

## Fall Workshop #6

### Question #1

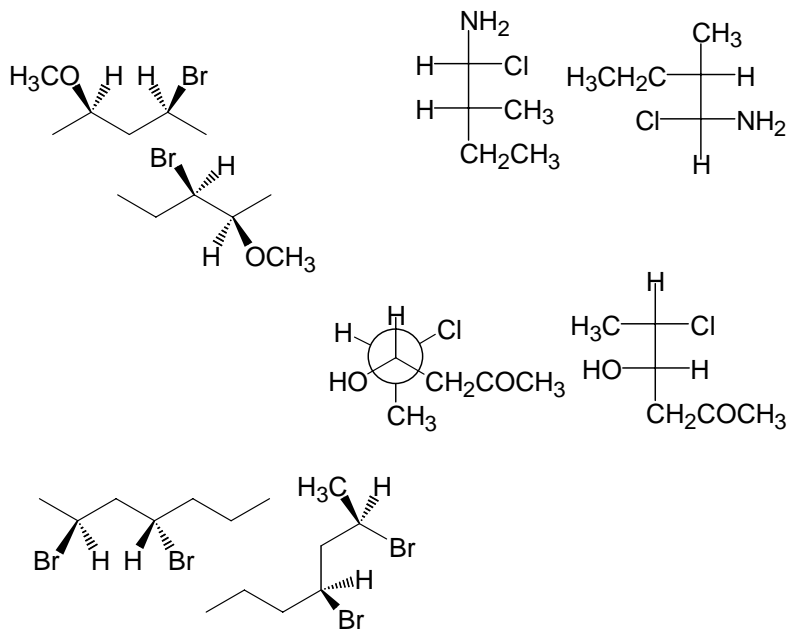
The general method for assessing stereochemical molecules is as follows:

- build the molecule
- assign R/S configuration
- perform superimposability/mirror image tests
- define relationships (see below)

Possible relationships include:

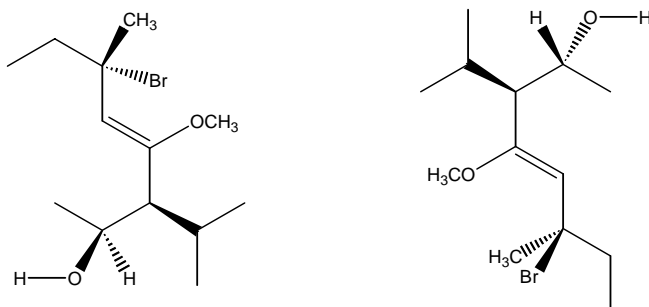
- identical** -- completely superimposable non-mirror images
- enantiomers** -- non-superimposable, mirror images
- diastereomers** -- non-superimposable, non-mirror images
- meso** -- looks initially like a pair of enantiomers, but by virtue of an internal mirror plane, becomes superimposable

Name each of the following structures (you'll need to build to assign R/S configuration) and then determine the isomeric relationship **between each pair of** structures using the guidelines above.



### Question #2

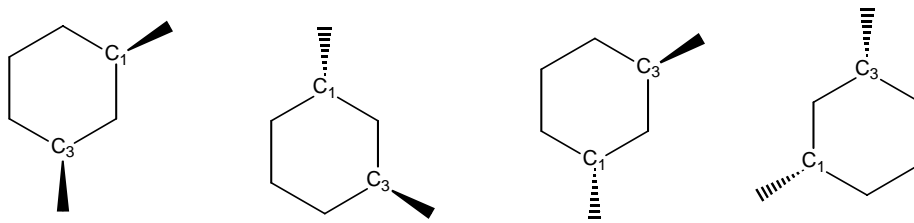
Mirror Images Pharmaceutical Corporation has designed a novel neuromuscular blocking agent and wants to submit the molecule shown below for patent approval. You are the lead organic chemist on the legal team and have been asked to investigate certain aspects of stereochemistry in order to submit a report along with the patent application. Your report requires the following information:



- Identify all stereocenters that are **not** asymmetric carbons in the molecule on the **RIGHT**--- label with an SC
- Identify all asymmetric carbons in the molecule on the **LEFT**--- label with an AC
- Assign the configuration about all stereocenters and asymmetric carbons on **BOTH** molecules --- use E/Z or R/S assignments
- Provide the complete IUPAC name for the compound on the **LEFT** --- identify the longest chain and any priority groups
- Show all polar covalent bonds by writing in the dipole arrow for the molecule on the **RIGHT**
- Identify the stereochemical relationship between the two molecules (identical, enantiomers, diastereomers, constitutional isomers, or meso)

### Question #3

Identify all possible stereochemical relationships among the four compounds shown below.



#### Question #4

Imagine that you were given a 4.0 mL of a 0.75 M solution of an enantiomerically pure sample of **(5R)-5-hydroxy-3-heptyn-2-one**. The observed optical rotation for this compound has been determined to be  $+9.0^\circ$  in a 10 cm sample container.

$$\alpha = \left[ \alpha \right]_D^{25} c l$$

c is in g/mL  
l is in dm

- What is the molar mass of **(5R)-5-hydroxy-3-heptyn-2-one**?
- What is the specific rotation of **(5R)-5-hydroxy-3-heptyn-2-one**?
- What is the observed rotation if this solution is mixed with an equal volume of a 0.75 M solution of enantiomerically pure **(5S)-5-hydroxy-3-heptyn-2-one**?
- Why do you observe this rotation?
- What is the observed rotation if the original 0.75 M solution of **(5R)-5-hydroxy-3-heptyn-2-one** is diluted with an equal volume of solvent?
- What is the specific rotation of **(5R)-5-hydroxy-3-heptyn-2-one** after the dilution described in part (e)?
- What is the specific rotation for a sample of pure **(5S)-5-hydroxy-3-heptyn-2-one**?
- What is the observed optical rotation of a 10 mL solution that contains 0.04 mole of **(5R)-5-hydroxy-3-heptyn-2-one** and 0.1 mole of **(5S)-5-hydroxy-3-heptyn-2-one** (assume a 10 cm path length)?
- Given the specific rotations of **(5R)-5-hydroxy-3-heptyn-2-one** and **(5S)-5-hydroxy-3-heptyn-2-one** (determined above), what is the optical purity and % composition of a mixture whose observed rotation was found to be  $-55^\circ$ ?

#### Question #5

If time permits, you can play Organic Chemistry Jeopardy, Stereochemistry (Game 13) at <http://chemed.chem.pitt.edu/Jeopardy/organic/index.htm>