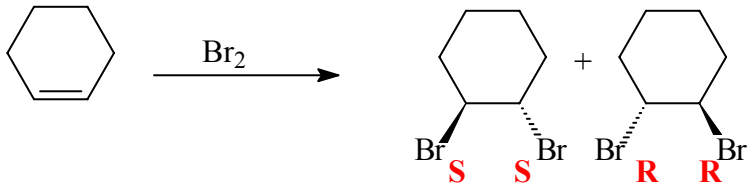
CHEM 241-601

Stereochemistry Problem Set

1. The bromination of cyclohexene gives the two compounds shown below. Assign *R* or *S* to each chiral center in the products. Are the two molecules the same or different?



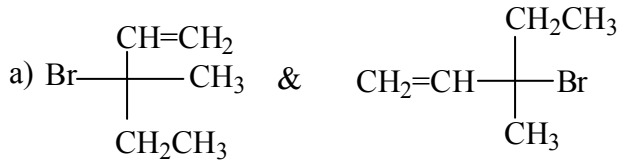
The two compounds are enantiomers

2. In class, we discussed an unusual concept inherent in *some* medicines. When someone takes an analgesic like ibuprofen, only 50% of the drug will actually act as an anti-inflammatory agent. Explain why this is the case. What does the other 50% of the drug hopefully do? Why doesn't acetaminophen (Tylenol®) have this characteristic (the entire tablet (100%) is an analgesic)?

Ibuprofin has an asymmetric center and is sold as a racemic mixture. Only one stereoisomer can act as an anti-inflammatory agent due to asymmetric nature of the receptor site. Usually the other 50% is biologically inactive and benign (hopefully). Ibuproifin is actually unusal in that the wrong enantiomer is partially metabolized to the active one in most people. Acetominophen does not have an asymmetric center therefore all of the drug is active.

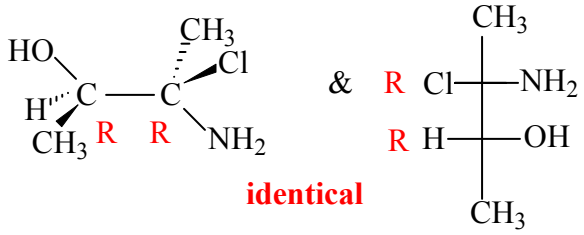
3. Determine if the following pairs of compounds are identical, enantiomers, or diastereomers.

a)



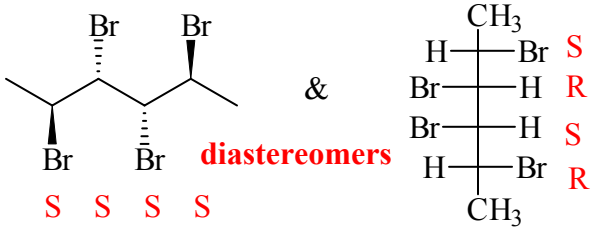
(S) **enantiomers** (R)

b)



identical

c)

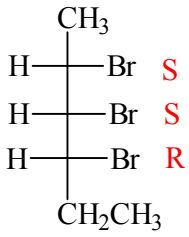


diastereomers

4. Consider the molecule 2,3,4-tribromohexane.

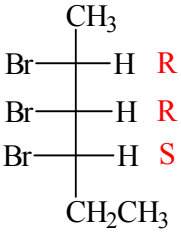
a) Draw a Fischer projection (C-1 on top, C-4,5 on bottom) of the 2(S),3(S),4(R) stereoisomer and label as **A**.

A



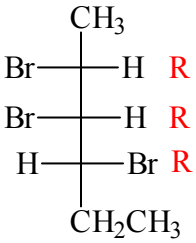
b) Draw the enantiomer of the stereoisomer you drew in a). Label as **B**.

B

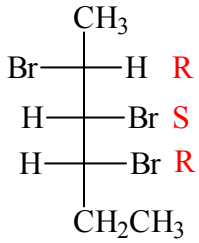


c) Draw two diastereomers of **A** that are not enantiomeric. Give the absolute configurations of each chiral center and label as **C** and **D**.

C



D

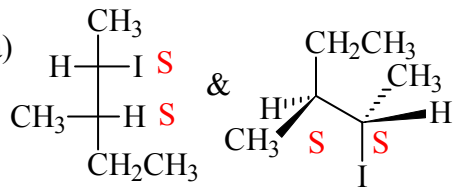


d) How many stereoisomers are there of this molecule? **8**

e) Are there any optically *inactive* stereoisomers? No

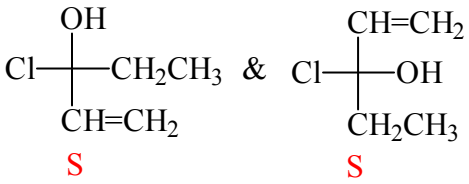
5. Determine whether the following pairs of compounds are enantiomers, diastereomers or identical. Also, assign the absolute configuration of each chiral center.

a)



identical

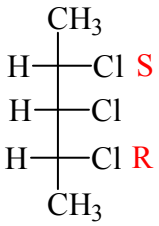
b)

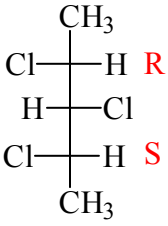


identical

6. Consider the molecule 2,3,4-trichloropentane. This one is tough.
   a) Draw Fischer projections of each stereoisomer and indicate the absolute configuration at carbons 2 & 4 in each structure.
   b) Is carbon 3 a chiral center?

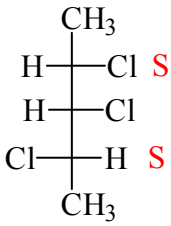
Indicate which of the stereoisomers are chiral and which are not.

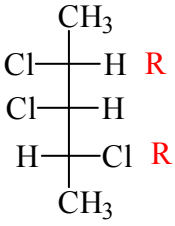




Both are meso
C-3 is actually "pseudo-chiral"
By switching C-3, another meso compound forms.

The 4 groups appended to C-3 are different (top and bottom different absolute config.)





Both optically active
C-3 is not chiral here
top half and bottom half have same abs. config.