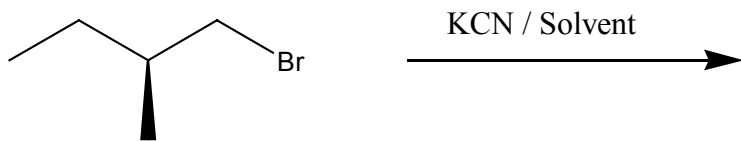


Whittier College
Organic Chemistry: CHEM 231A
Problem Set # 3
 40 Points Total
 Due October 31, 2002

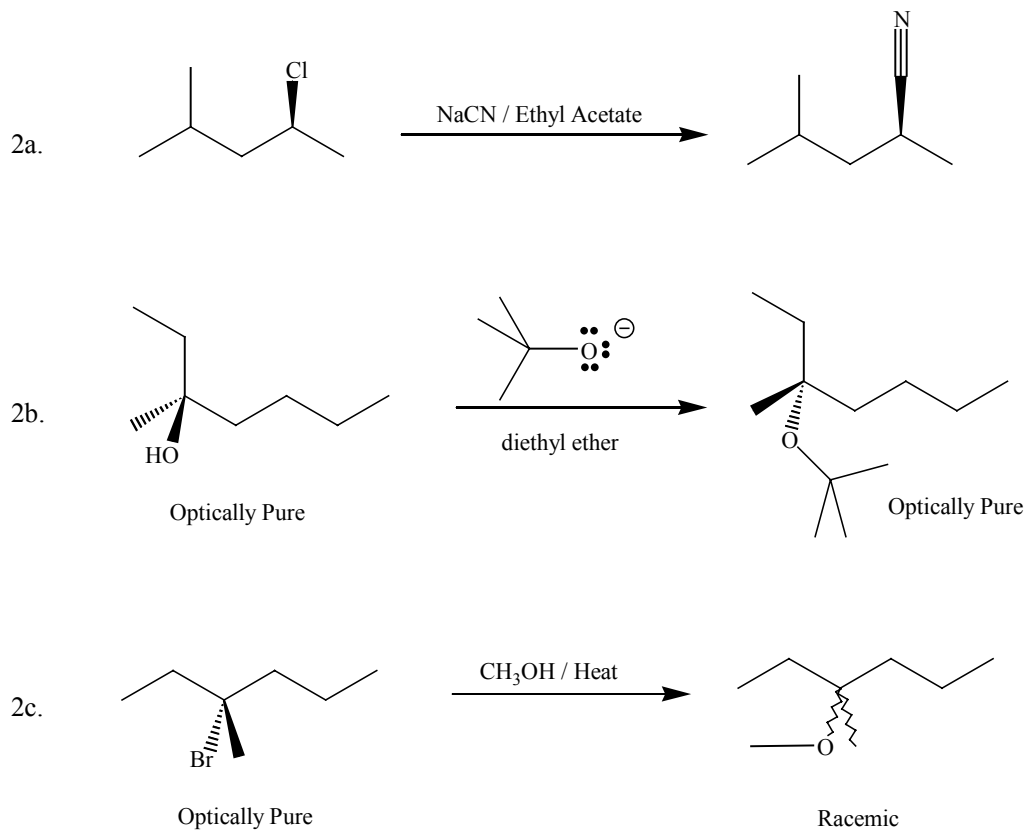
1. Given the following reaction: (7 points)



<u>Solvent</u>	<u>Rate</u>
Methanol	60 minutes
DMF	10 minutes

- 1a. What is the product for this reaction? (1 pt)
- 1b. What is the mechanism for this reaction? (1 pts)
- 1c. Provide an explanation for the difference in rate data. (3 pts)
- 1d. If the starting material is optically pure, would the product of the reaction also be optically pure? Explain. (2 pts)

2. Consider the following reactions: Will the reaction occur as drawn or will some other product be formed? Explain. (9 pts = 3 pts each)



3. Optically pure (R) 1-chloro-1-phenyl ethane undergoes a reaction in water at pH 7 – 11 to form mainly 1-phenyl-1-ethanol. The rate of the reaction is independent of the pH of the solvent. (8 pts)
- 3a. What is the structure of (R) 1-chloro-1-phenyl ethane? (1 pt)
- 3b. What does pH have to do with the reaction at all? (2 pts)
- 3c. Why doesn't the reaction occur at low pH? (2 pts)
- 3c. Keeping in mind the effect of pH on the rate noted above, predict the probable configuration of the product alcohol. Explain. (3 pts)
4. When t-butyl chloride is dissolved in a mixture of 80 % acetone / 20 % water and the solution is heated to 50 C, t-butanol is the major product. When a small amount of LiCl is added to a separate but same reaction, the rate of disappearance of t-butyl chloride increases (the reaction time decreases). As the concentration of LiCl is systematically increased, the rate of disappearance of t-butyl chloride is systematically increased (the reaction time is shortened), yet the product remains unchanged. (8 pts)
- 4a. Draw the reaction that is occurring. (1 pt)
- 4b. Explain the effect of the added LiCl on the rate of disappearance of t-butyl chloride. (3 pts)
- 4c. Draw a mechanism for the reaction. (2 pts)
- 4d. Draw an energy diagram for the reaction that helps explain the observed effect. (2 pts)
5. When 2-bromo-3-methylbutane is mixed with sodium methoxide in diethyl ether at room temperature, two products are formed: 2-methoxy-3-methyl butane (A) and 2-methyl-2-butene (B). In subsequent reactions and upon addition of increasing amounts of a new reagent, sodium isopropoxide, the amount of product B increases and the amount of product A decreases. In addition, the reaction rate increases as the amount of isopropoxide increases. (8 pts)
- 5a. Draw each of the separate reactions that are occurring. (2 pts)
- 5b. Explain the effect of the added isopropoxide on the reaction, both in terms of rate and product ratios. (3 pts)
- 5c. Draw a mechanism for the reaction. (1 pt)
- 5d. Draw an energy diagram for the reaction that helps explain the observed effect. (2 pts)