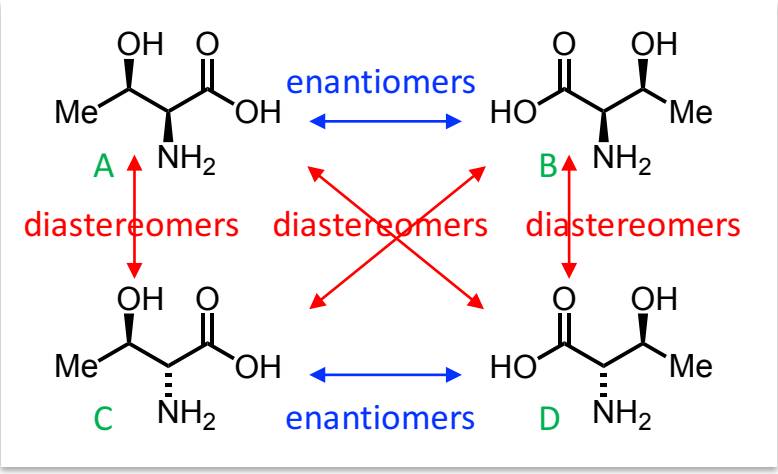
Introduction to Organic Chemistry
Stereochemistry – Problem Set



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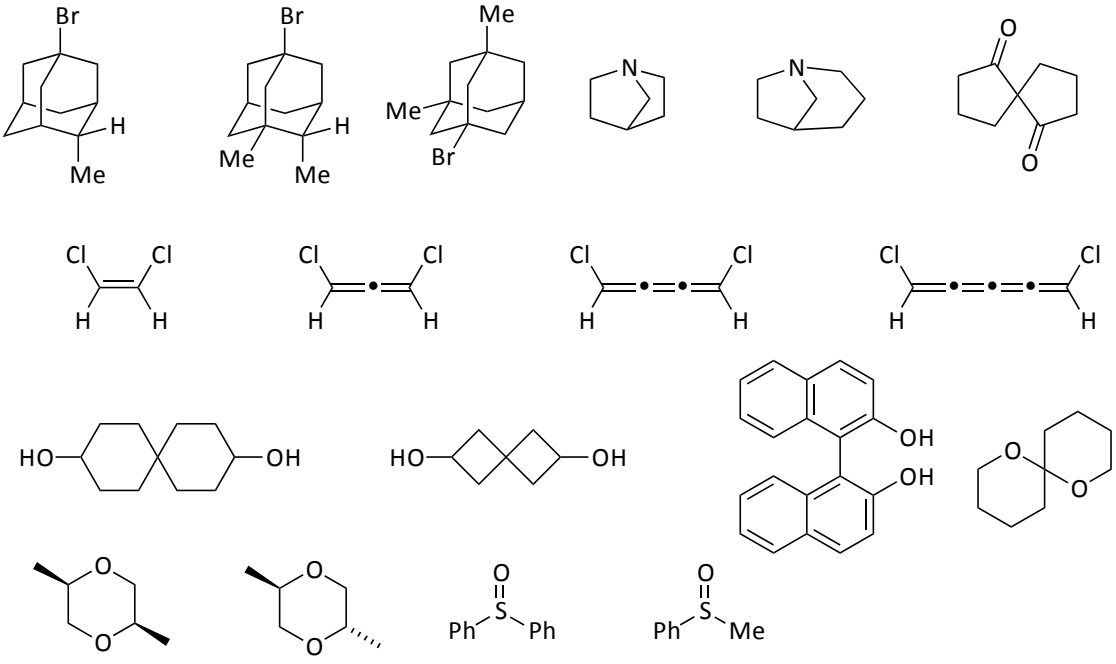
Below you will find a set of problems related to the stereochemistry part of the course.

1. How would you predict in principle whether a molecular compound is chiral and can be resolved into enantiomers?

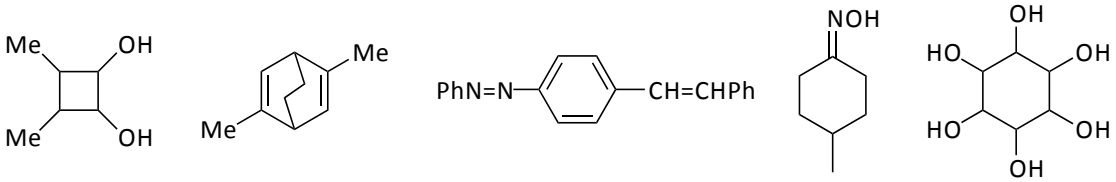
2. Which of the following molecules are chiral?



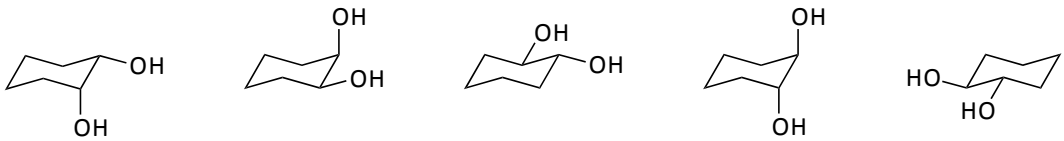
3. a) Draw all the stereoisomers of the following molecules.

b) What are the relationships (e.g. enantiomers or diastereomers) between the stereoisomers in each case?

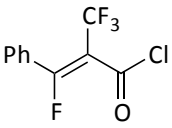
c) Identify the meso forms and state which of the stereoisomers are chiral.

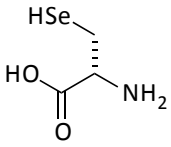


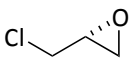
4. The following are different representations of the stereoisomers of cyclohexan-1,2-diol. What are the relationships between the different representations? Are they *the same, enantiomers or diastereomers?*

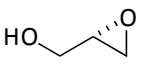


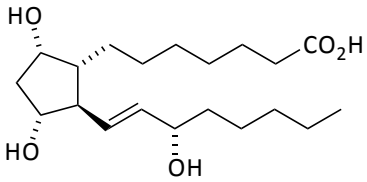
5. Using the Cahn-Ingold-Prelog sequence rule assign *R* or *S*, or *E* or *Z*, stereochemical descriptors to all of the following molecules.







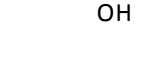




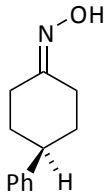
The following problems can be attempted once you have covered a few more of the 1st year organic chemistry courses

6. *Racemisation* is the conversion of one enantiomer (or an excess of one enantiomer) into a 50:50 mixture of enantiomers. To draw a mechanism for *racemisation* you need to be able to draw the conversion of one enantiomer into the other enantiomer. Alternatively if you can draw a mechanism which involves an intermediate that contains a *plane of symmetry* then the product *will* be *racemic*.

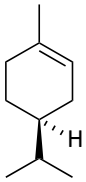
The following compounds racemise under the conditions shown, provide a mechanism; the starting materials are all enantiopure



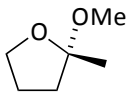
racemises in acid



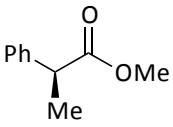
racemises in acid



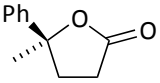
racemises in acid



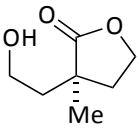
racemises in acid



racemises in base



racemises in acid



racemises in base

7. The following reactions all yield racemic products provide explanations – the starting materials are all enantiopure.