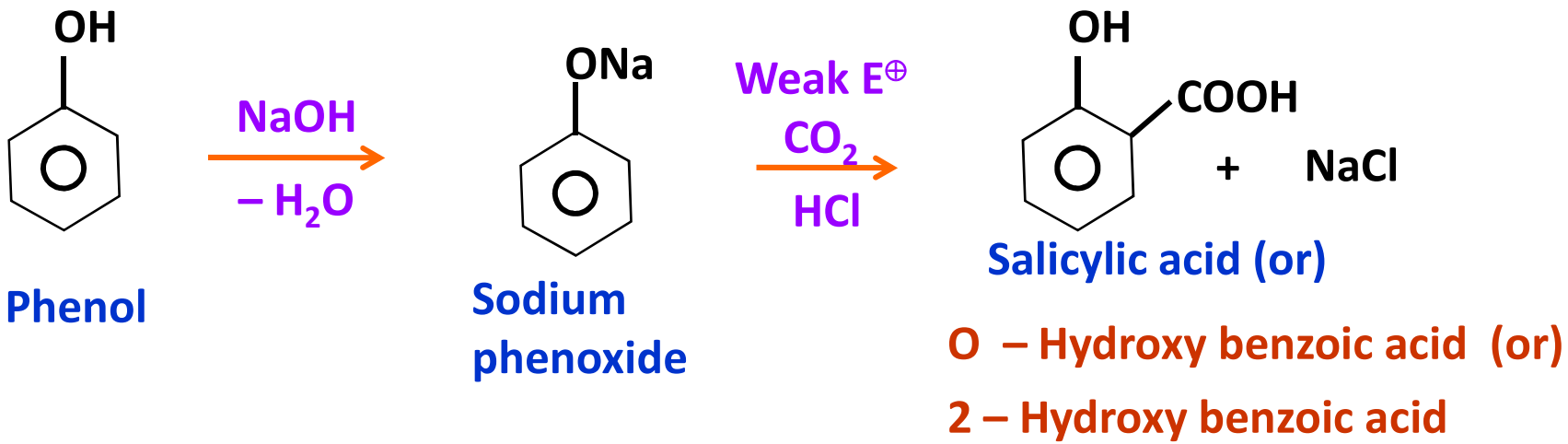
c) 2,4,6 – Trinitro benzene

d) Picric acid

KOLBE'S
&
REIMER – TIEMANN
REACTION

Chemical properties of Phenol

Kolbe's Reaction



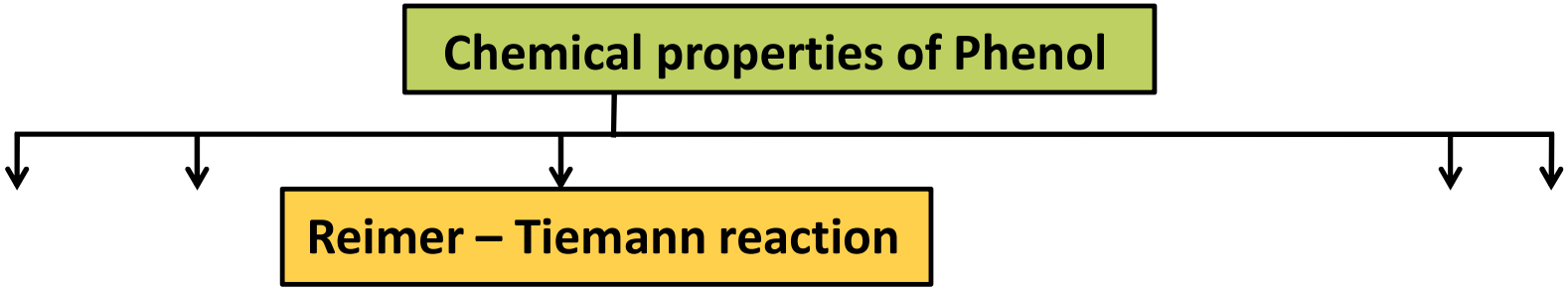
Phenol

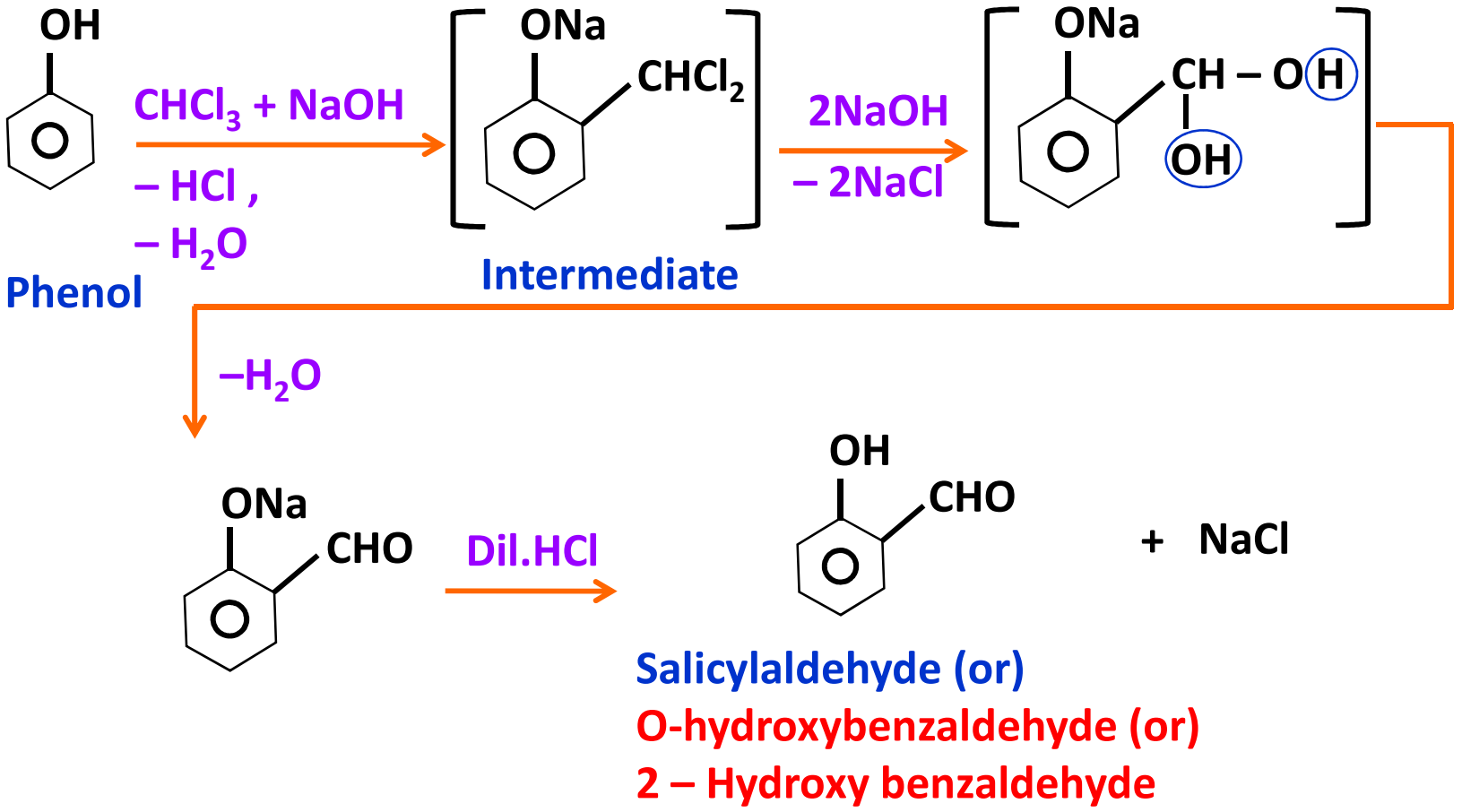
Sodium phenoxide

Salicylic acid (or)

O – Hydroxy benzoic acid (or)

2 – Hydroxy benzoic acid

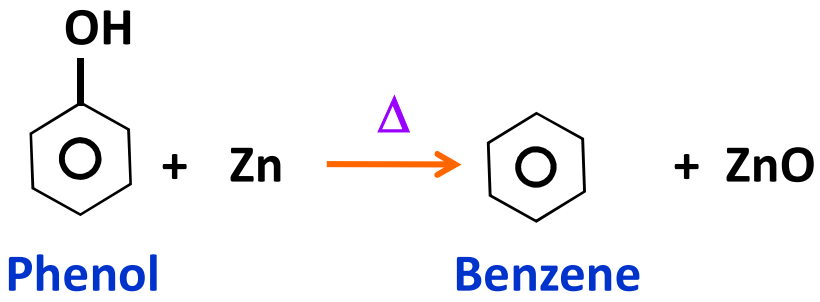

Chemical properties of Phenol
Reimer – Tiemann reaction


OH
$CHCl_3$ + NaOH
– HCl ,
– H_2O
Phenol
ONa
$CHCl_2$
Intermediate
2NaOH
– 2NaCl
ONa
CH – OH
OH
–H_2O
ONa
CHO
Dil.HCl
OH
CHO
+ NaCl
Salicylaldehyde (or)
O-hydroxybenzaldehyde (or)
2 – Hydroxy benzaldehyde

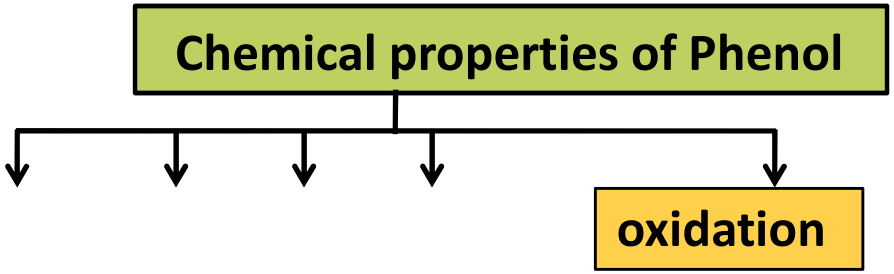
Chemical properties of Phenol

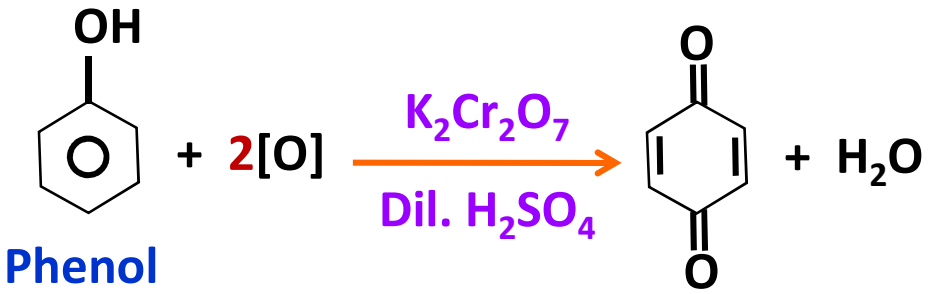
Reaction with Zn dust

Reduction



Phenol **Benzene**





Phenol

Benzoquinone

Distinguishing test between Alcohol and Phenol

- Alcoh… …t phenols turns bl…
- Pr… …loride (Fe… …uration with aq. Neutral $FeCl_3$.

Let us see how we can differentiate between alcohol and phenol

$$3\ C_6H_5OH + FeCl_3 \longrightarrow (C_6H_5O)_3Fe + 3\ HCl$$

Phenol — Ferric chloride — Ferric phenoxide) Violet coloration

1. Riemer Tiemann reaction gives formation of ...

a) salicylic acid

b) salicylaldehyde

c) sodium phenoxide

d) Both b & c

2. Phenol gives violet coloration when treated with…

a) litmus paper

b) acidic $FeCl_3$ solution

c) aq. Neutral $FeCl_3$ solution ✓

d) None of these

INTRODUCTION TO ETHERS

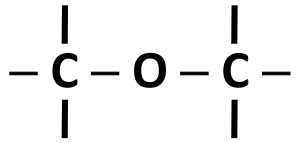
Ethers

Ethers Alkoxy or Aryloxy derivatives of alkane

IUPAC Name:Alkoxyalkane or Aryloxy alkane

i) $R - H \xrightarrow[+ OR']{- H} R - O - R'$

Alkane (Alkoxy) Ether

Functional group of Ether is 

(Ether linkage)

G.F. for aliphatic ethers $\Rightarrow$ $C_nH_{2n+2}O$ (or) C_nH_{2n+1}-O-C_nH_{2n+1}

Which is same as monohydric alcohols therefore they are functional isomers

For eg. $H_3C - CH_2 - OH$ Ethanol

& $H_3C - O - CH_3$ Dimethyl ether

MCQs

1. Ethers are…derivatives of alkane

a) alkoxy

b) aryloxy

c) Both a & b ✓

d) Alkyl or aryl

2. General representation of Ether is…

a) R – OH

b) R – O – R

c) 

d) R – COOR

3. Ethers are functional isomers of…

a) Aldehydes

b) Dihydric alcohols

c) Trihydric alcohols

d) Monohydric alcohols ✓

4. General formula for aliphatic ethers is…

a) C_nH_{2n+2}

b) $C_nH_{2n}O$

c) ✓ $C_nH_{2n+2}O$

d) None of these

ISOMERISM OF ETHERS

Classification of Ethers

Ethers

Ethers are of two types

Simple or symmetrical ethers

G.R. : R – O – R

(Both the alkyl groups which are attached to the oxygen atom are same) For eg.

$H_3C – O – CH_3$

Dimethyl ether

(or) Methoxymethane

Mixed or Unsymmetrical ethers

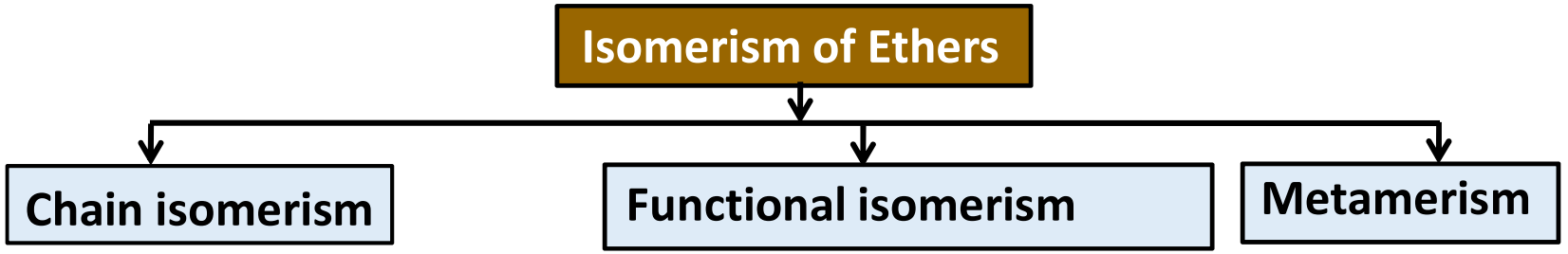
G.R. : R – O – R'

(Both the alkyl groups which are attached to the oxygen atom are different)

For eg.

$H_3C – O – C_2H_5$

Ethyl methyl ether(or) Methoxyethane



(Different arrangement of carbon chain)

For eg.

$H_3C - O - CH_2 - CH_2 - CH_2 - CH_3$

n – butyl methyl ether

&

$H_3C - O - CH_2 - CH(CH_3) - CH_3$

Isobutyl methyl ether

(Functional groups are different)

For eg.

$H_3C - O - CH_3$

Dimethyl ether

&

$H_3C - CH_2 - OH$

Ethanol

For eg.

Compounds having M.F. $C_4H_{10}O$ has the following metamers :

$H_3C - CH_2 - O - CH_2 - CH_3$

Diethyl ether
Ethoxy ethane

$H_3C - O - CH_2 - CH_2 - CH_3$

Methyl n – propyl ether
1-methoxypropane

$$H_3C - O - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{CH}} - CH_3$$

Isopropyl methyl ether
2-methoxypropane

Metamerism

Metamers are either chain or position isomers with same functional group & have different alkyl groups attached to oxygen atom

Eg.

$H_5C_2 - O - C_2H_5$ ($C_4H_{10}O$)

$H_3C - O - C_3H_7$ ($C_4H_{10}O$)

MCQs

1. $C_2H_5 – O – CH_3$ is an example of…

a) symmetrical ether

b) Mixed ether

c) unsymmetrical ether

d) Both b & c ✓

2. $H_3C - O - CH_3$ and $H_3C - CH_2 - OH$ are…of each other

a) Chain isomers

b) metamers

c) Functional isomers ✓

d) All of these

3. **Ethers having same molecular formula but different alkyl groups on either side of oxygen atom, called as...**

a) chain isomers

b) metamers ✓

c) functional isomers

d) All of these

4. **Ethers in which both alkyl groups attached to oxygen are same, are called…**

   a) simple ethers

   b) mixed ehters

   c) symmetrical ethers

   d) Both a & c ✓

NOMENCLATURE OF ETHERS

No.	Structure	Common Name
1.	$H_3C - O - CH_3$	Dimethyl ether

Think about its IUPAC name.

I.U.P.A.C. Name (Alkoxyalkane)
Methoxymethane

Nomenclature of Ethers

No.	Structure	Common Name
2.	$H_3C - O - CH_2 - CH_3$	Ethyl methyl ether

Think about its IUPAC name.

I.U.P.A.C. Name (Alkoxyalkane)
Methoxyethane

Nomenclature of Ethers

No.	Structure	Common Name
3.	$CH_3 - H_2C - O - CH_2 - CH_3$	Diethyl ether

It's IUPAC name is ..

I.U.P.A.C. Name (Alkoxyalkane)
Ethoxyethane

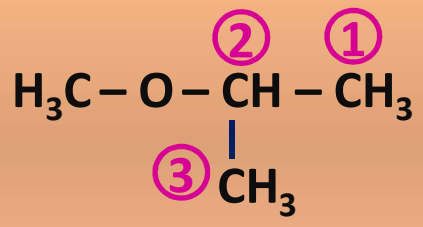
Nomenclature of Ethers

No.	Structure	Common Name
4.	$H_3C - O - \overset{①}{CH_2} - \overset{②}{CH_2} - \overset{③}{CH_3}$	Methyl n -propyl ether

I.U.P.A.C. Name (Alkoxyalkane)
1 – Methoxypropane

IUPAC name of it is--

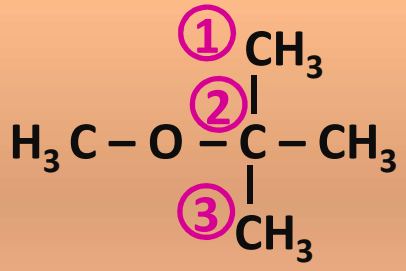
Nomenclature of Ethers

No.	Structure	Common Name
5.		isopropyl methyl ether

Now, can you tell me the IUPAC name ?

I.U.P.A.C. Name (Alkoxyalkane)
2 – Methoxypropane

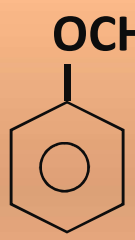
Nomenclature of Ethers

No.	Structure	Common Name
6.		tert-butyl methyl ether

I.U.P.A.C. Name (Alkoxyalkane)
2 – Methoxy – 2 – methylpropane

Now, can you tell me the IUPAC name ?

Nomenclature of Ethers

No.	Structure	Common Name
7.		Most common called as Anisole Other name based on alkyl and aryl groups Methyl phenyl ether

I.U.P.A.C. Name (Alkoxyalkane)
Methoxybenzene

IUPAC name of it is --

Nomenclature of Ethers

No.	Structure	Common Name
8.	$OCH_2 - CH_3$ 	Phenetole Other name: Ethyl phenyl ether

IUPAC name of it is --

I.U.P.A.C. Name (Alkoxyalkane)
Ethoxybenzene

MCQs

1. IUPAC name of ether in general is…

a) Alkoxyalkane

b) Alkylalkane

c) Allylalkane

d) None of these

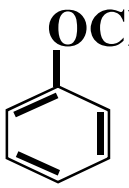
2. What is the IUPAC name of 

a) 2–Methyl–2–Methoxypropane

b) 2, 2–Dimethyl–2–methoxy ethane

c) 2–Methoxy–2–methylpropane

d) All of these

3. 

What is the name of this compound?

a) Phenyl ethoxy

b) Ethylbenzoxy

c) Ethoxy benzene ✓

d) All of these

PHYSICAL PROPERTIES OF ETHERS

Physical properties of Ethers

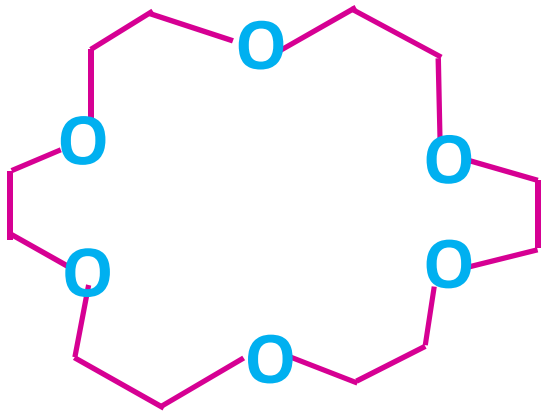
Let us go through physical properties carefully.

- Boiling points of ethers are slightly higher t… …ut much lower than that of alcohols.
- Ethers are immiscible with water because they do not form forms H – bonding with water molecule readily due to alkyl groups or hydrocarbon part.
- Dipole moment for diethyl ether is 1.18 D.
- Some ethers are Volatile and are highly inflammable.

Uses of Diethyl ether

Some important uses of Diethyl ether….

- Used as industrial solvent for oils, fats, etc.
- Used as solvent in the reaction of Grignards reagent.
- Used as refrigerant.
- A mixture of diethyl ether & ethyl alcohol, known as Natalite, which is used as fuel (substitute for petrol)



Did you come across this type of structure so far?

Imagine what it could be?

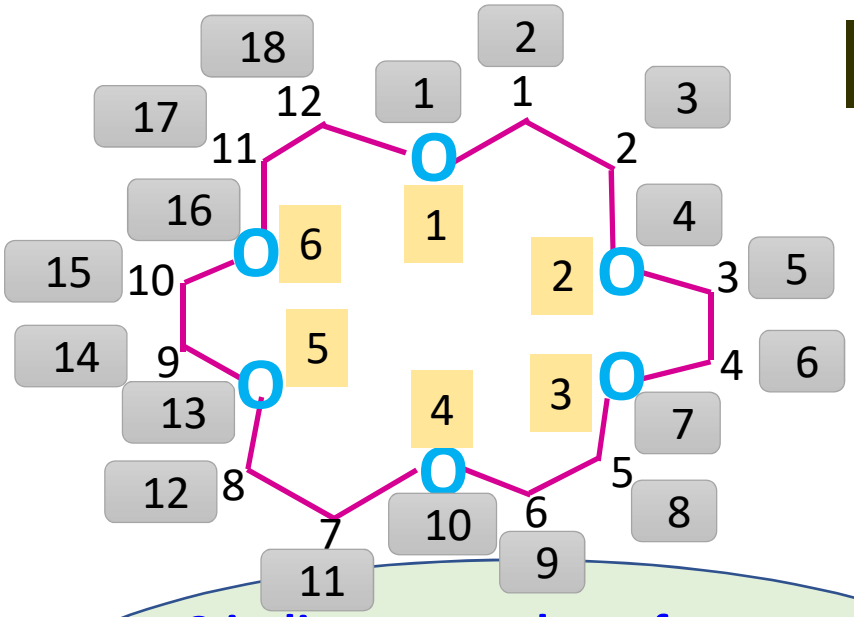
Let us travel to next slide for better understanding

Crown ethers

Charles J. Pederson discovered Macroscopic polyethers, which are the organic compounds with molecules containing large rings of carbon & oxygen atoms, called crown ethers.

Crown ethers are named as n – crown – m, where , n is the total number of atoms
and m is the number of oxygen atoms in the ring.

The number of carbons=total number of atoms- number of oxygen atoms.
The first crown ether synthesized is
18 – crown – 6.



Structure of 18 – crown – 6

1 to 6 are oxygens

1 to 12 are carbons

1 to 18 total number of atoms.

6-indicates number of oxygens

18 -indicates number of atoms including carbons

Number of carbons =18-6=12

MCQs

1. Boiling points of ethers are lower than that of…

a) Carboxylic acids

b) Alcohol ✓

c) Amides

d) all of these

2. Those ethers which are… in nature, are highly inflammable

a) Non – volatile

b) Volatile ✓

c) Both a & b

d) None of these

3. Natalite is…

a) diethyl ether and methyl alcohol

b) dimethyl ether and methyl alcohol

c) diethyl ether and ethyl alcohol

d) diethyl ether and propyl alcohol

4. The first crown ether to be synthesized was…

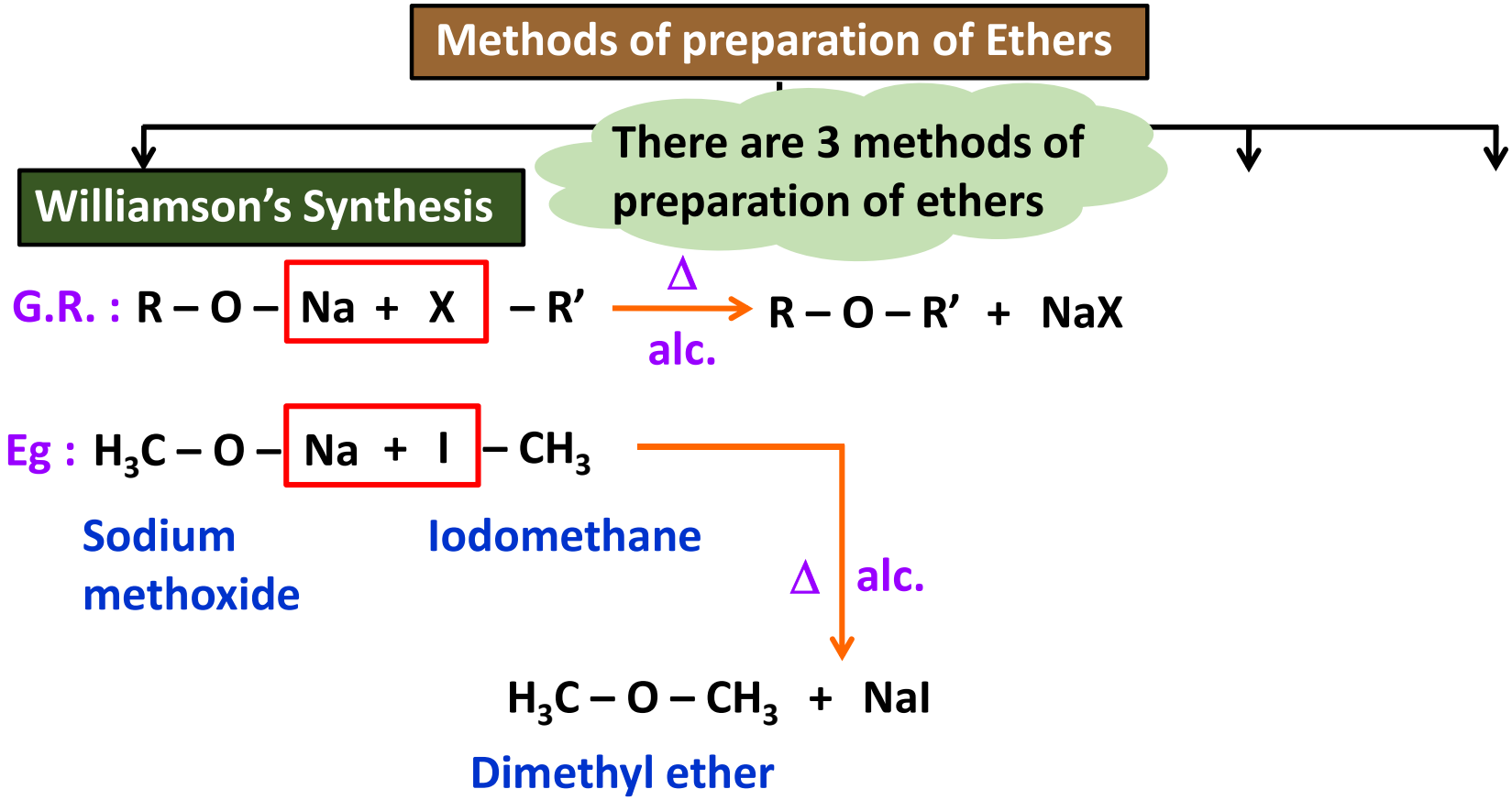
a) 16 – crown –6

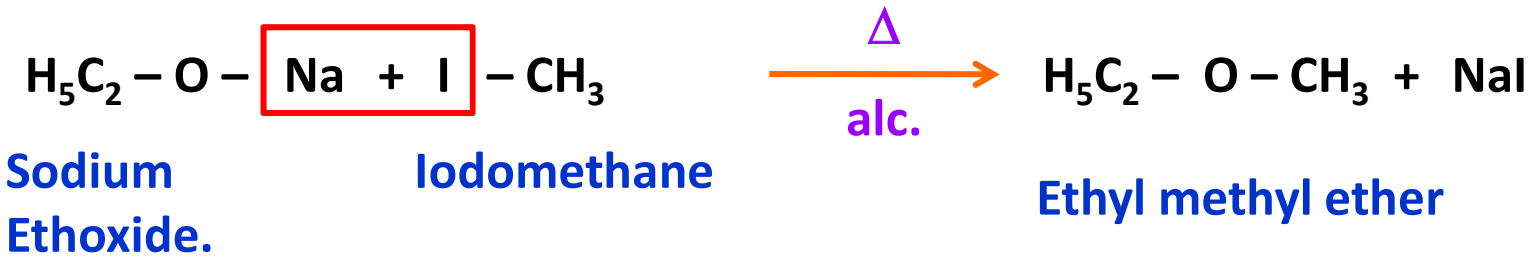
b) 14 – crown –6

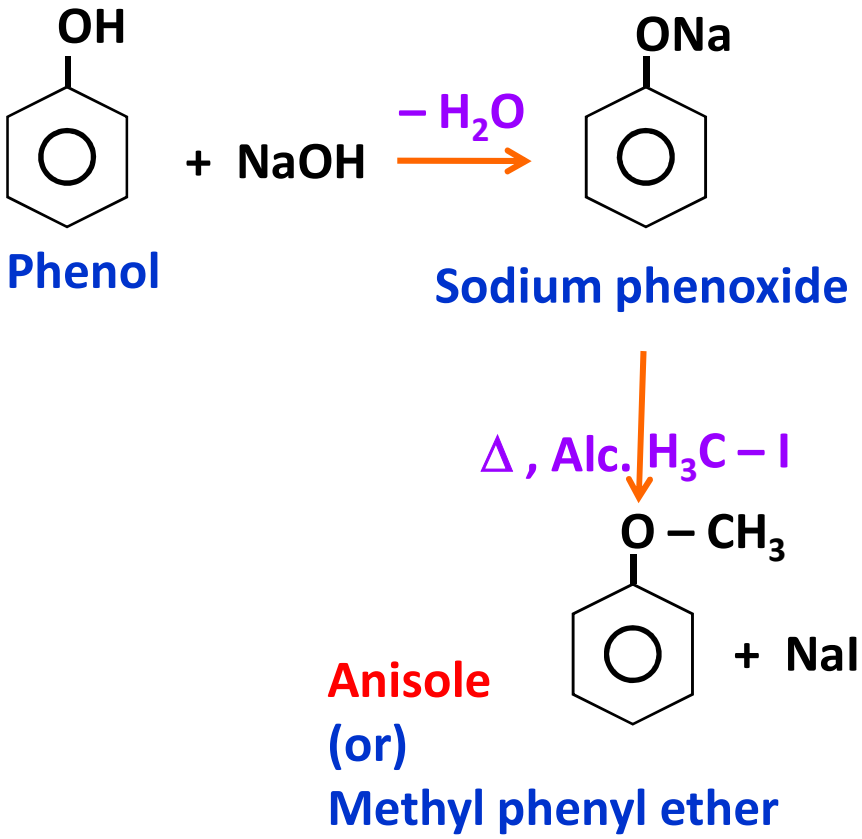
c) 17 – crown – 6

d) 18 – crown – 6 ✓

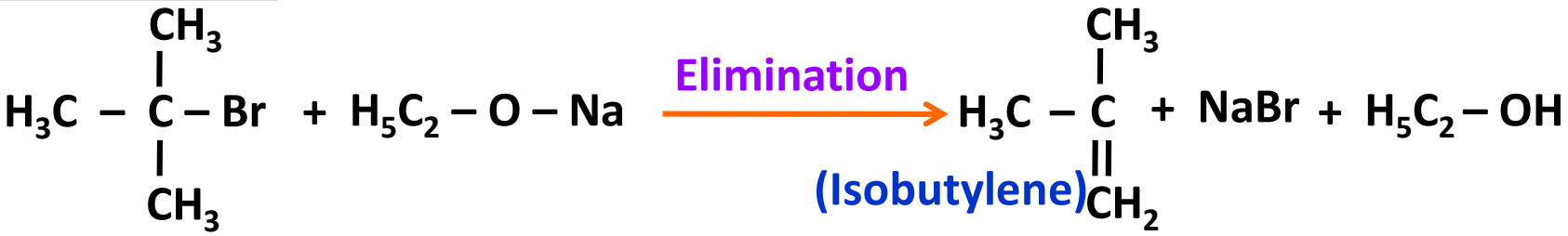
PREPARATION OF ETHERS


Methods of preparation of Ethers
There are 3 methods of preparation of ethers
Williamson's Synthesis
G.R. : R – O – Na + X – R'
Δ
alc.
R – O – R' + NaX
Eg : H3C – O – Na + I – CH3
Sodium methoxide
Iodomethane
Δ alc.
H3C – O – CH3 + NaI
Dimethyl ether


H5C2 – O – Na + I – CH3
Δ
alc.
H5C2 – O – CH3 + NaI
Sodium Ethoxide.
Iodomethane
Ethyl methyl ether


OH
+ NaOH
– H_2O
ONa
Phenol
Sodium phenoxide
Δ , Alc. $H_3C – I$
O – CH_3
+ NaI
Anisole
(or)
Methyl phenyl ether

Limitation



Tert – butyl bromide (3^0)

Only 1^0 alkyl halide is used in this method, because 2^0 & 3^0 alkyl halide gives alkene on Elimination.

Methods of preparation of Ethers

From Alcohol & Diazomethane

G.R. : $R-OH + CH_2N_2 \xrightarrow[HBF_4]{\Delta} R-O-CH_3 + N_2\uparrow$

(Alcohol) (diazomethane) (Ether)

Eg :

$H_3C-OH + CH_2N_2 \xrightarrow[HBF_4]{\Delta} H_3C-O-CH_3 + N_2\uparrow$

(Methanol) (dimethyl ether)

$H_5C_2-OH + CH_2N_2 \xrightarrow[HBF_4]{\Delta} H_5C_2-O-CH_3 + N_2\uparrow$

(Ethanol) Ethyl methyl ether

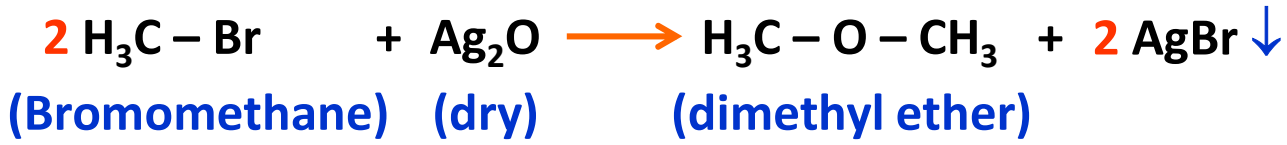
Limitation

Only Methyl ethers are obtained by this method.

Diethyl ether can’t be prepared by this method.

Methods of preparation of Ethers

- With dry Ag_2O



MCQs

1. Methyl iodide when heated with alcoholic sodium ethoxide, product is…

a) diethyl ether

b) ethyl methyl ether ✓

c) diethyl ether

d) all of these

2. In Williamson's synthesis, only…alkyl halide is used

a) Secondary (2^0)

b) Tertiary (3^0)

c) Primary (1^0) ✓

d) all of these

3. Only…ethers are obtained from alcohols and diazomethane

a) ethyl

b) diethyl

c) dimethyl

d) methyl ✓

4. Bromomethane on treatment with dry Ag_2O, gives…

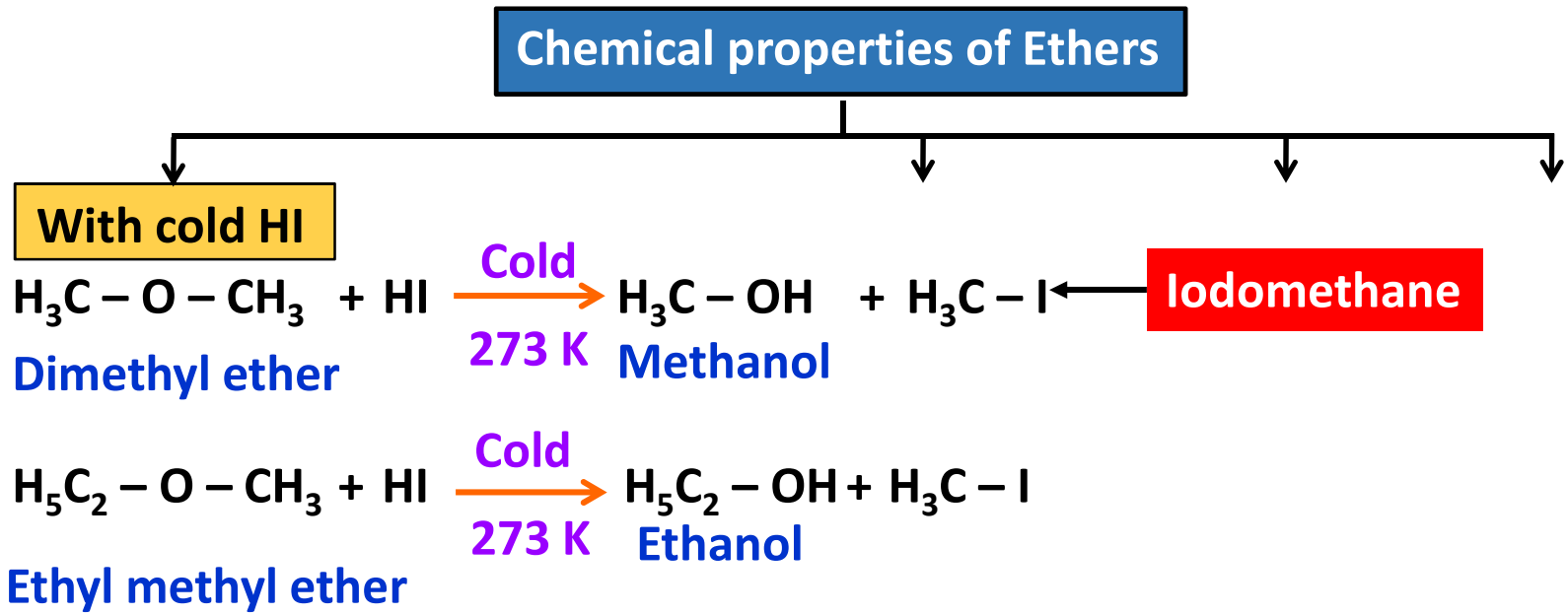
a) diethyl ether

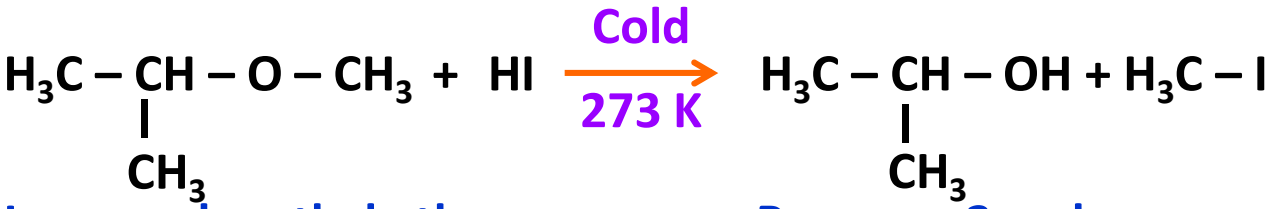
b) ethyl methyl ether

c) dimethyl ether ✓

d) All of these

CHEMICAL PROPERTIES OF ETHERS


Chemical properties of Ethers
With cold HI
$H_3C - O - CH_3 + HI \xrightarrow[273\ K]{Cold} H_3C - OH + H_3C - I$
Iodomethane
Dimethyl ether
Methanol
$H_5C_2 - O - CH_3 + HI \xrightarrow[273\ K]{Cold} H_5C_2 - OH + H_3C - I$
Ethyl methyl ether
Ethanol

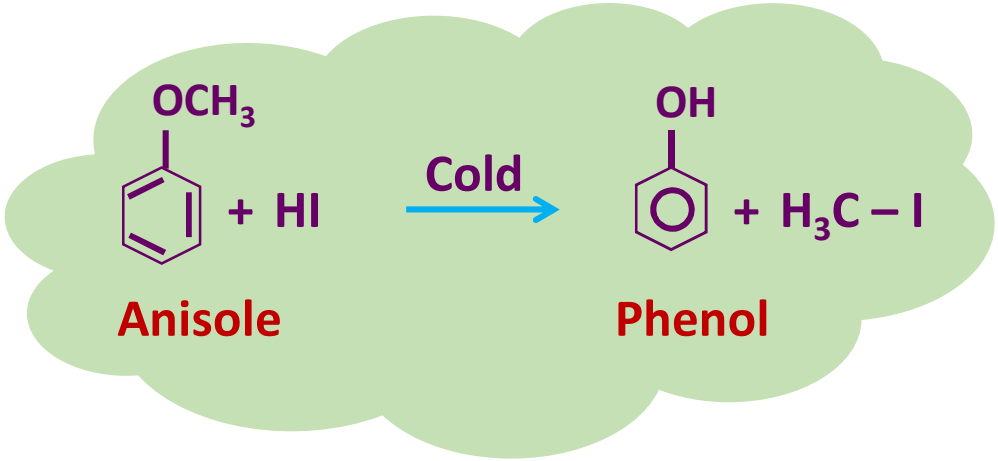


Isopropyl methyl ether

Propan – 2 – ol

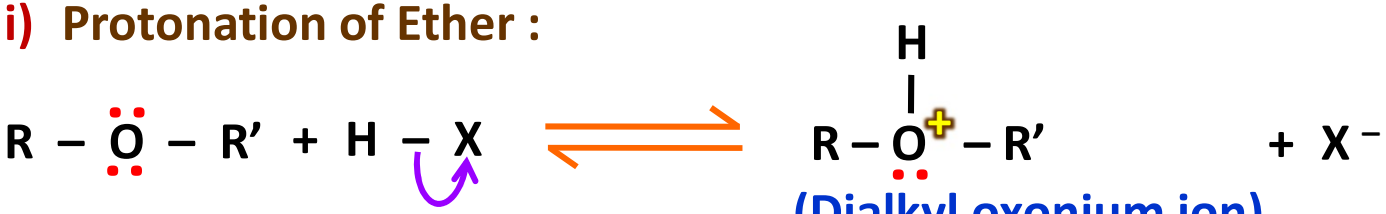
Tert. – butyl methyl ether

Tert. – butyl iodide


OCH3
+ HI
Cold
OH
+ H3C – I
Anisole
Phenol

Mechanism

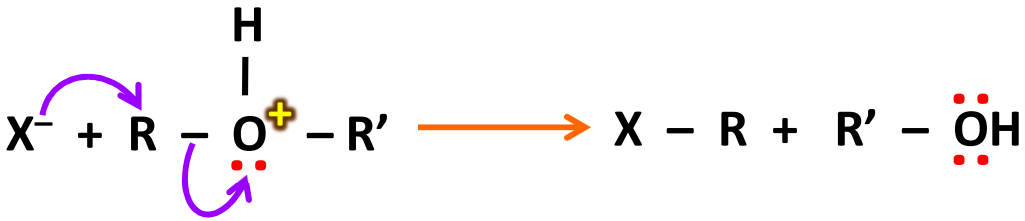
i) Protonation of Ether :



(Dialkyl oxonium ion)

ii) SN^2 cleavage :

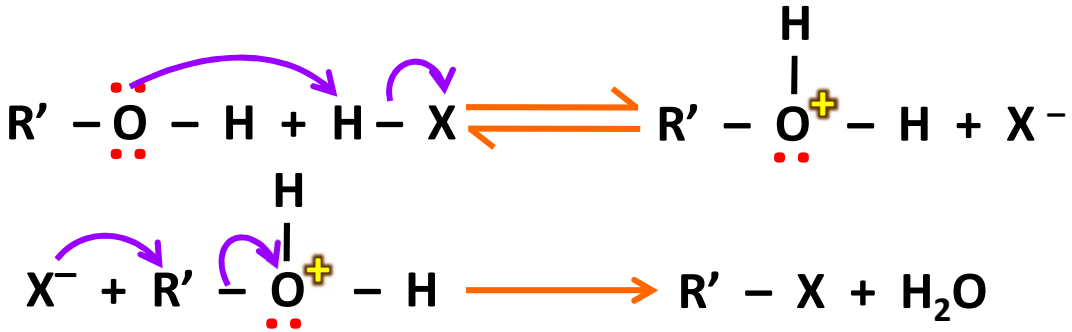
(a) If alkyl groups are 1^0 or 2^0 then lower alkyl group forms alkyl halide

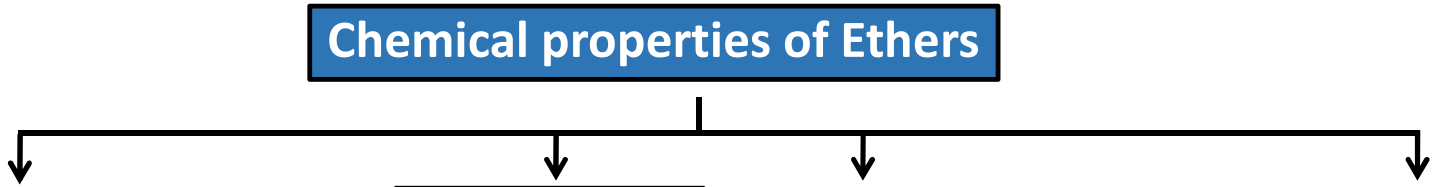


(b) If alkyl group is tertiary then tertiary alkyl halide is formed.

(Carbocation)

iii) At high temperature alcohol molecule reacts with excess of HX to give alkyl halide :





Let us see reaction of ether with Hot HI

$H_3C - O - CH_3 + 2\ HI \xrightarrow{373\ K} {}_{3}C - I + H_2O$

Dimethyl ether)

$H_3C - O - C_2H_5 + 2\ HI \xrightarrow{\Delta,\ 373\ K}$

Ethyl methyl ether)

$H_3C - I + H_5C_2 - I + H_2O$

Isopropyl methyl ether)

MCQs

1. $CH_3 - O - CH_3 + HI \xrightarrow{\text{Hot}}$

a) CH_3I, CH_3OH

b) CH_3I, CH_4

c) CH_3OH, CH_3OH

d) CH_3I ✓

2. $C_2H_5 - O - CH_3 + HI \xrightarrow{\text{Cold}}$

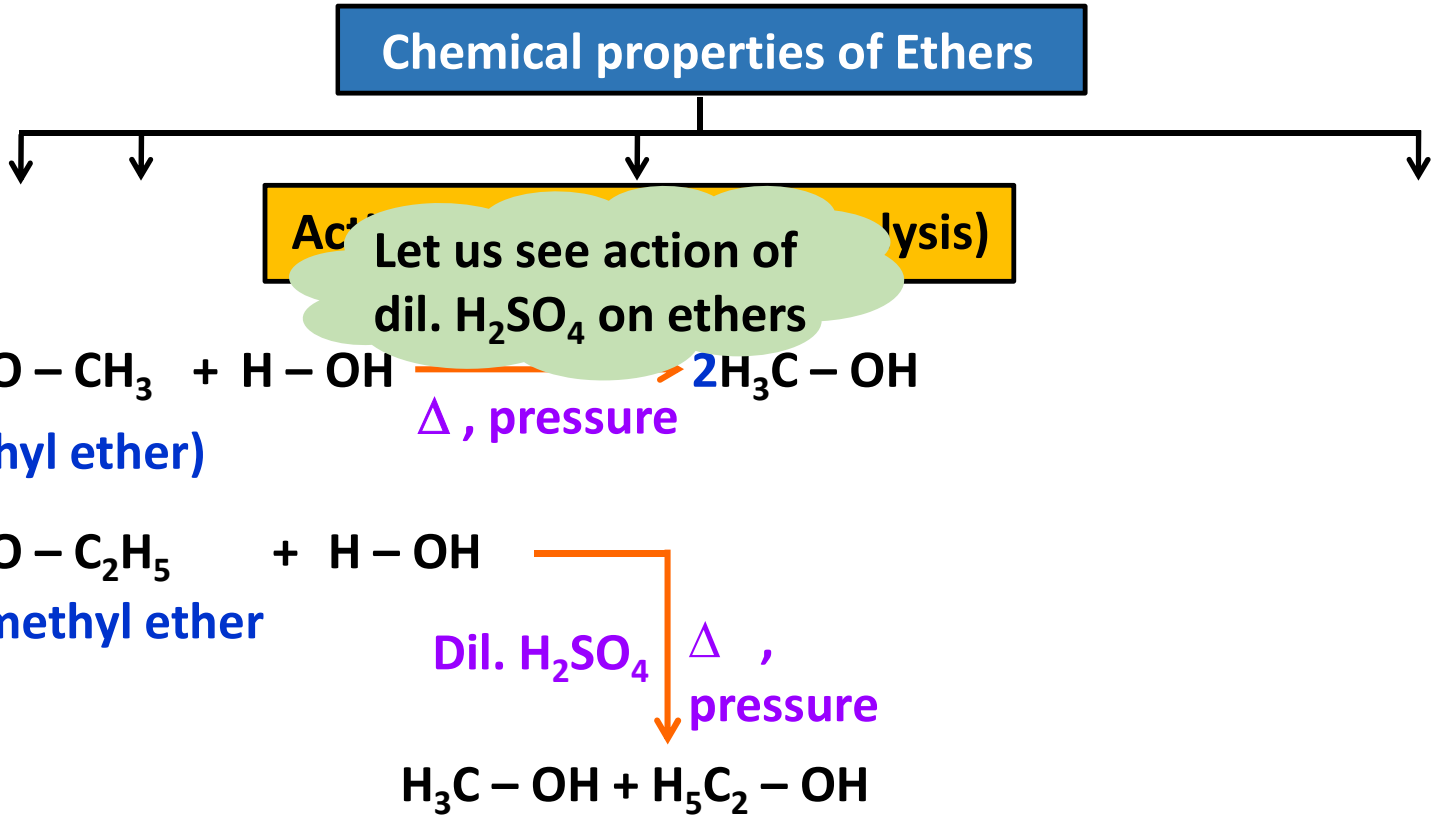
a) C_2H_5I, CH_3OH

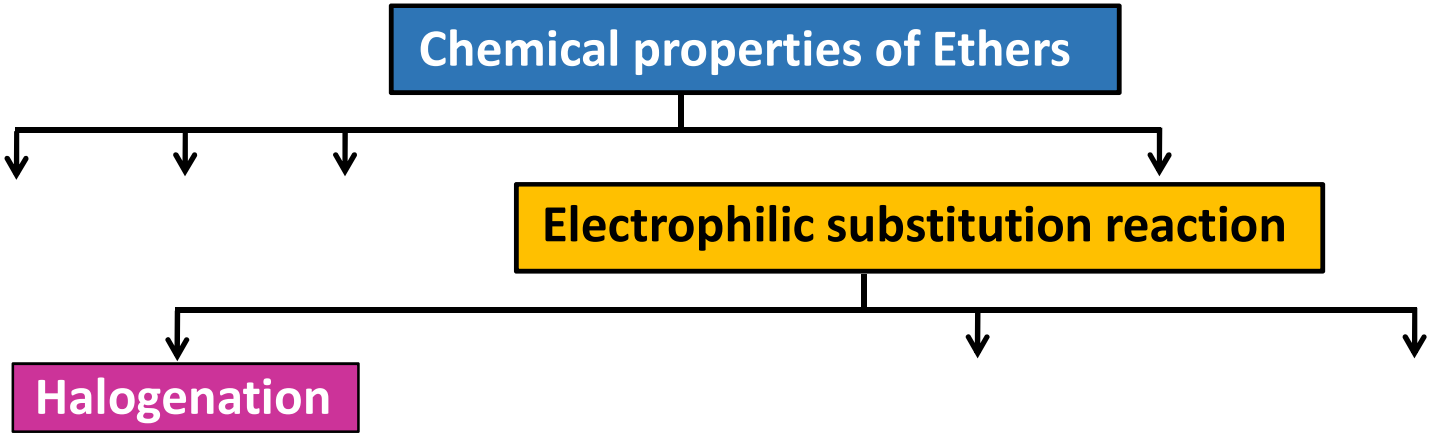
b) CH_3I, C_2H_5I

c) CH_3I, C_2H_5OH

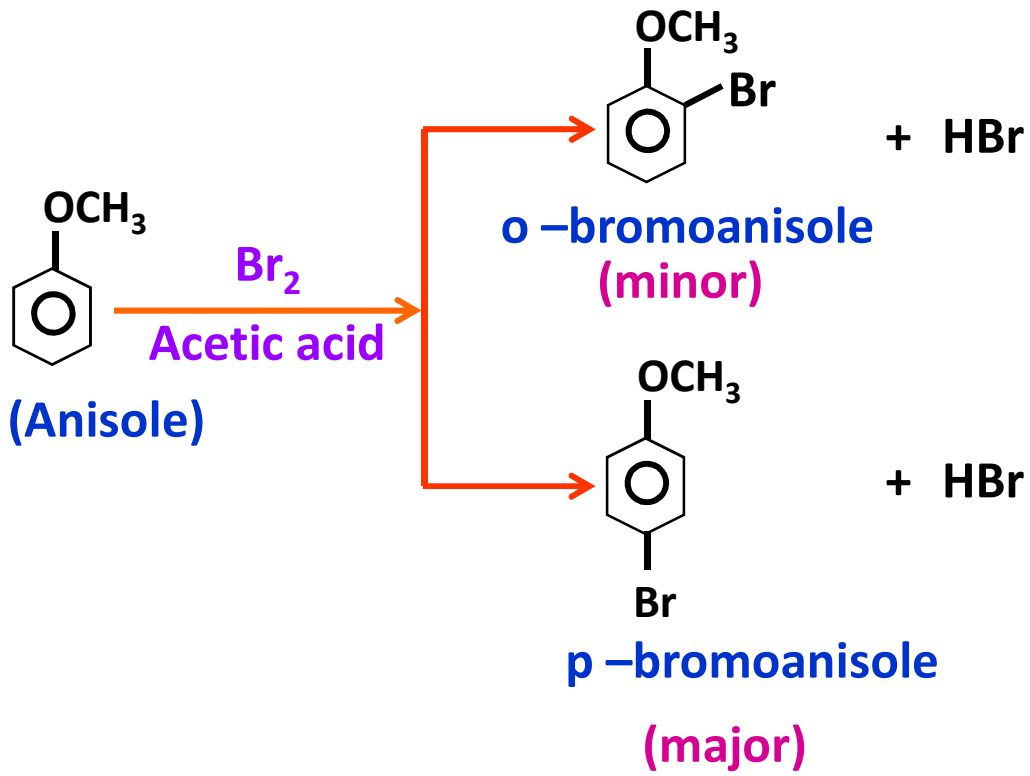
d) C_2H_5OH, CH_3OH

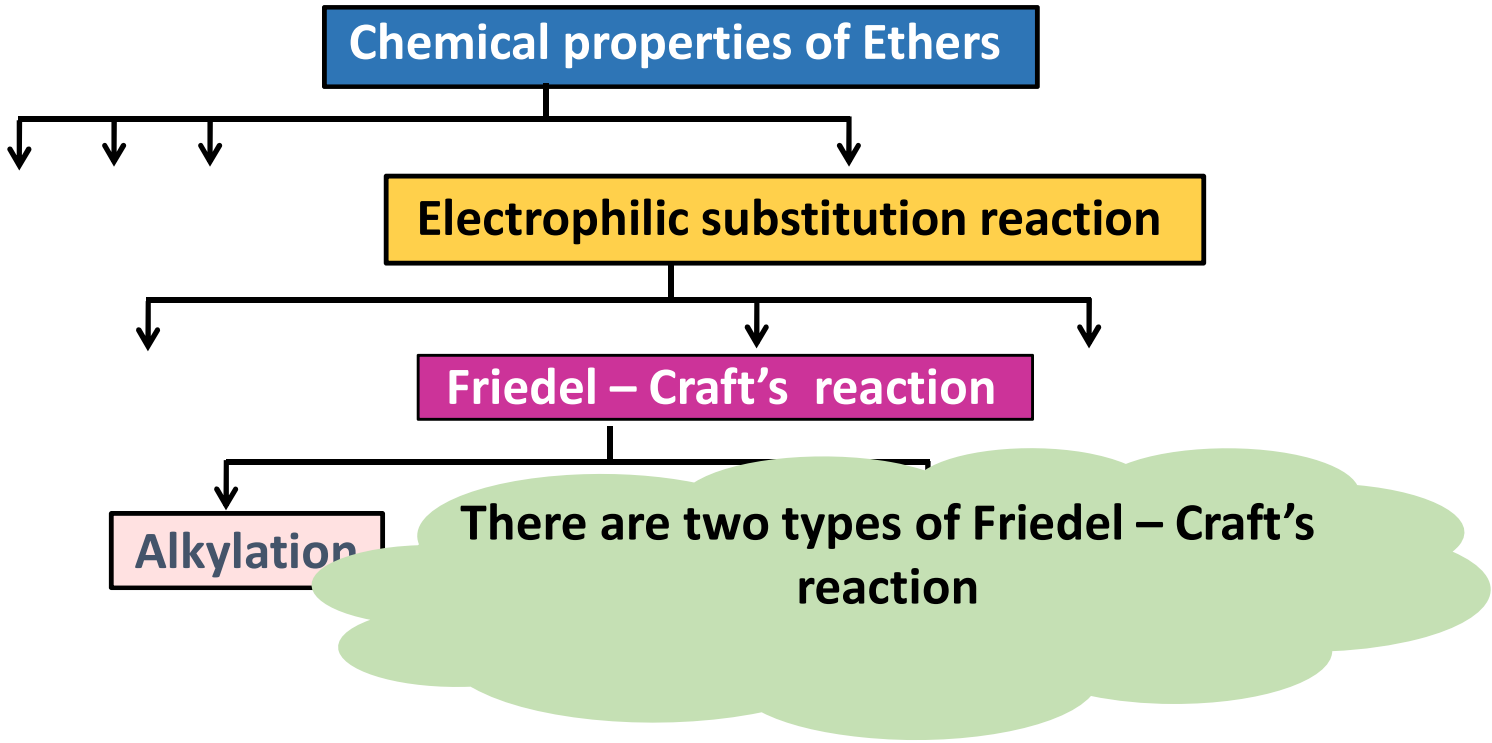
ELECTROPHILIC SUBSTITUTION REACTION OF ETHERS

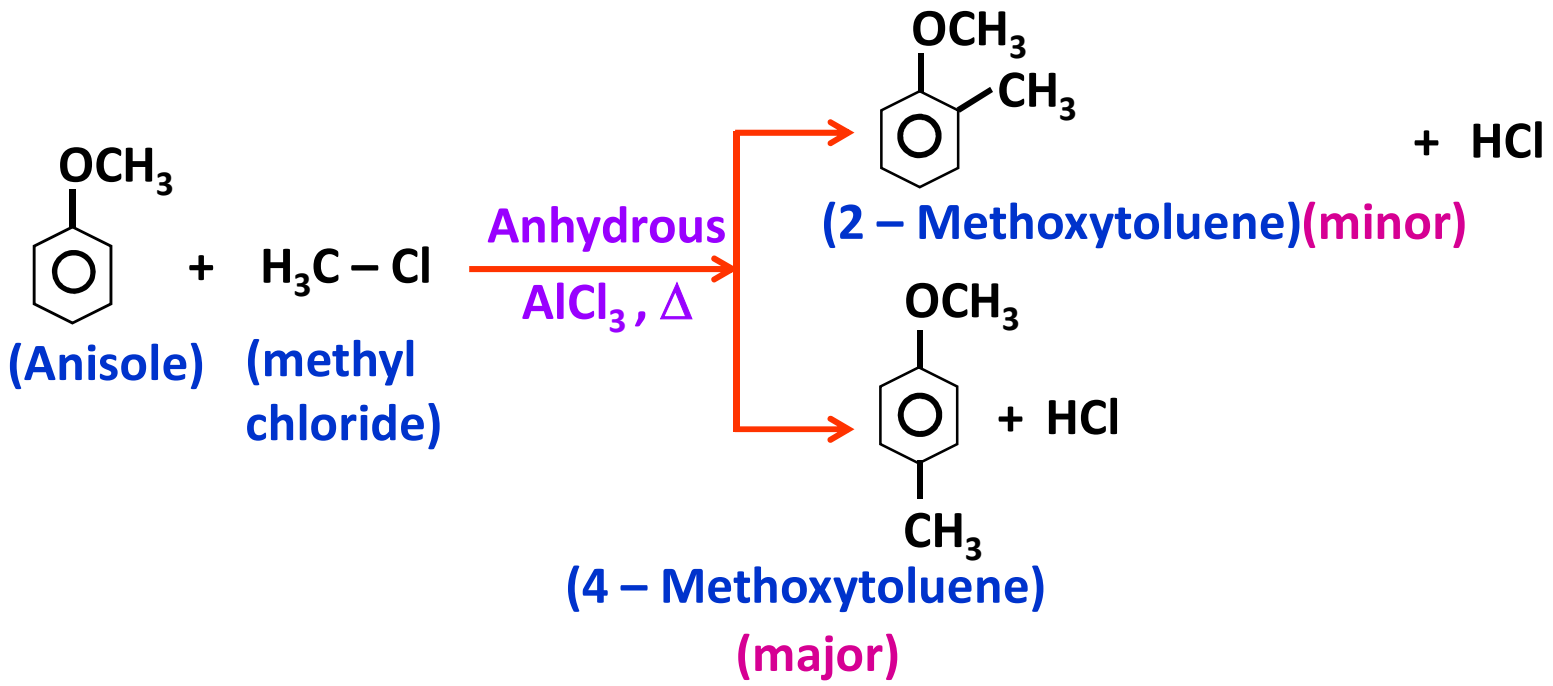

Chemical properties of Ethers
Let us see action of dil. H_2SO_4 on ethers
$H_3C – O – CH_3$ + H – OH
$2H_3C – OH$
Δ , pressure
Dimethyl ether)
$H_3C – O – C_2H_5$ + H – OH
Ethyl methyl ether
Dil. H_2SO_4
Δ , pressure
$H_3C – OH + H_5C_2 – OH$

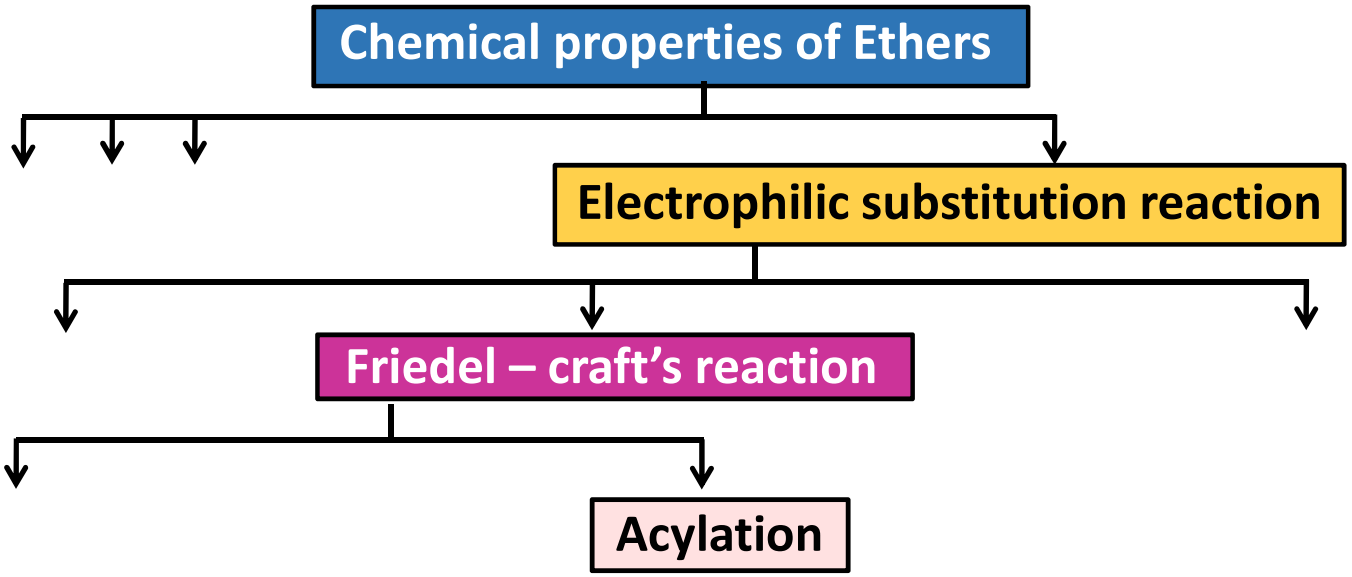


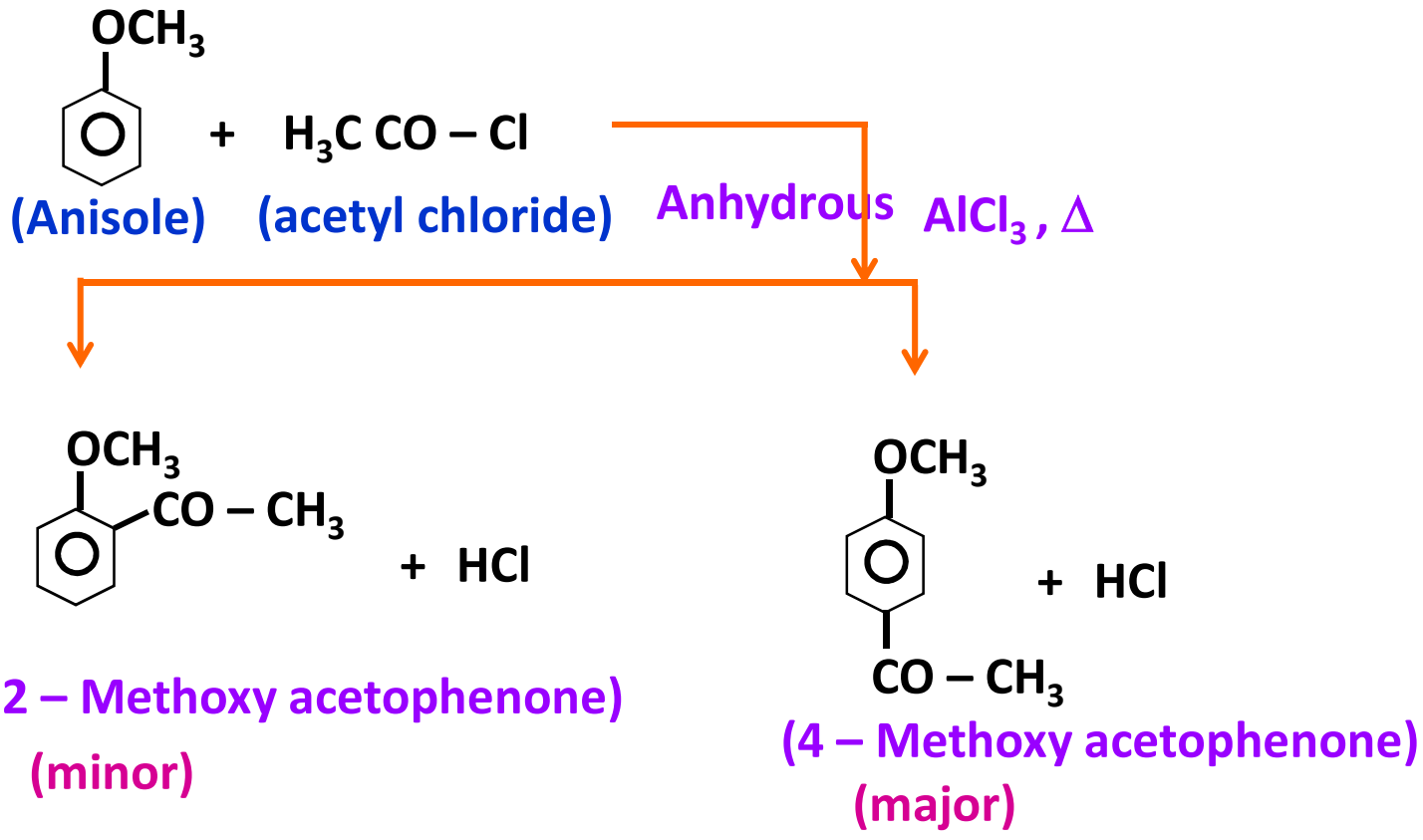
There are three types of electrophilic substitution reactions

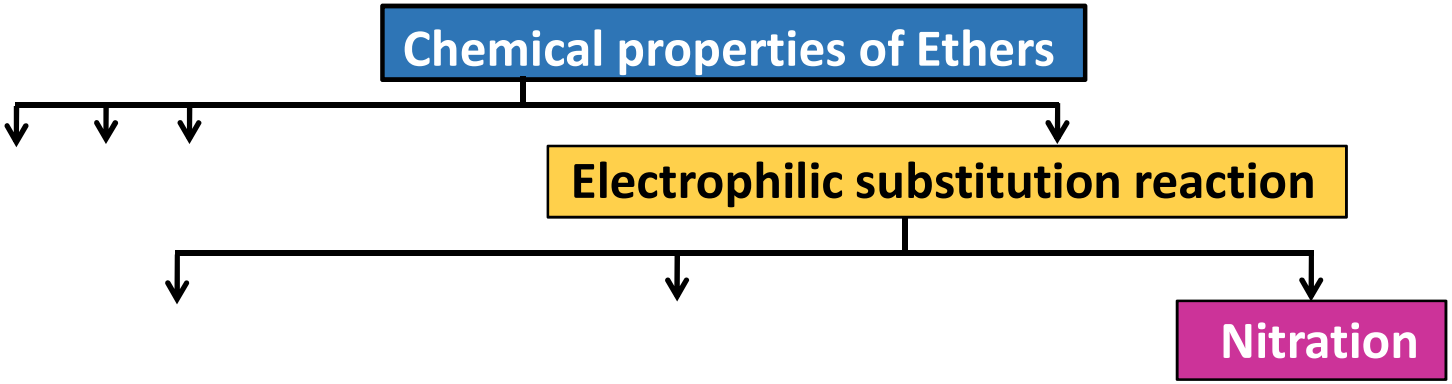

OCH3
Br2
Acetic acid
(Anisole)
OCH3
Br
+ HBr
o –bromoanisole
(minor)
OCH3
Br
+ HBr
p –bromoanisole
(major)

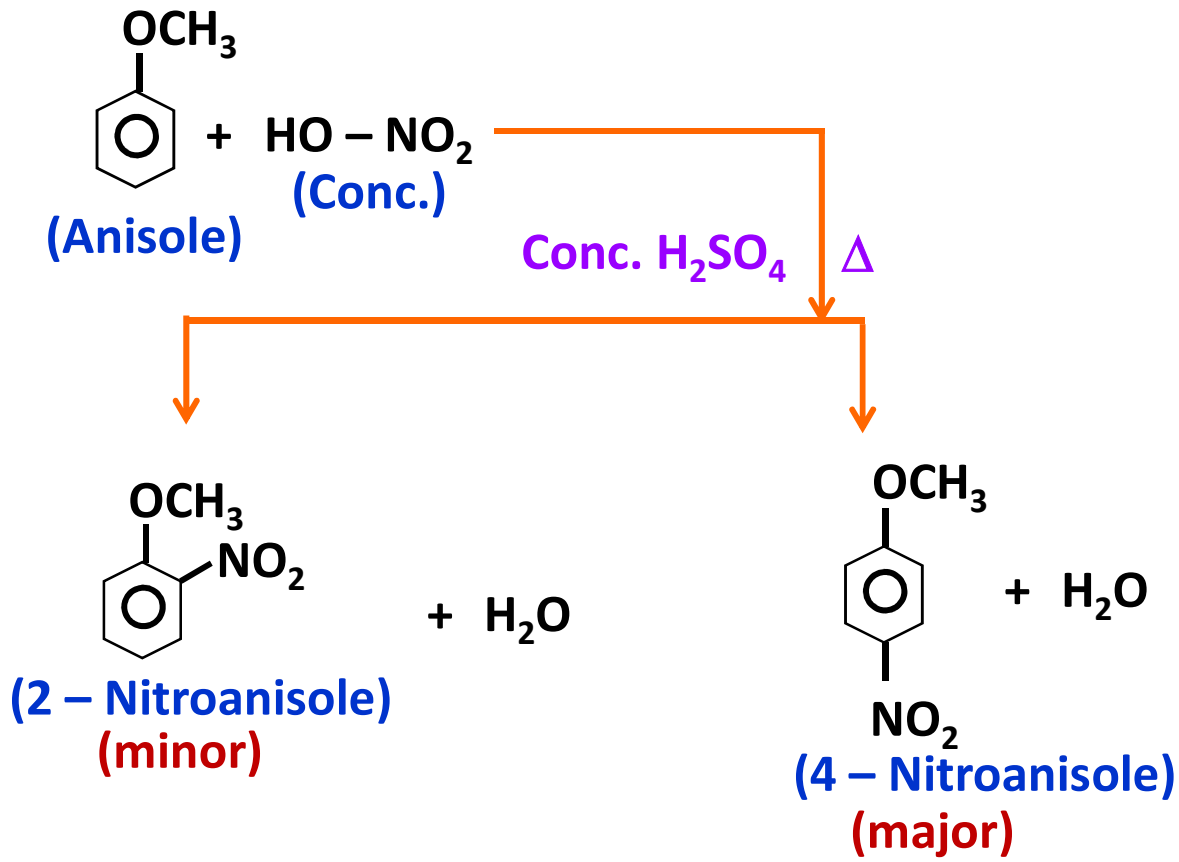

Chemical properties of Ethers
Electrophilic substitution reaction
Friedel – Craft's reaction
Alkylation
There are two types of Friedel – Craft's reaction


OCH3
+ H3C – Cl
(Anisole)
(methyl chloride)
Anhydrous
AlCl3 , Δ
OCH3
CH3
+ HCl
(2 – Methoxytoluene)(minor)
OCH3
+ HCl
CH3
(4 – Methoxytoluene)
(major)


Chemical properties of Ethers
Electrophilic substitution reaction
Friedel – craft's reaction
Acylation


OCH3
+ H3C CO – Cl
(Anisole)
(acetyl chloride)
Anhydrous AlCl3 , Δ
OCH3
CO – CH3
+ HCl
(2 – Methoxy acetophenone)
(minor)
OCH3
+ HCl
CO – CH3
(4 – Methoxy acetophenone)
(major)


Chemical properties of Ethers
Electrophilic substitution reaction
Nitration


OCH3
+ HO – NO2
(Conc.)
(Anisole)
Conc. H2SO4
Δ
OCH3
NO2
+ H2O
(2 – Nitroanisole)
(minor)
OCH3
+ H2O
NO2
(4 – Nitroanisole)
(major)

MCQs

1. Anisole when treated with Br_2 in acetic acid gives,

a) o – bromoanisole

b) m – bromoanisole

c) p – bromoanisole

d) Both a & c ✓

2. Anisole when heated with acetyl chloride in presence of anhydrous $AlCl_3$…

a) 2 – methoxyacetophenone

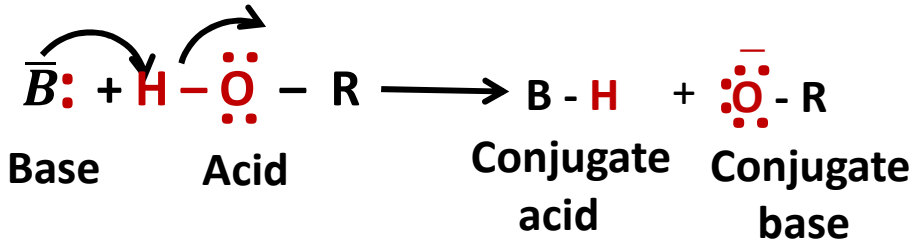
b) 3 – methoxyacetophenone

c) 4 – methoxyacetophenone

d) Both a & c

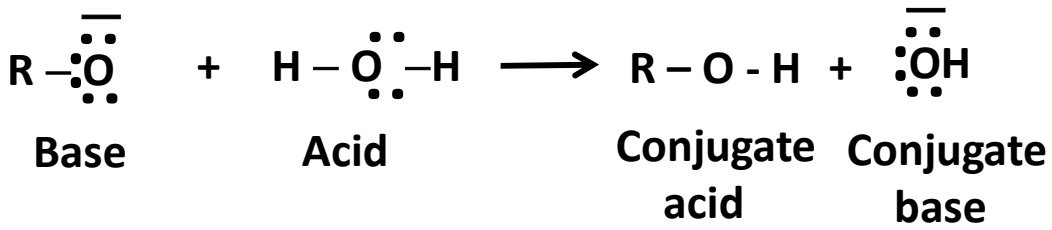
Acidic nature of Alcohols , Phenols & Ethers

The reactions show that alcohols and phenols are acidic in nature. In fact, alcohols and phenols are brownsted acids i.e., they can donate a proton to a stronger base (B:).



Alcohols are however, weaker acids than water.

`This can be illustrated by the reaction of water with an alkoxide.



This reaction shows that water is a better proton donor (i.e., stronger acid) than alcohol.

Also, in the above reaction, we note that alkoxides are strong bases (sodium ethoxide is a stronger base than sodium hydroxide).

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