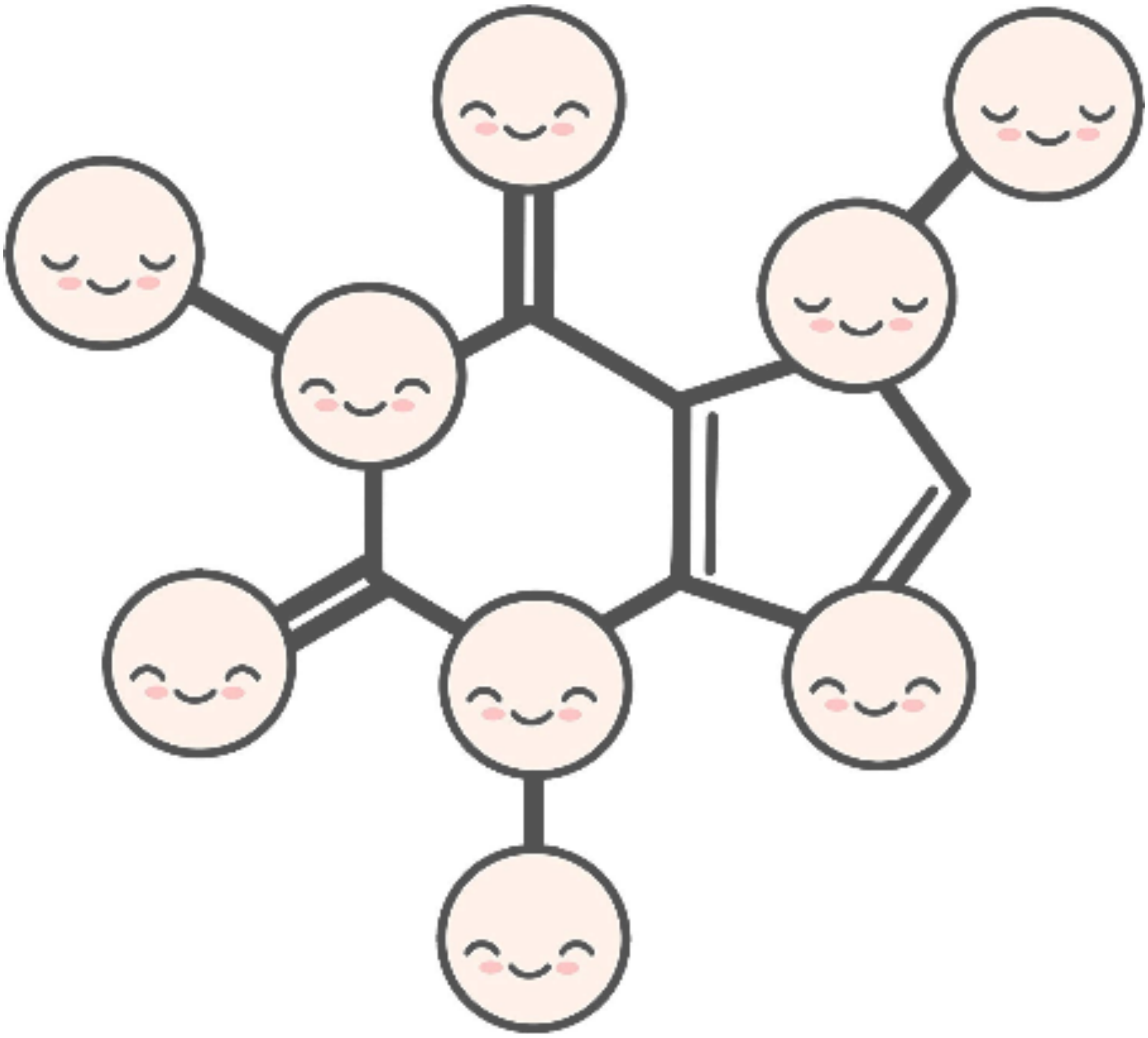
CHEM 203

Supplemental Learning - 2019



MINI-GUIDE

HHCN

Important Concepts

Make sure you are familiar with the following concepts

- Opposites *attract/repel* and like charges *attract/repel*
- Electronegative vs. Electropositivity
- *Theories*
  - Valence Bond Theory
    - What are valence electrons?
    - What are the two types of bonds we learned this semester? Which one is more reactive?
  - Molecular Orbital Theory
    - How can orbitals be combined?
- Representation of molecules
  - What is the difference between conformation and configuration?
- *Reactions*
  - Arrow pushing direction - draw the arrow of electron flow

$\oplus$ $\ominus$

- The **ultimate rule** of arrow pushing on a NEUTRAL ATOM:

  TWO ____ FOLLOWED BY TWO_____

- Alkyl groups are electron *donors/acceptors.*
- Thermodynamic vs. Kinetic Conditions

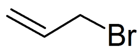
Representing Molecules

This term we learned that molecules can be represented in different ways:

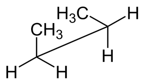
1. *Condensed structures*

   e.g. CH_4

2. *Line Diagrams*

   e.g. 

3. *Sawhorse projections*

   e.g. 

4. *Lewis Diagrams*
5. *Newman's Projections*
6. *Fisher Projections*
7. *Chair Conformations (for cyclohexanes)*

Let's take a look at the last four in more detail!

<u>Lewis Diagrams</u>

Write down the rules we should follow when doing Lewis Diagrams. What are some tips and tricks that work for you when drawing the structures?

RULES

1.
2.
3.
4.
5.
6.

Tips:

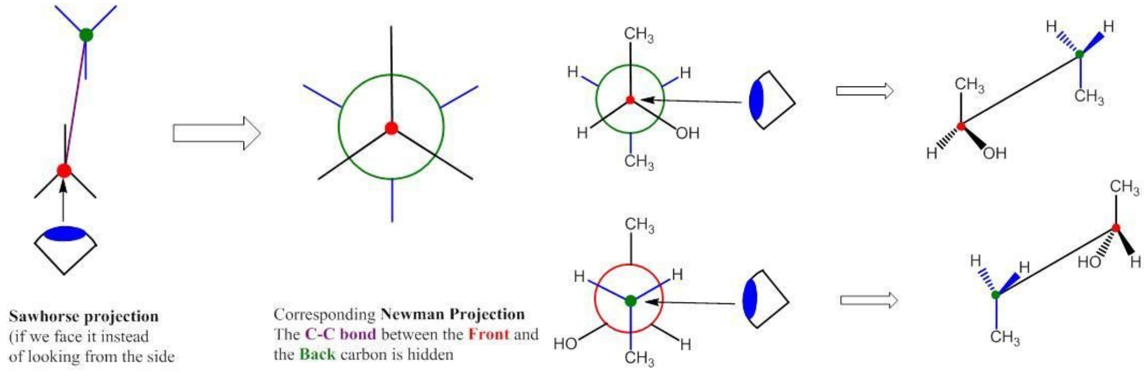
Example

Practice Exercises

SI_6	PBr_5	BH^-_2	ClF^+_5	SF_5	CCl^-_3
ClO^-	HONO	ClNO	HC_4H		

Newman's Projection

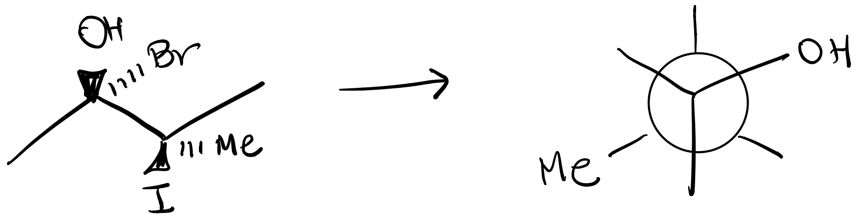
In a Newman's projection, we are looking down at a carbon-carbon bond.

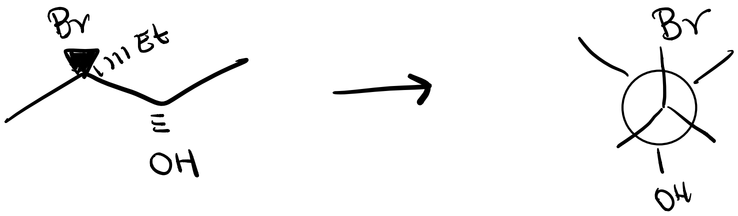


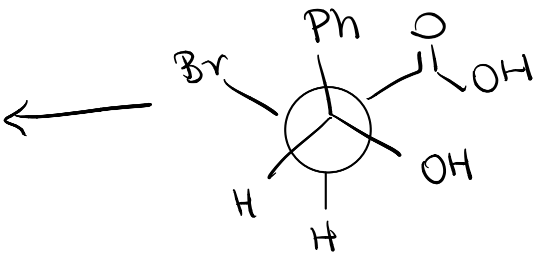
Durham University - Departament of Chemistry (https://www.dur.ac.uk/chemistry Accessed on Dec 9th, 2019)

- What is the Newman's projection with the most stable conformation?

Practice Exercises

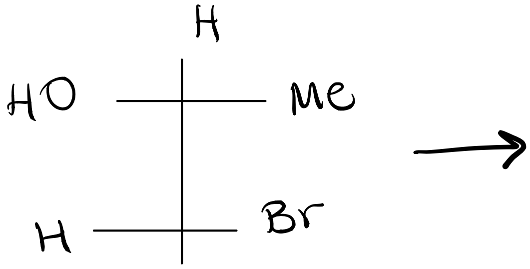




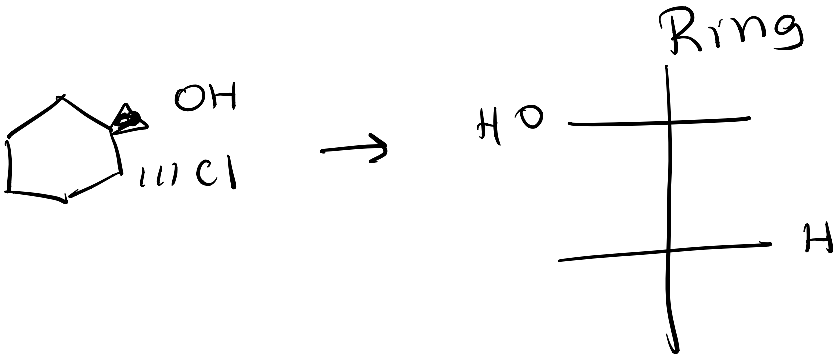


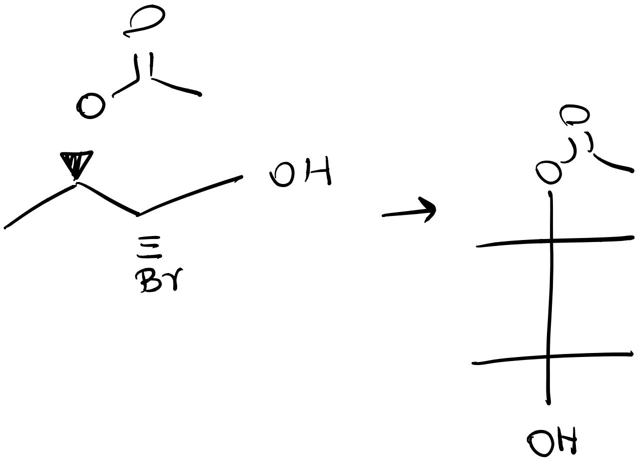
Fisher Projections

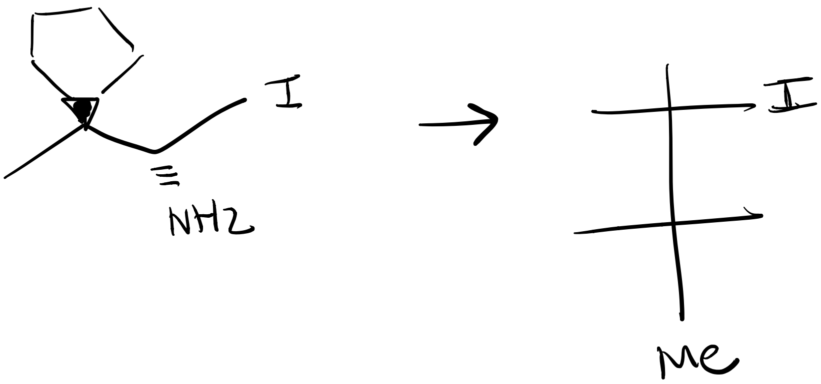
What do the lines in a fisher projection actually represent?



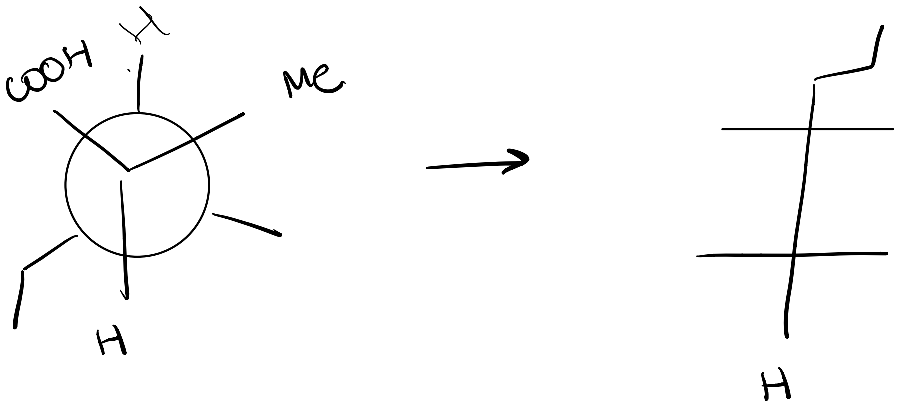
Practice Problems

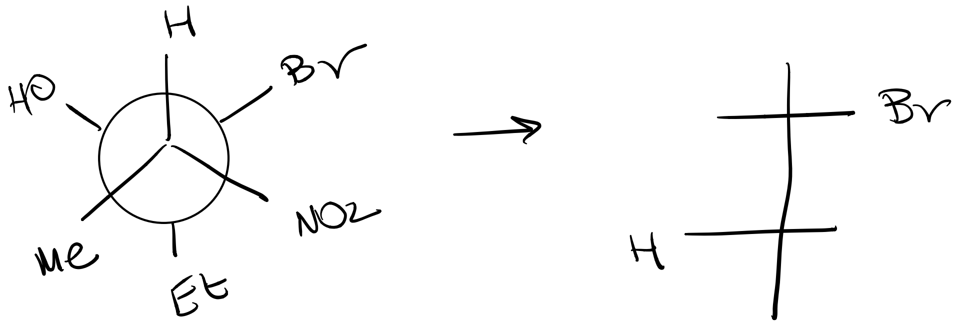


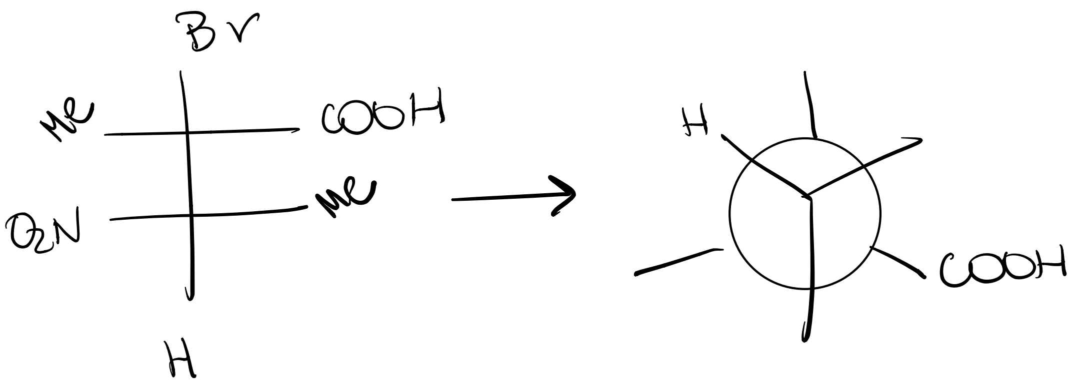




Converting between Fisher and Newman's Practice Problems

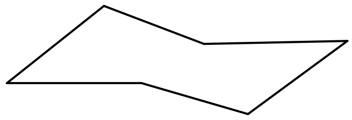






Chair Conformations (*for cyclohexanes)*

What are the different bonds we have in chair conformation?



What happens when we do a chair flip?

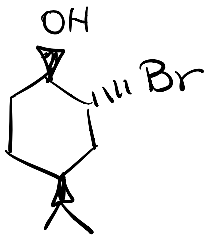
⇌

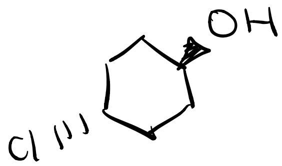
- When drawing the most stable chair, where should we put most of the substituents?

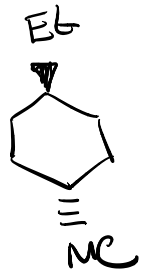
Related to this topic: How can you measure the internal angle of a ring?

Practice Problems

* Draw chairs!



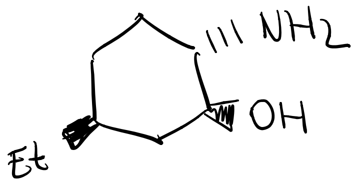




⇌ ⇌ ⇌

* FLIP THEM !!

→ what is the most stable chair for this molecule?

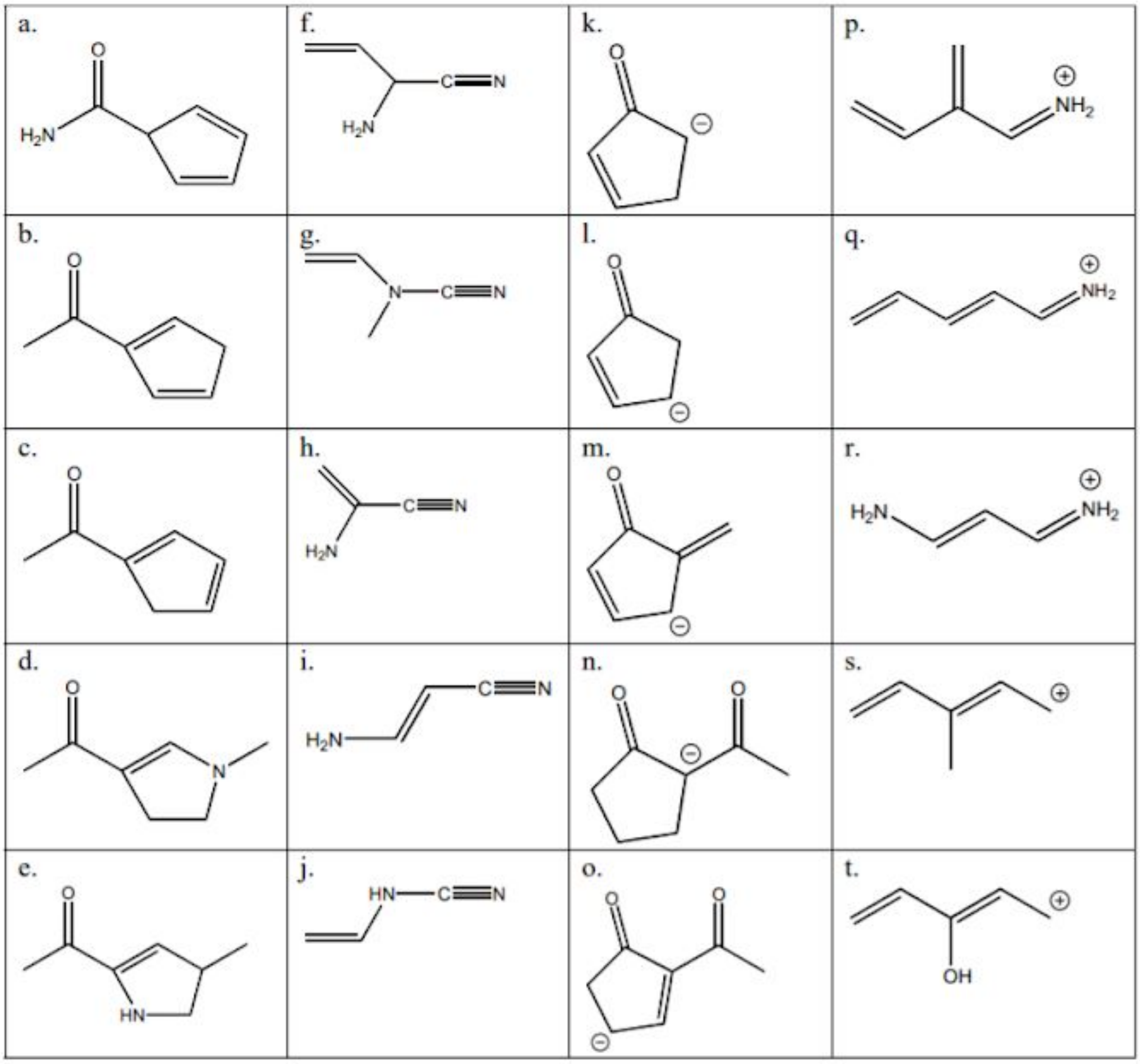


Resonance

Resonance is the movement of ***σ / π*** *bonds.*

- Does resonance actually exist? Why do we use it?

Practice Problems



https://static1.squarespace.com/static/55761eabe4b09a6eed974521/t/5a5817b871c10baff712f6d2/1515722681082/Resonance+practice+problems+PDF.pdf Accessed on Dec 9th, 2019

IUPAC Naming

What are the general rules we learned for IUPAC Naming?

RULES

1.
2.
3.
4.
5.
6.
7.

Tips:

General Principle

X(R/S)-SUBSTITUENTS NUMBER OF CARBONS+X-(E/Z)SATURATION+X-(R.S) F.G.

PARENT CHAIN

- X = Carbon number

Prefixes for number of carbons

1.	2.	3.	4.	5.	6.	7.
8.	9.	10.	11.	12.		

Saturation

Single bond ends in___

Double bond ends in___

Triple bond ends in___

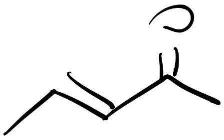
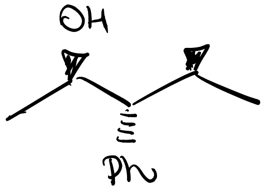
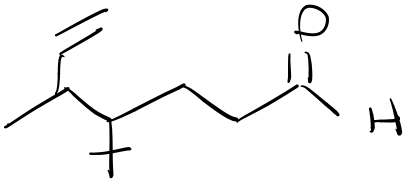
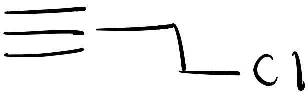
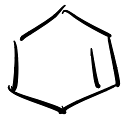
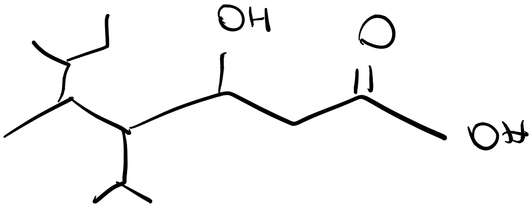
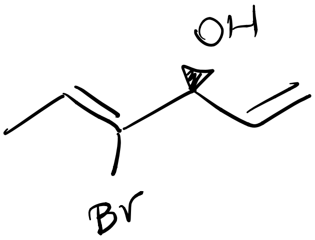
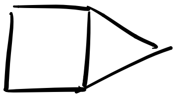
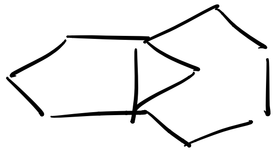
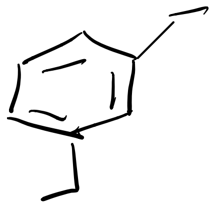
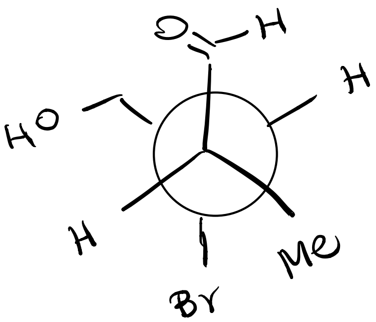
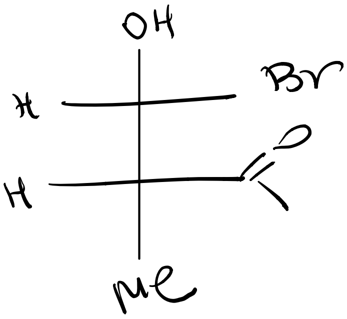
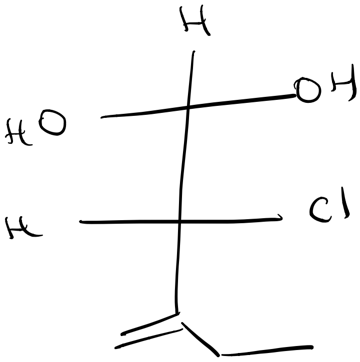
Function Groups

What are the functional groups we learned this semester?

*Which functional groups have special rules for naming? What are the rules for these groups?

Practice Problems

**Make sure you are comfortable with stereochemistry for the naming questions. Otherwise, follow to next topic and then come back to practice naming :D*

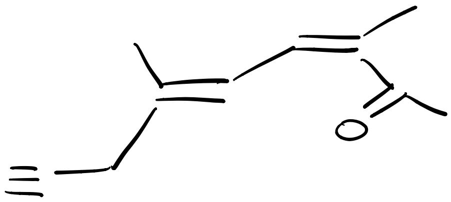
- 6-amino 4-hidroxy hept-2-anone
- (1-hidroxy-ethyl) butanoate
- bicyclo [4.4.0] 3-methyl-dec-3(Z)-ene
- 2(S)-isopropyl- 1(R)-cyclohexanol
- 3(S)-phenyl pentanoic acid
- 3(R), 4(R)-dihydroxy-2-pentanone.

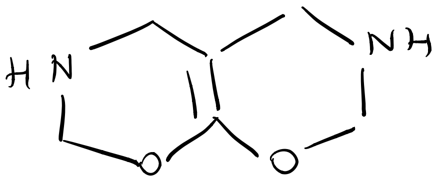
Stereochemistry

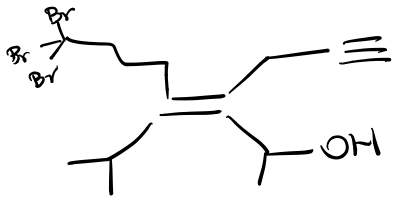
Alkenes

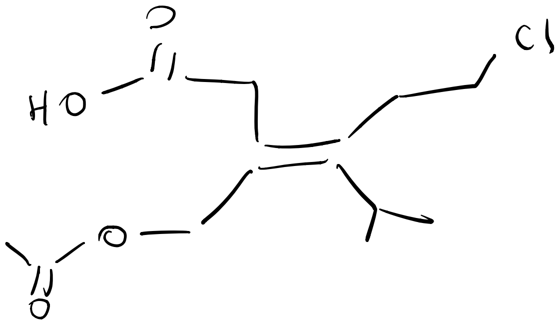
What is the difference between E and Z?

Practice Problems









Chirality

- What is so special about a chiral carbon?

  D/L Stereoisomers

Rules

1.

2.

3.

4.

**What is the difference between D/L and d/l?*

R/S Sterosiomers

*Why is this system preferred over the D/L?

R means:

S means:

Relations

Define

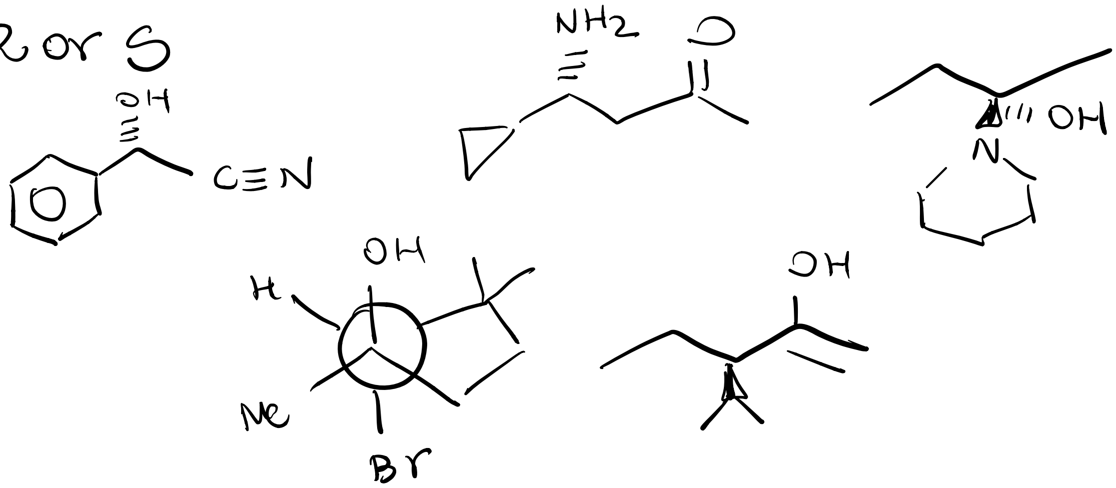
Enantiomers

Diastereoisomers

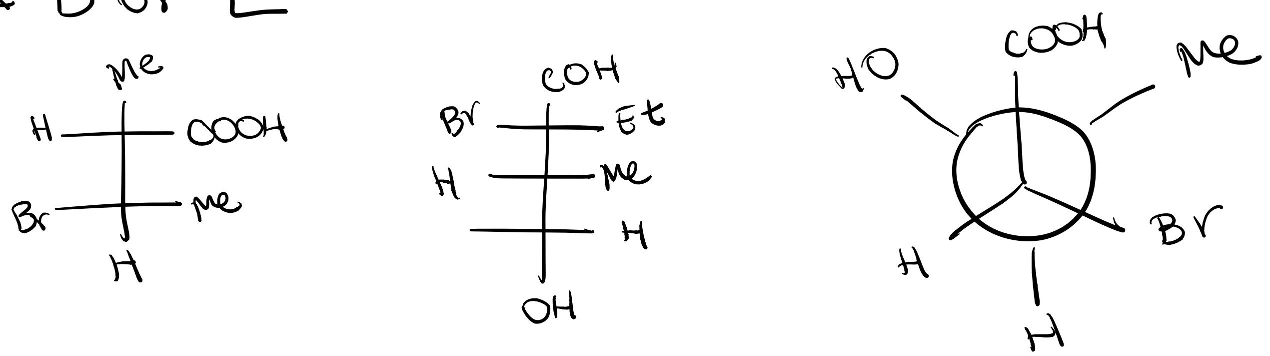
Mesomers

Practice Problems

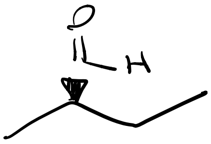
* R or S



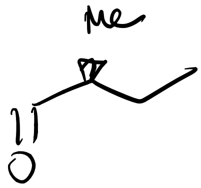
* D or L

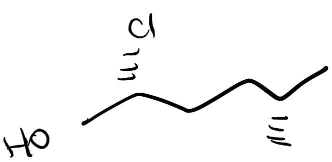


* Relations

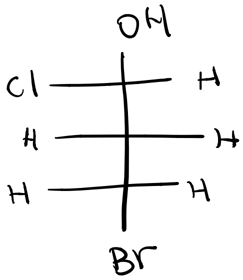


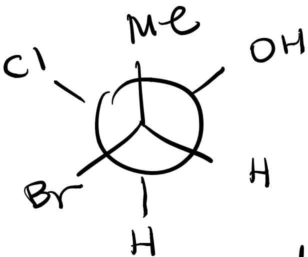
and



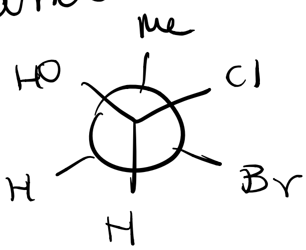


and





and



Reactions

Remember the important concepts we learned? They apply here as well! So keep them in mind when performing a synthesis of a molecule.

When we are talking about reactions and creating molecules, we want to ask two questions:

1. *How does this react? If I combined this molecule with another one, what would happen? What is its chemical behavior?*
2. *How can I make this? This is the opposite of the previous questions, meaning if I was to make this molecule, what reagents/conditions would I need?*

Alkanes

1. Where do alkanes come from?
2. How can they react?

What are the reactions we learned that had alkanes as their reactive group?

1. Bromination (involves r_______)

What are the reagents? What is the mechanism?

2. G__________ Reaction

What is the mechanism?

Alkenes

1. We haven't learned where do alkenes come from, so don't worry about it right now.
2. What are some reactions that involve alkenes?
   a. NBS (other derivatives are_____________). Selective for_________________

      Mechanism?

   b. Hydrogenation

      Reagents?

   c. Br_2

      Mechanism?

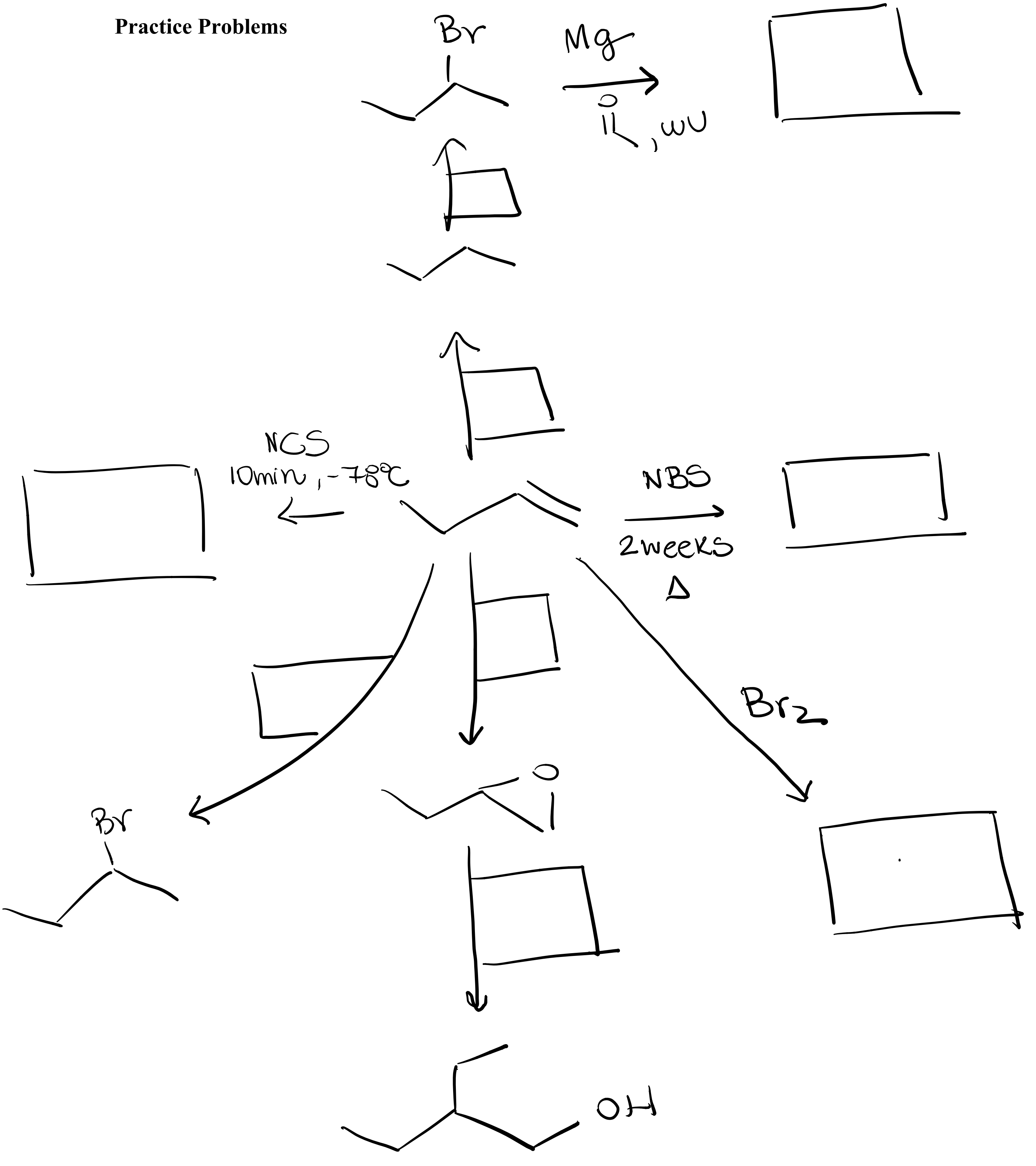
   d. HBr

      Mechanism?

   e. Formation of e______ (using______) and opening

      How can you control for selectivity when opening the ring?

Practice Problems



Spectroscopy and Spectrometry

What are the three techniques we learned this term to determine the structure of a molecule?

H NMR

What are your tips and tricks when analyzing HNMR?

C NMR

What are the different types of C NMR? How can they be used to determine the structure of a molecule?

Mass Spec

What are some diagnostic peaks we need to remember?