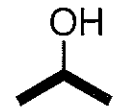
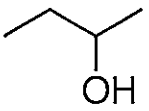
Alcohol/Ether Nomenclature

Alcohols (ROH): Identify the longest parent carbon chain *that contains the OH group*. Drop the alkane "e" and add "ol" to give "#-alkanol," where the # indicates the position of the OH group (be sure to number from the end of the chain closest to the OH). If there are two OH's, the parent is "#,#-alkanediol" (triol, tetraol, etc.).

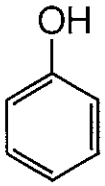


2-propanol *or* isopropyl alcohol

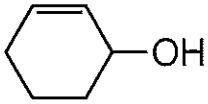


common:_____

IUPAC:_____

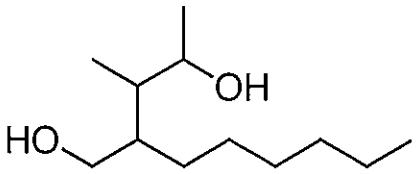


phenol



2-cyclohexen-1-ol

or cyclohex-2-en-1-ol (alcohol FG has priority and gets lower #)

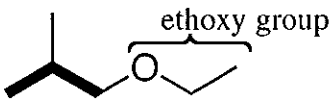


IUPAC:_____

Types of Alcohols

RCH_2OH	primary, 1°
R_2CHOH	secondary, 2°
R_3COH	tertiary, 3°

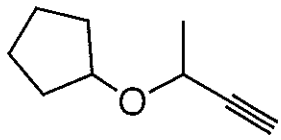
Ethers (ROR'): Ethers have no effect on the name of the parent; they are simply named as a substituent (group) attached to the parent. Any -OR substituent is named by dropping the "yl" ending and adding "oxy" (e.g., ethyl becomes ethoxy). Simple ethers are often named as an "alkyl alkyl ether," but this is not IUPAC.



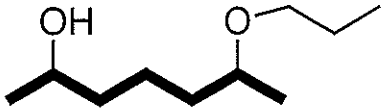
1-ethoxy-2-methylpropane *or* isobutyl ethyl ether

$CH_3CH_2OCH_2CH_3$
diethyl ether

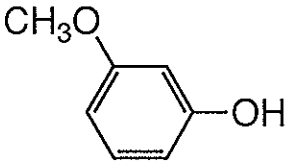
IUPAC:_____



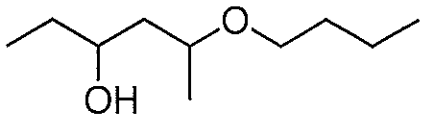
IUPAC:_____



6-propoxy-2-heptanol

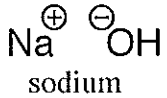


IUPAC:_____



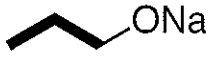
IUPAC:_____

Alkoxides (RO^-): Name the alcohol. Replace the entire ending with "oxide" to give "**alkoxide**." (The counterion is listed first.)

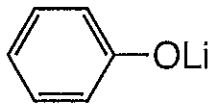


sodium hydroxide

propanol



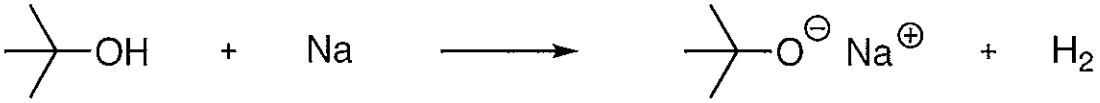
sodium propoxide



lithium phenoxide

$KOCH_2CH_3$
postassium ethoxide

Preparation of Alkoxides (B&P 8.2C)



Reactions of Alcohols

8.2D Substitution Reactions (ROH → RX)

$CH_3Cl + {}^{\ominus}OH \longrightarrow$

$CH_3OH + Cl^{\ominus} \longrightarrow$

* $^{\ominus}OH$ is a reactive, strong base (unstable) so it's a poor LG
* -OH can be turned into a good leaving group by treatment with a strong acid

$ROH + NaCl \longrightarrow$
$ROH + HCl \longrightarrow$
$ROH + HBr \longrightarrow$
$ROH + HI \longrightarrow$

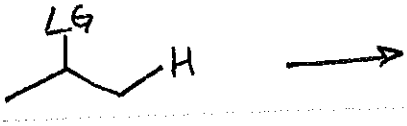
Mech. Strong acid so protonate 1st!

$CH_3OH + H-Cl \rightleftharpoons$

predict + give mechanism:

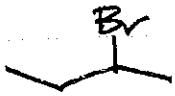
Explain why (S)-2-butanol forms a racemic mixture when it is heated in aq. sulfuric acid. (8.36)

8.2E Elimination Reaction – Dehydration of ROH



→ an elimination reaction

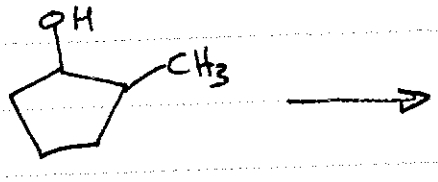
Example (E2) ↑ 1-step mech.



NaOH (strong base) →

* Formation of alkene follows Zaitsef's Rule
* More stable alkene is major product

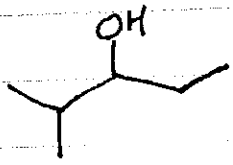
Dehydration of Alcohols (need strong acid to make OH a LG)



→

mechanism (exact reverse of alkene hydration) called "E1"

Ex.



$\xrightarrow{HCl}$

$\xrightarrow[\Delta]{H_2SO_4}$

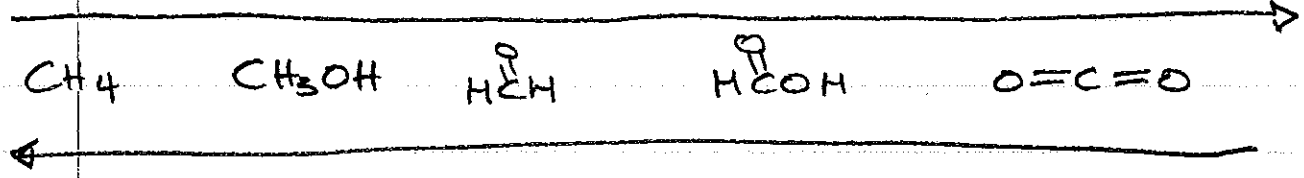
Rate of Dehydration

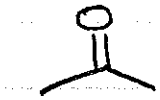
→ more stable carbocation will be formed faster

allylic / benzylic / 3° ROH > 2° ROH >> 1° ROH

8.2F Oxidation Reactions

Redox Review



Example  $\xrightarrow{LiAlH_4}$  a _____ reaction

ketone — alcohol

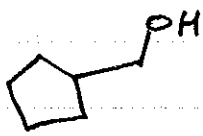
a _____ agent

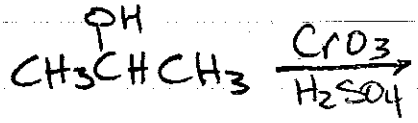
a) chromic acid ($H_2Cr_2O_4$) oxidation

$CH_3CH_2OH \xrightarrow{H_2Cr_2O_4}$

1° alcohol

predict product:

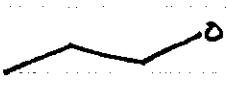
 $\xrightarrow{H_2Cr_2O_4}$

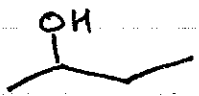


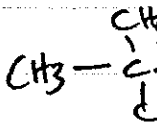
b) selective oxidizing agent: PCC → milder conditions, stop at aldehyde

 $CrO_3Cl^{\ominus}$ pyridinium chlorochromate

Summary

1° ROH  $\xrightarrow{PCC}$ $\xrightarrow{H_2Cr_2O_4}$

2° ROH  $\xrightarrow[H_2Cr_2O_4]{PCC \text{ or }}$

3° ROH  $\xrightarrow[[OX]]{any}$

predict: