

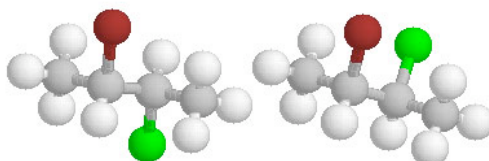
Name(s)_____

Chem 226 / Dr. Rusay

Worksheet: Free Radical Reactions/ Stereochemistry

1. Free radical mono-chlorination of (S)-2-bromobutane produces a complex mixture of isomers with the molecular formula: C_4H_8BrCl . Two of the isomers are illustrated below. Label each of the chiral carbon atoms as R- or S-. The printed darker atoms are the halogens. Bromine is darker than chlorine. For a better views see:

<http://chemconnections.llnl.gov/Organic/Chem226/jmol-html/Br-Cl-product-1.html>



product 1

product 2

[Circle the correct response.] The pair of isomers are: diastereomers, enantiomers, identical, constitutional, cis-trans (E-Z).

2. Consider the six possible isomers from question #1; the S- absolute configuration of the bromine substituted carbon atom is retained in four of them.

Draw Fischer structures for each of the six isomers, indicate the absolute configuration (R- or S) for each chiral carbon atom in the structures. Identify any enantiomers by circling the pairs. Estimate the relative % distribution of each of the isomers (selectivity).

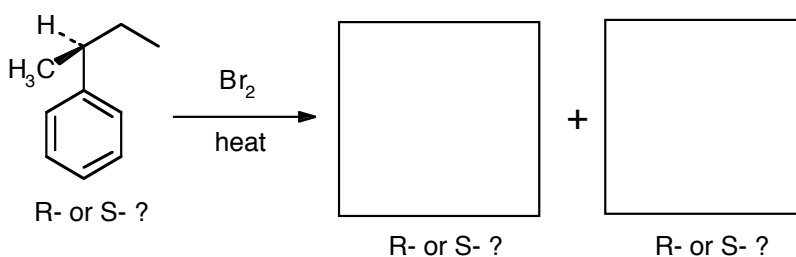
1)	2)	3)
relative % =	relative % =	relative % =
4)	5)	6)
relative % =	relative % =	relative % =

If the reaction were the bromination of (S)-2-chlorobutane what would be the expected changes in the product distribution?

3. Draw three additional resonance forms for the following benzyl free radical with the radical on a carbon in the ring. Indicate electron movements with the appropriate arrows. Circle the resonance structure that you believe is the most stable and provide a brief explanation for your choice.



4. Bromination of *d*-2-phenylbutane, $[\alpha]_D^{25} = +26.6^\circ$, which is illustrated below produces a racemic mixture of the two mono-brominated products as the only products formed. Complete the reaction and identify the absolute configurations of the starting material and products.



What is the estimated optical rotation of the resulting mixture?

Provide a brief explanation of why these products are formed and not any of the four other possible mono-brominated products.

5. Provide reagents for the first reaction, the major products for the second, and the reactant plus reagents for the third.

