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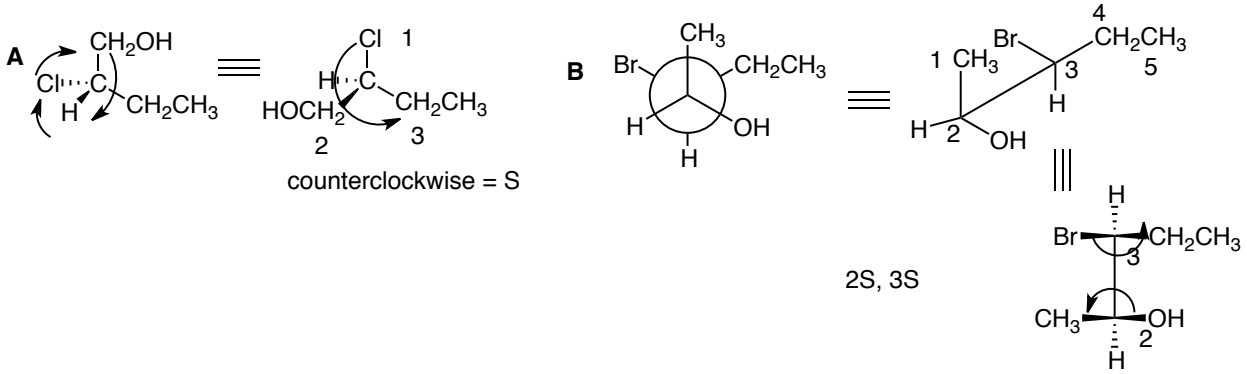
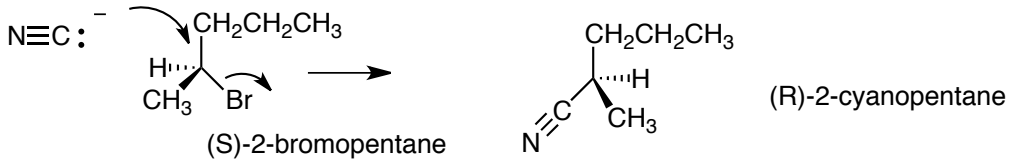
L. I. U.

Chem. 121, Sect 005, Quiz 3 Fall, 2011, 50 points

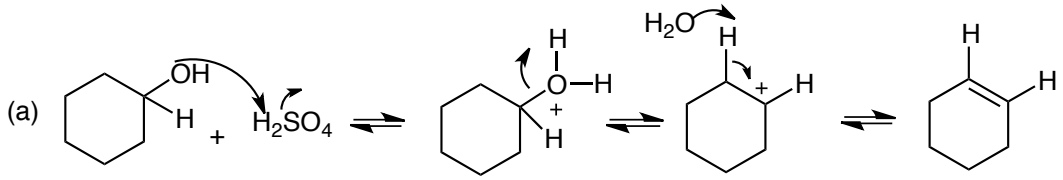
1. Assign the absolute configuration (R or S) to each chirality center. Be sure to number the carbons for molecule **B.** (15 pts)



2. Show the reaction that occurs between (S)-2-bromopentane and cyanide anion (NC^-). Assign the absolute configuration to the product. (10 pts)



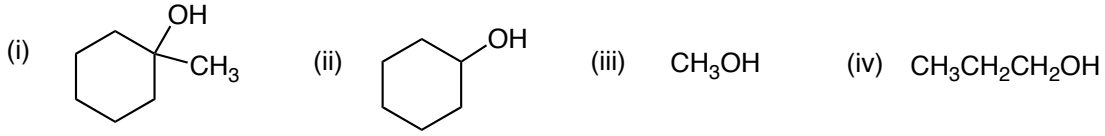
3. In the preparation of cyclohexene from cyclohexanol using sulfuric acid (a) show the complete reaction that occurs, including the complete reaction mechanism. (b) The reaction is reversible. Explain how we drove the reaction to completion. (c) Explain the purpose of adding sodium chloride to the distillate in the first step of the work up. (11 pts)



(b) We drive the equilibrium to the right by removing the product, cyclohexene, and the water as it forms by distillation.

(c) The sodium chloride was added to "salt out" the cyclohexene from the water layer and to draw out any water from the cyclohexene layer by increasing the ionic strength of the water.

4. In the Lucas Test for alcohols using HCl and $ZnCl_2$ as a Lewis Acid, which alcohol would (a) react fastest? (b) Which alcohol would react slowest? Explain briefly in each case. (8 pts)



(a) The tertiary alcohol 1-methylcyclohexanol (i) would react the fastest in the Lucas Test since there is a carbocation intermediate formed and the tertiary carbocation forms the fastest.

(b) Methanol (iii) would react the slowest under the S_N1 conditions since it involves a very high energy methyl carbocation.

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5. In the preparation of 1-bromobutane from 1-butanol using sodium bromide and aqueous 65% sulfuric acid, one student could not find the aqueous sulfuric acid and so decided to just use 100% water instead. Would the reaction still work? Why/why not? Explain briefly. (6 pts)
The reaction would not work at all. Water is a very weak acid (pKa 15.7) and does not significantly protonate the 1-butanol. The OH group must be protonated in order to make it into a good leaving group.