

Chapter 12: Alcohols

Today – Chapter 12 Sections

12.1 Alcohols and Phenols

12.2 Acidity of Alcohols (Ch. 3?)

12.3 Preparation of Alcohols (Ch. 7? Ch.8?)

12.5 Preparation of Diols (8.9, 8.10)

12.9 Reactions of Alcohols

Wednesday – Reactions with Alcohols

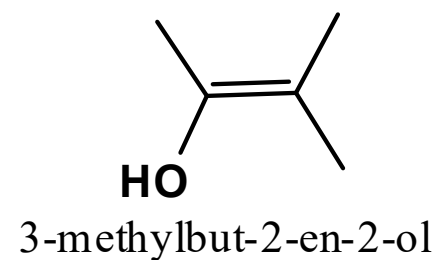
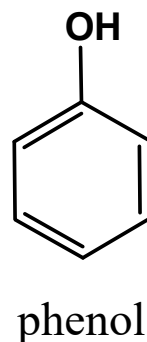
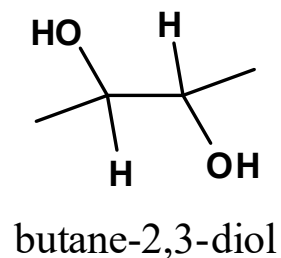
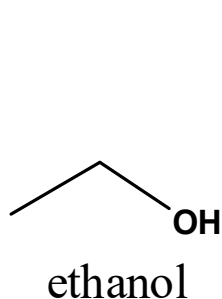
12.4 Preparation of Alcohols by Reduction

12.6 Preparation of Alcohols with Grignard

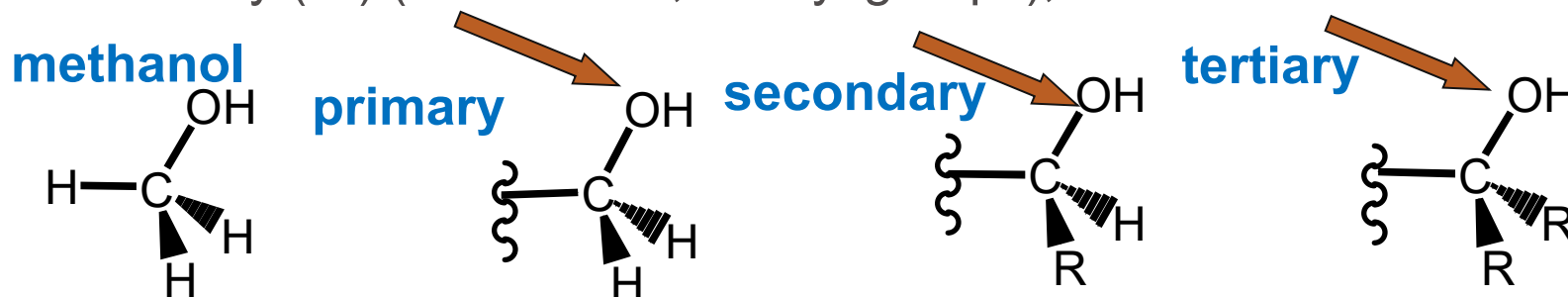
12.9 Reactions of Alcohols

12.10 Oxidation of Alcohols

Alcohols, Diols, Phenols, and Enols



- Alcohols possess a hydroxyl group (-OH).
- General classifications of alcohols based on substitution on C to which OH is attached
 - Methyl (C has 3 H's)
 - Primary (1°) (C has two H's, one alkyl group)
 - Secondary (2°) (C has one H, two alkyl groups)
 - Tertiary (3°) (C has no H, 3 alkyl groups),

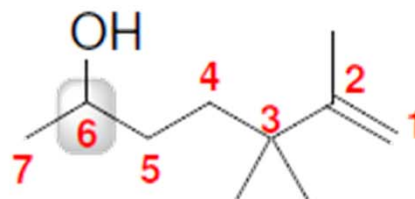
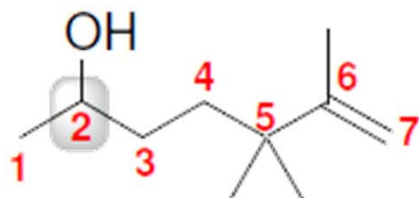
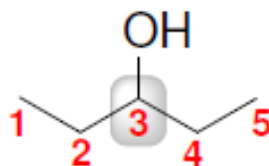
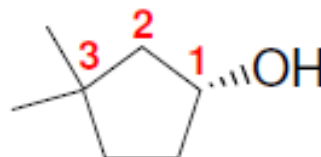
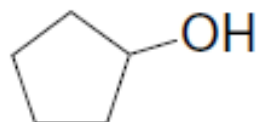


Alcohols and Phenols – Nomenclature

- Alcohols are named using the same procedure we used in Chapter 4 to name alkanes with minor modifications:

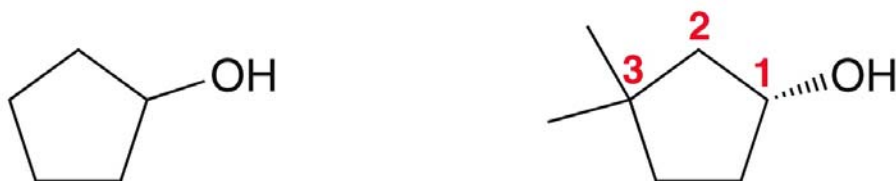
Alcohols and Phenols – Nomenclature

- For cyclic alcohols, the –OH group should be on carbon 1, so often the locant is assumed and omitted.

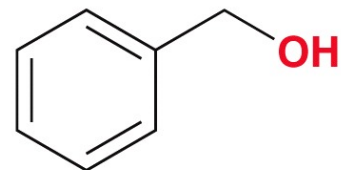
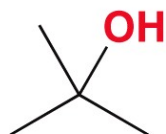
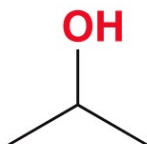


Alcohol Nomenclature

- For **cyclic alcohols**, the **–OH group is always carbon 1**



- Common names** for some alcohols are also frequently used



Commercially Important Alcohols

(CH₃OH) is the simplest alcohol

With a suitable catalyst, about 2 billion gallons of - _____ is made industrially from CO₂ and H₂ every year

(CH₃CH₂OH), produced by fermentation of grains or fruits

Industrially, _____ is made via acid-catalyzed hydration of ethylene (5 billion gallons/year in the U.S. alone)

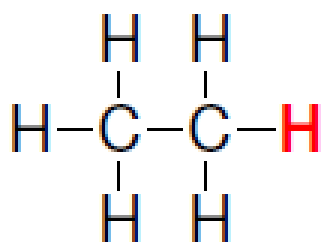
CH₃CH(OH)CH₃,

_____ is made industrially from the acid-catalyzed hydration of propylene

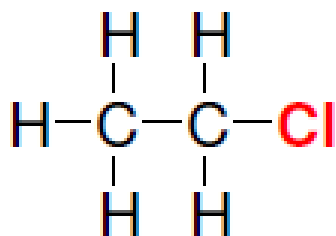
_____ is poisonous, but it has many uses: solvent, antiseptic, additive to gasoline

Alcohols and Phenols – Physical Properties of Alcohols

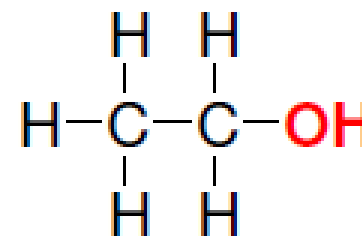
- The –OH of an alcohol can have a big effect on its physical properties.
- Compare the boiling points below.



ethane



chloroethane



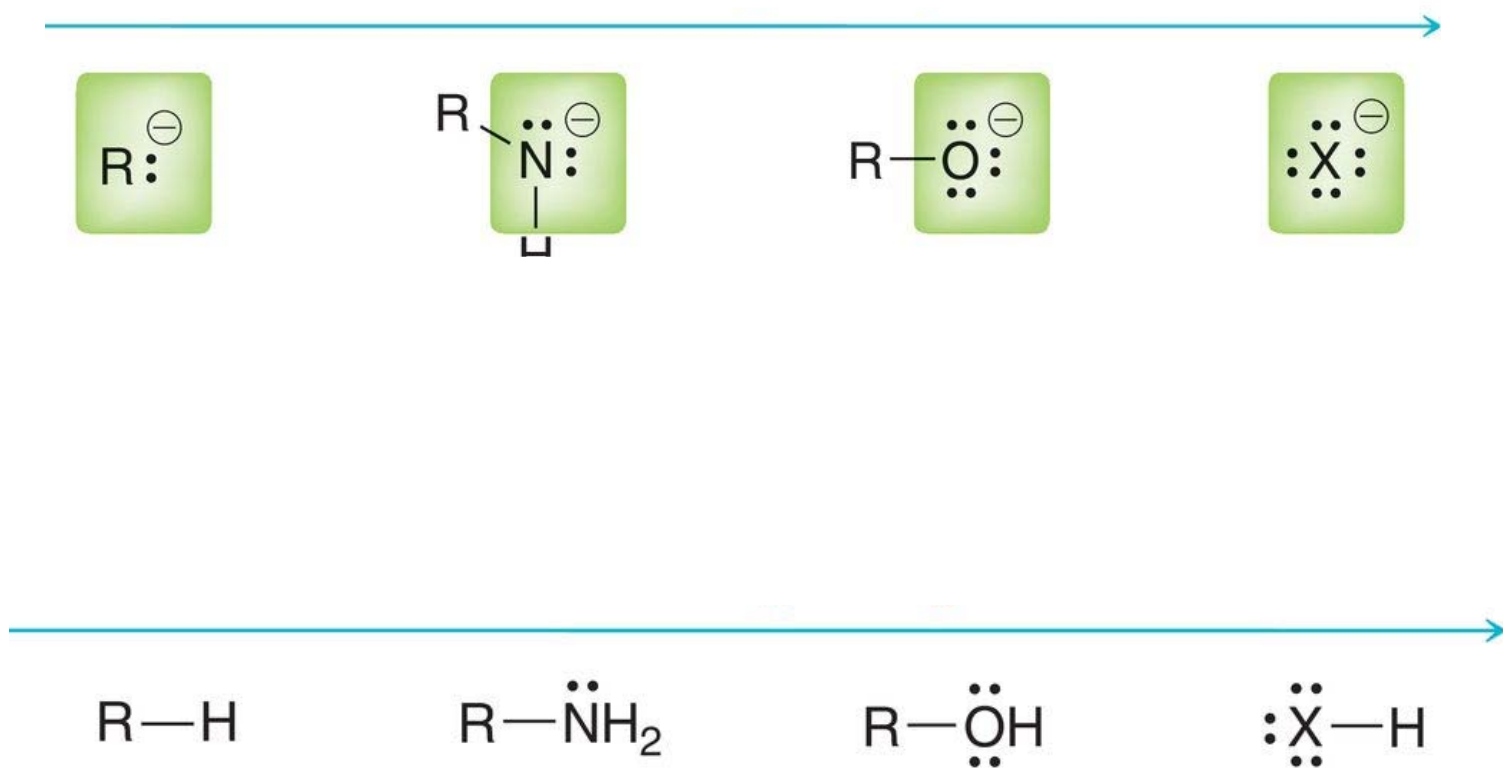
ethanol

Acidity of Alcohols and Phenols

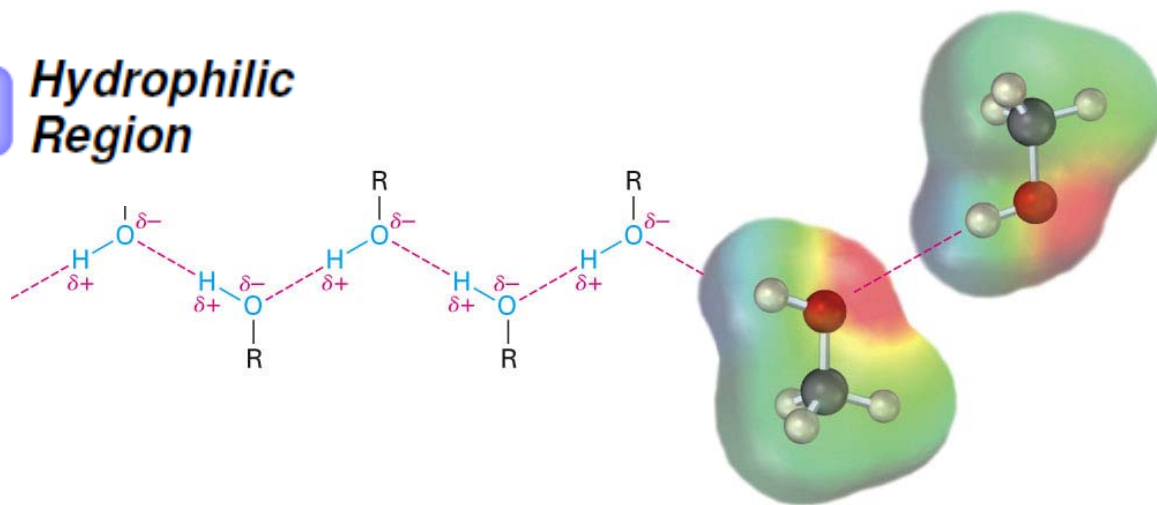
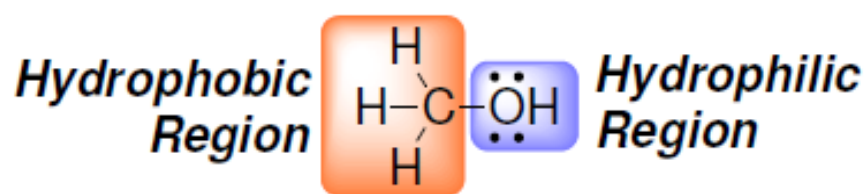
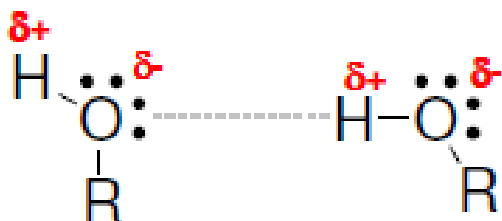
- A strong base is necessary to deprotonate an alcohol.
- Na, K, or Li metal is often used as well:

Acidity of Alcohols and Phenols

- Alkoxide –

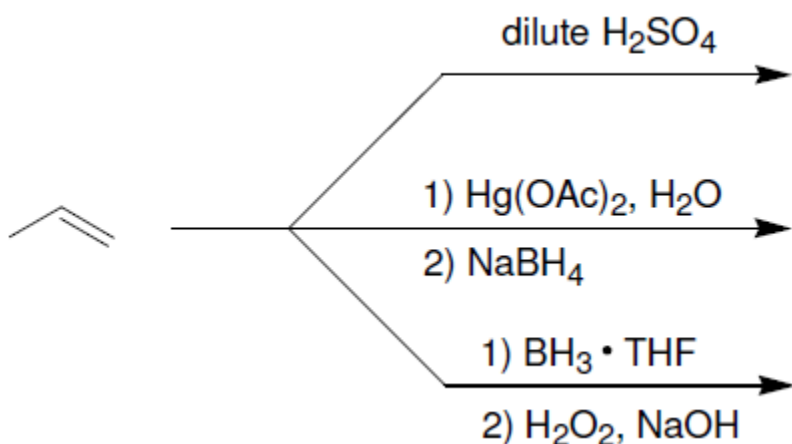


Alcohols and Phenols – Physical Properties of Alcohols



Preparation of Alcohols

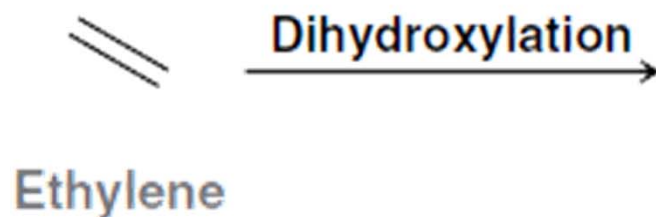
- In Chapter 8, we learned how to make alcohols from alkenes.



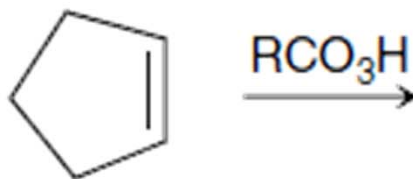
- Recall that acid-catalyzed hydration proceeds through a carbocation intermediate that can possibly rearrange.
- REMEMBER - How do you avoid rearrangements?

Anti Dihydroxylation

- Dihydroxylation occurs when two –OH groups are added across a C=C double bond.



- ANTI dihydroxylation is achieved through a multi-step process.

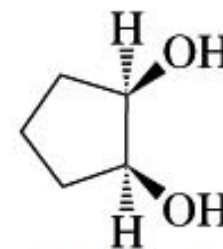


Syn Dihydroxylation



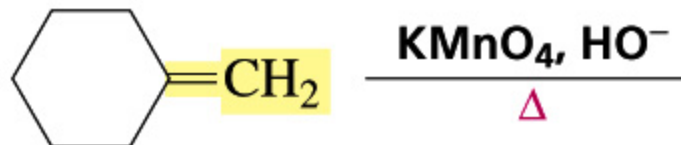
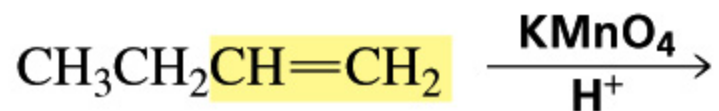
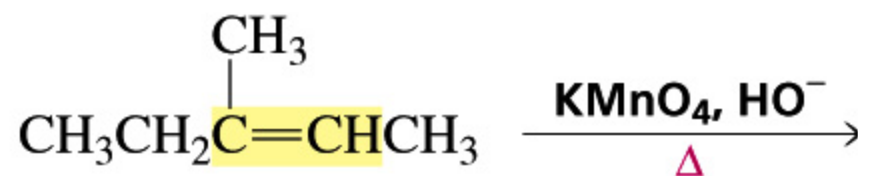
Mechanism for *cis*-Glycol Formation?

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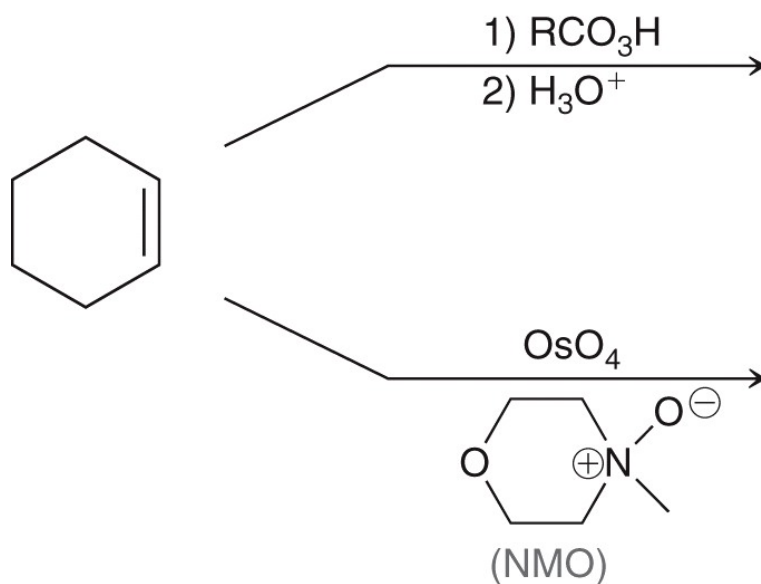
cis-1,2-cyclopentanediol

Syn Dihydroxylation



Preparation of Diols

- Recall the methods we discussed in chapter 9 to convert an alkene into a diol



For Next Time....

Suggested Homework Problems Chapter 9

1, 7, 9, 13, 18, 20, 32-37, 41, 44, 52, 57

Suggested Homework Problems Chapter 10

1, 2, 12, 16, 23, 24, 33, 42

Suggested Homework Problems Chapter 12!

1, 4, 5, 7, 13, 17, 27-32, 34, 43-45