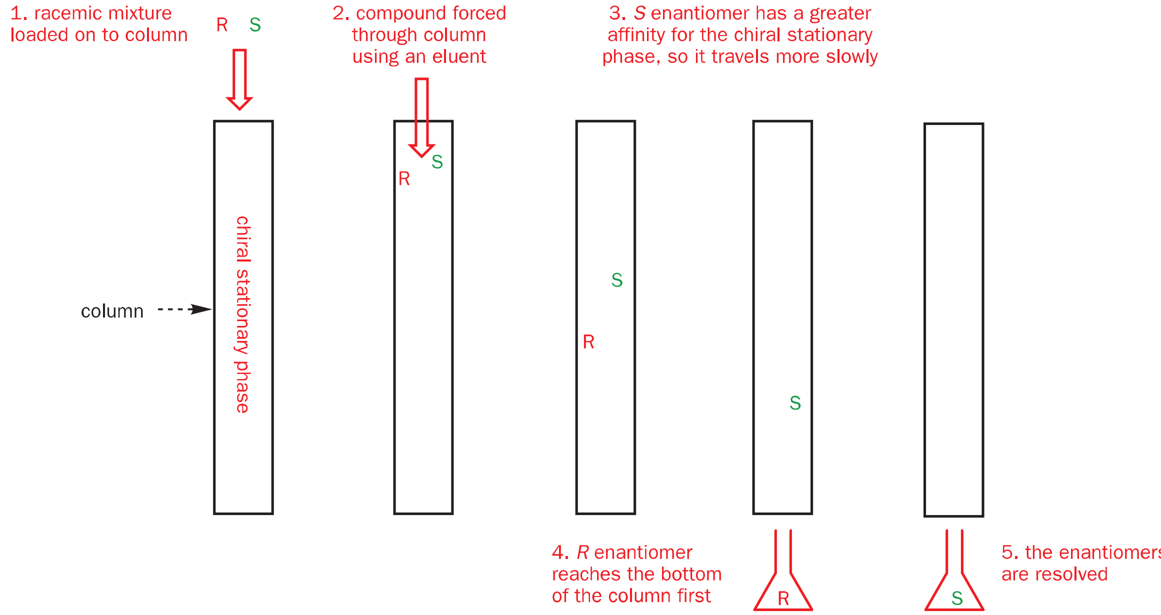
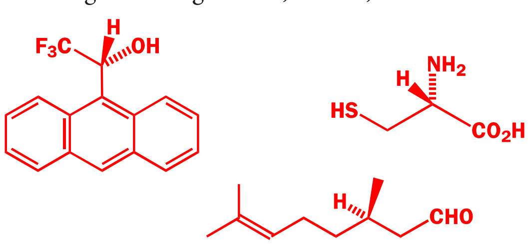
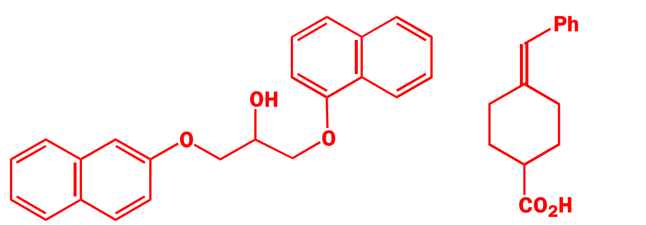


Two enantiomers of one molecule may be the same compound, but they are clearly different, though only in a limited number of situations. They can interact with biological systems differently, for example, and can form salts or compounds with different properties when reacted with a single enantiomer of another compound. In essence, enantiomers behave identically *except* when they are placed in a chiral environment. In Chapter 45, we will see how to use this fact to make single enantiomers of chiral compounds, but next we move on to three classes of reactions in which stereochemistry plays a key role: substitutions, eliminations, and additions.

Problems

1. Assign a configuration, *R* or *S*, to each of these compounds.

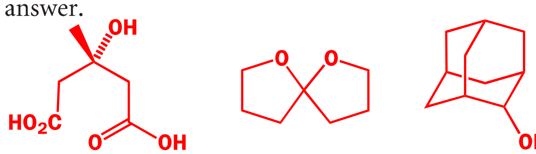




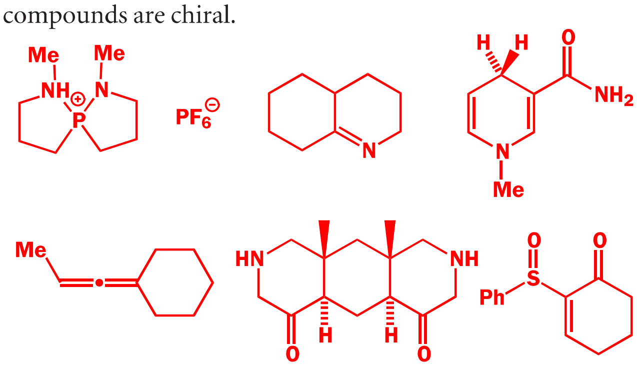
2. If a solution of a compound has a rotation of +12, how could you tell if this was actually +12, or really –348, or +372?

3. Cinderella's glass slipper was undoubtedly a chiral object. But would it have rotated the plane of polarized light?

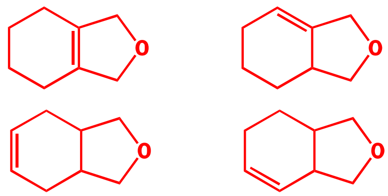
4. Are these compounds chiral? Draw diagrams to justify your answer.



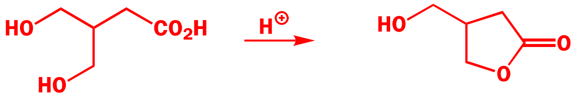
5. What makes molecules chiral? Give three examples of different types of chirality. State with explanations whether the following compounds are chiral.

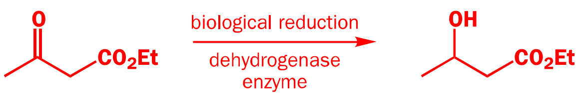


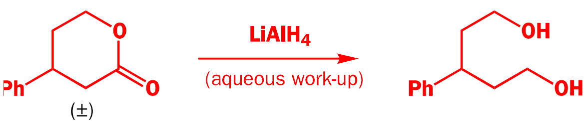
6. Discuss the stereochemistry of these compounds. (*Hint.* This means saying how many diastereoisomers there are, drawing clear diagrams of each, and saying whether they are chiral or not.)

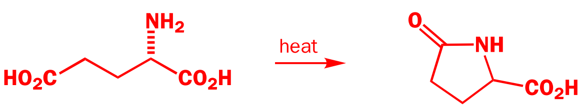


7. In each case state with explanations whether the products of these reactions are chiral and/or optically active.





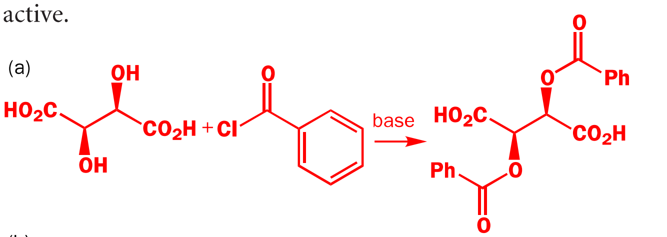




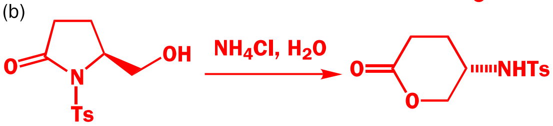
S-(+)-glutamic acid

8. Propose mechanisms for these reactions that explain the stereochemistry of the products. All compounds are optically active.

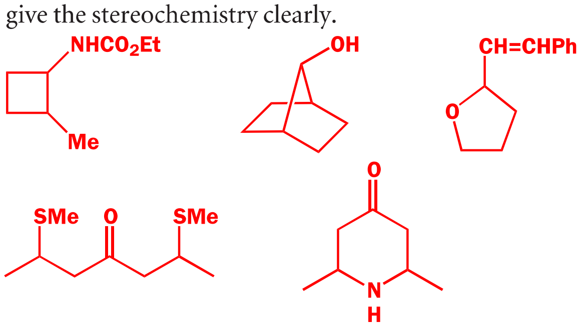
(a)



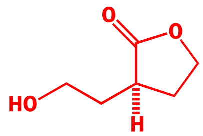
(b)



9. Discuss the stereochemistry of these compounds. The diagrams are deliberately poor ones that are ambiguous about the stereochemistry—your answer should use good diagrams that give the stereochemistry clearly.

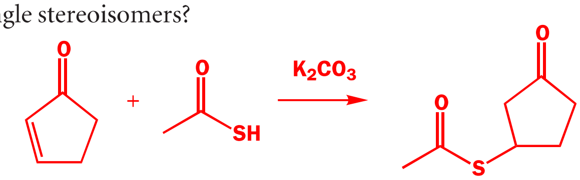


10. This compound racemizes in base. Why is that?

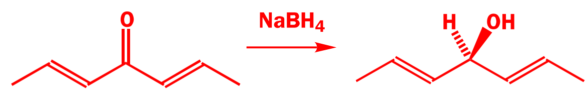


11. Draw mechanisms for these reactions. Will the products be single stereoisomers?

(a)

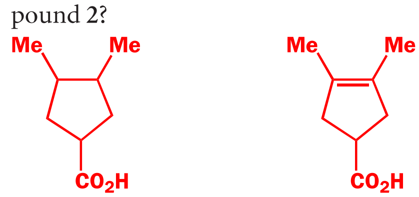


(b)



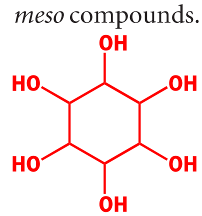
(c)

12. How many diastereoisomers of compound **1** are there? State clearly whether each diastereoisomer is chiral or not. If you had made a random mixture of stereosiomers by a chemical reaction, by what types of methods might they be separated? Which isomer(s) would be expected from the hydrogenation of compound **2**?



1 2

13. Just for fun, you might like to try and work out just how many diastereoisomers inositol has and how many of them are *meso* compounds.



inositol