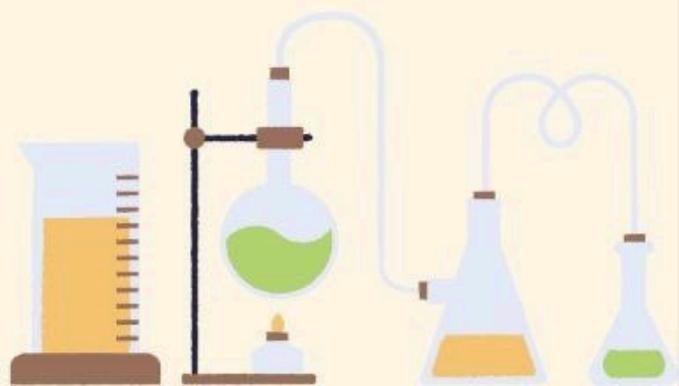


Organic Chimestry

Chapter 7 summary

written by: roaa olimat

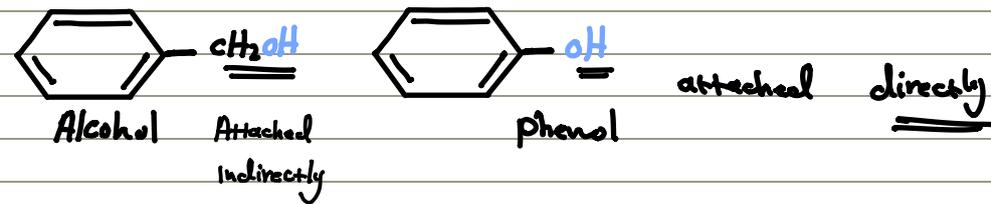
Edited by: malak altaji



Chapter 7: Alcohol and Phenols

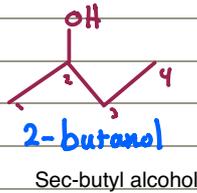
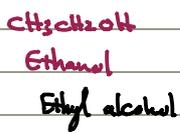
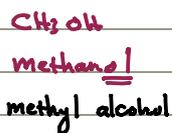
Alcohols :- Have a general Formula (R-OH) where OH \rightarrow Hydroxyl group

Phenols :- Have OH group attached **directly** to **benzene ring**

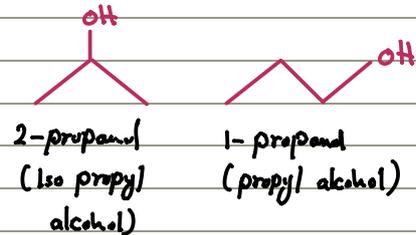


Nomenclature of alcohol \rightarrow IUPAC system

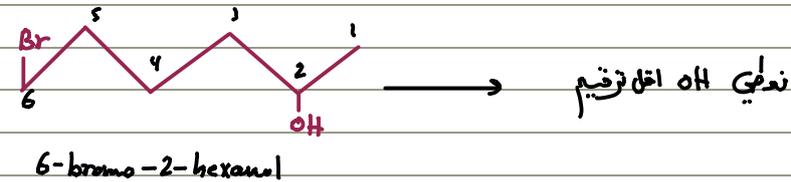
Example:-



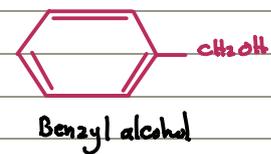
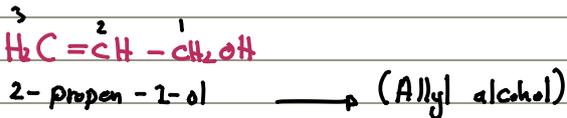
Common name



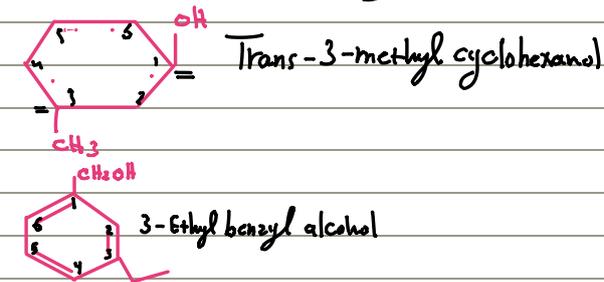
The Relationship between them is **Constitutional Isomers**



الكحول من ناحية الترقيم تقدم من :-
I فاليه الأريل
II للأرين
III الأليفات



Note: Benzyl alcohol is optically inactive



Have two Substituents:

1 $CH_2=CH-R$ vinyl

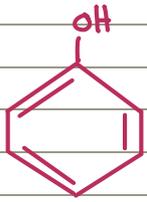
2 $H_2C=CHCl$ vinyl chloride

3 $H_2C=C(H)-CH_2-R$ Allyl

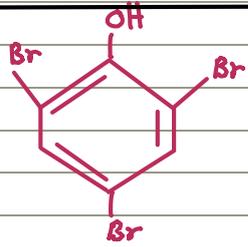
4 $H_2C=C(H)-CH_2Br$ Allyl bromide

ملاحظة :- إذا كانت OH موجودة مع CHO أو COOH تكون مصفحة

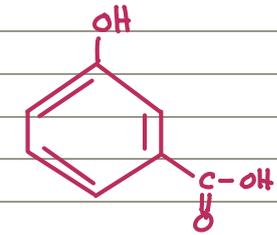
Nomenclature of phenols:-



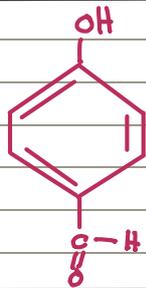
Phenol



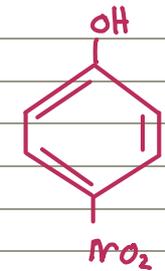
2,4,6-Tribromophenol



m-hydroxybenzoic acid



p-hydroxybenzo aldehyde



4-Nitrophenol

Classification of alcohols

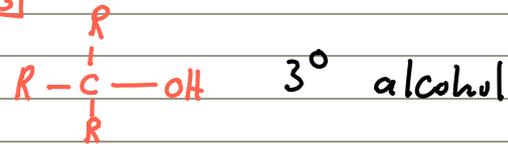
1



2



3



physical properties of alcohol:-

1 They can form hydrogen bond among their molecules

2 Have high boiling points compared to ethers and hydro carbons

3 low molar masses of alcohols are soluble in water →

الكحول الذي له أعلى عدد ذرات كربون له أعلى BP

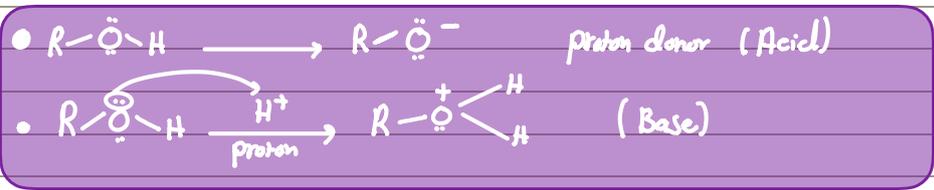
إذا كانت الكحولات تمتلك نفس عدد ذرات الكربون فالكحول

الذي يمتلك أكثر تفرع و spherical أكثر يكون أقل BP

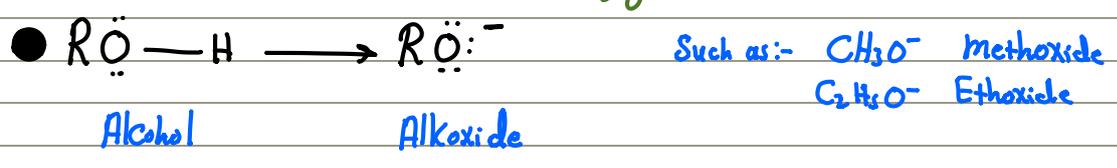
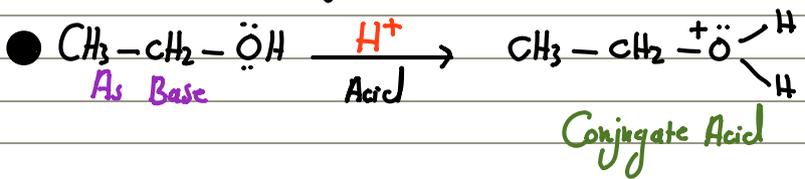
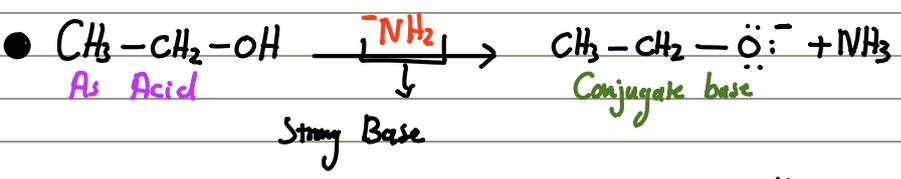
الملاقة بين molar mass للكحول
" عدد ذرات الكربون " مع الذائبية في الماء عكسية

* ال Solubility ارفع كلما كان التفرعات
أكثر بمعنى more spherical الذائبية بتزيد

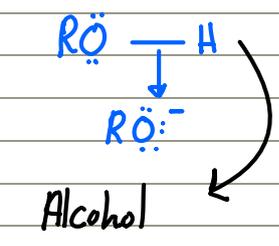
Acidity and basicity :- of alcohol



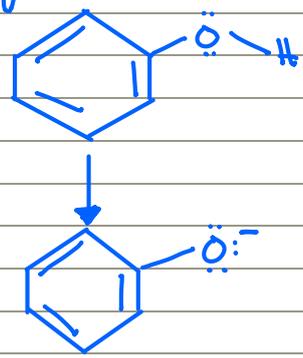
Important Examples :-



Now which one is a stronger acid?



or



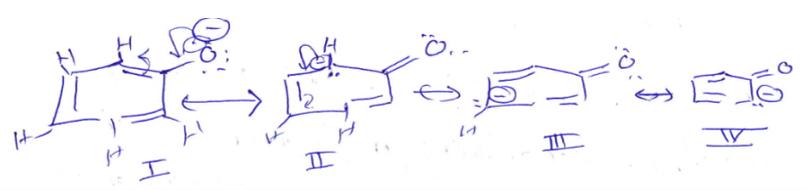
phenols

The stronger acid because the -ve charge in the phenoxide anion is delocalized through resonance structure

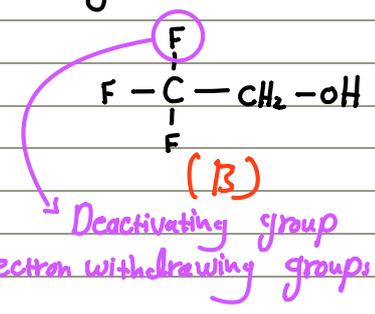
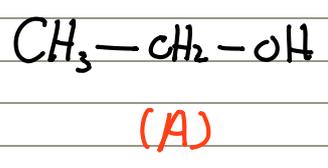
The negative charge localized on the oxygen atom

لا يوجد Resonance في ذرة الكربون المحيطة بالأكسجين لأنها sp3

* الكحول اصعب من الفينول



Example :- which one is a stronger acid?



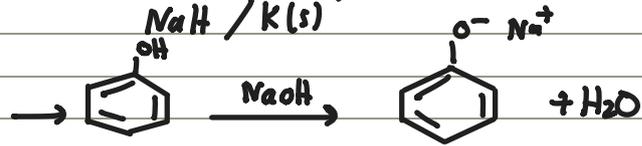
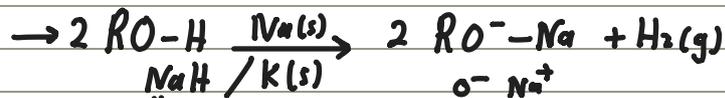
Answer: B

Deactivating group electron withdrawing groups
 ساحب للإلكترونات

	Substituent group	Name of group	
Ortho, Para-Directing	$-\ddot{N}H_2, -\ddot{N}HR, -\ddot{N}R_2$	amino	Activating
	$-\ddot{O}H, -\ddot{O}CH_3, -\ddot{O}R$	hydroxy, alkoxy	
	$\begin{matrix} O \\ \\ -NHC-R \end{matrix}$	acylamino	
	$-CH_3, -CH_2CH_3, -R$	alkyl	
	$-F, -Cl, -Br, -I$	halo	
Meta-Directing	$\begin{matrix} :O: \\ \\ -C-R \end{matrix}$	acyl, carboxy	Deactivating
	$\begin{matrix} :O: \\ \\ -C-\ddot{O}H \end{matrix}$	carboxamido, carboalkoxy	
	$\begin{matrix} :O: \\ \\ -C-NH_2 \end{matrix}$	carboxamido, carboalkoxy	
	$\begin{matrix} :O: \\ \\ -C-\ddot{O}H \end{matrix}$	sulfonic acid	
	$-C\equiv N:$	cyano	
	$\begin{matrix} :O: \\ \\ -N-\ddot{O}: \\ \\ :O: \end{matrix}$	nitro	

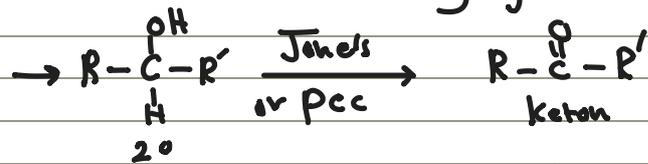
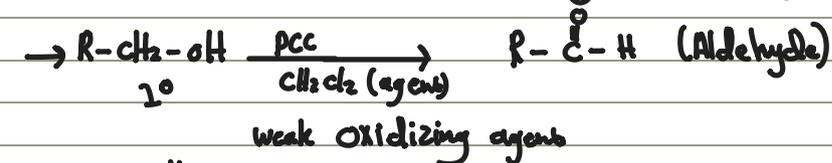
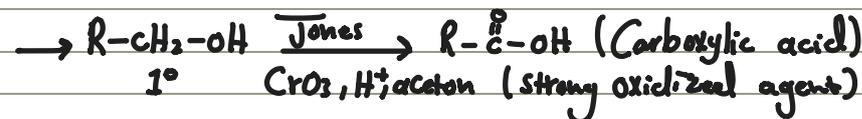
Reactions

Rule 1: Acidity of Alcohols and phenols



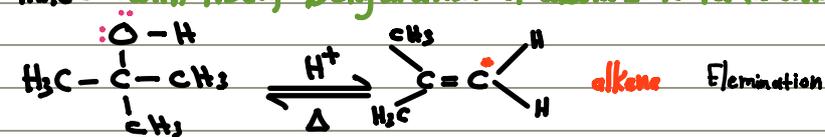
الكحول لا تتفاعل مع NaOH لانها تعتبر حموض ضعيفه لا تتفاعل مع قاعده قويه

Rule 2: Oxidation of Alcohols :-

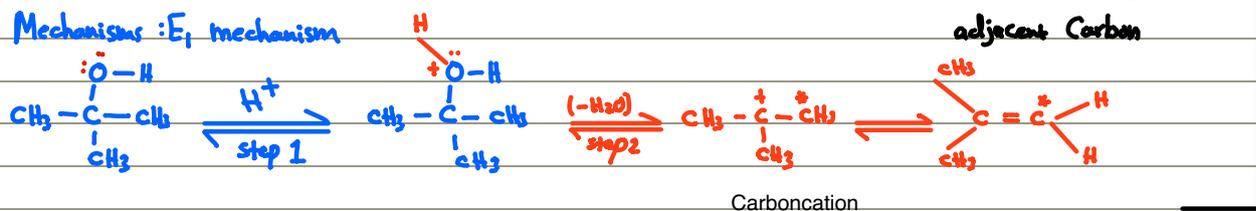


→ 3° alcohol can't be oxidized

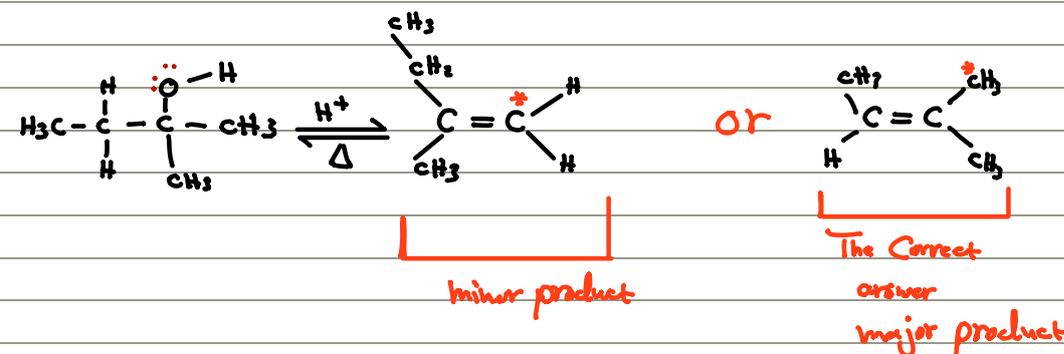
Rule 3: with H₂SO₄ Dehydration of alcohols to form alkenes (Removal of H₂O) ✨. Elimination ✨



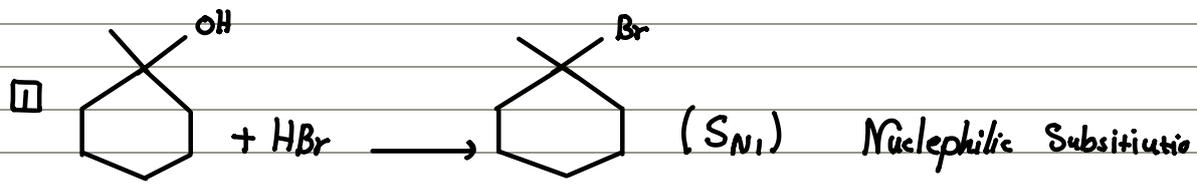
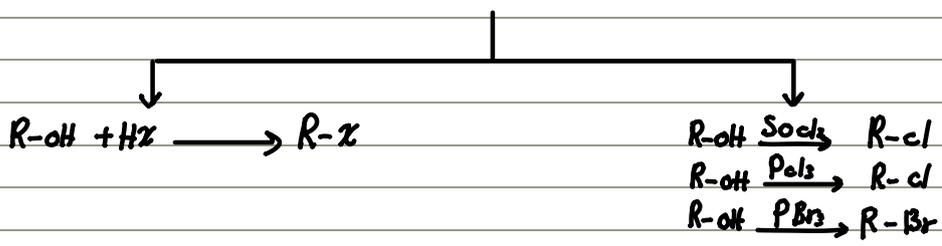
Mechanism: E₁ mechanism



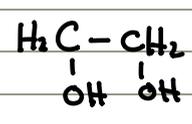
This reaction is multistep



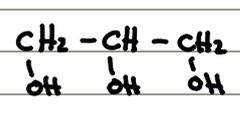
Rule 2: Final reaction of alcohols: preparation of alkyl halides from alcohols:-



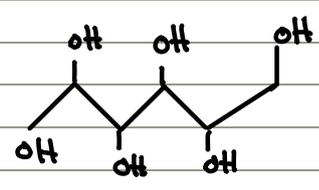
* Alcohols with more than one hydroxyl group



Ethylene glycol
(1,2 - Ethanediol)

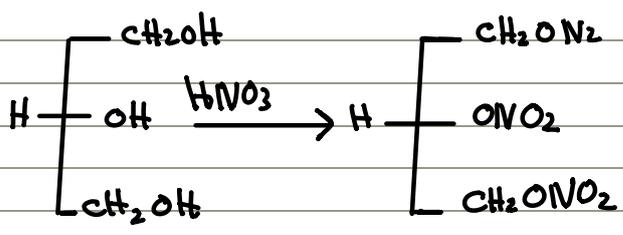


glycerol

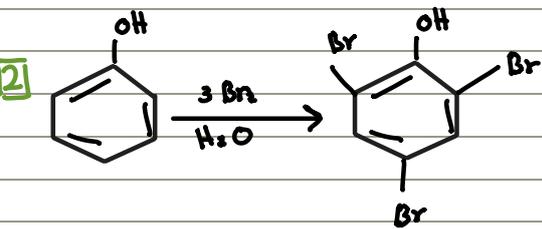


Sorbitol

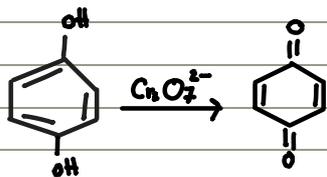
* Have high b.p and miscible with H₂O



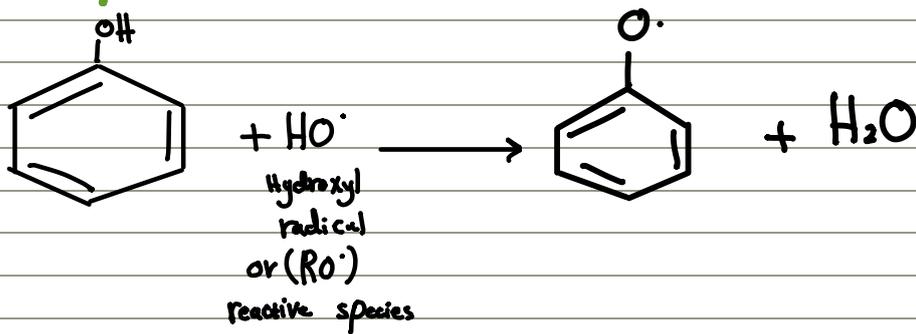
Reactions of phenols



3 Oxidation of phenol



7.16 phenols as antioxidants



Thiols have a general formula RSH

* $-\text{SH}$ is called sulfhydryl groups

* Mercaptans are thiols

* CH_3SH
methan thiol
(methyl mercaptan)

1-butan thiol
(n-butyl Mercaptan)

Thiophenol

Draw: isobutyl mercaptan, 3-pentene thiol

* Thiols are more acidic than alcohols
(RSH) ROH

* Synthesis: $\text{R-X} + \text{SH}^- \xrightarrow{\text{S}_\text{N}2} \text{R-SH} + \text{X}^-$

