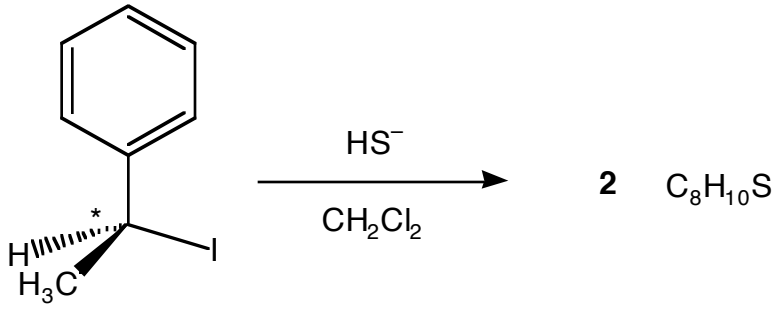
Problem 55, Chemistry 301X - 2006

Reaction of the enantiomerically pure iodide **1** (C_8H_9I) with one molar equivalent of thiolate (HS^-) ion in CH_2Cl_2, a slightly polar solvent, leads to enantiomerically pure **2**, $C_8H_{10}S$.



(+)-**1**

C_8H_9I

a. Draw the product and an arrow formalism for its formation.

b. Is the starting iodide *R* or *S* ?

c. Is the product *R* or *S* ?

d. If the rotation of the iodide **1** is (+ = clockwise), as shown in the figure, can you tell if the product **2** will rotate the plane of plane polarized light clockwise (+) or counterclockwise (–)? If so, tell us which it is.

e. Would the reaction of **1** with thiolate be faster or slower in a nonpolar solvent? Explain carefully.

f. Increasing solvent polarity in the reaction by adding methyl alcohol (CH_3OH) leads to a decrease in the optical rotation of the product **2**. Why?

g. What will happen to the rotation of **2** as we continue to increase the polarity of the solvent? Explain.