

Procedure:

1. Set up a hot water bath in a 400-mL beaker.
2. Add 2.0 mL (1.6 g) of t-butyl alcohol and 2.0 mL of 6.0 M HCl in a small reaction vial. Obtain the masses of each reactant by tarring the vial, adding the reactant & reading the mass. Solid t-butyl alcohol can easily be melting by warming the bottle in a hot water bath.
3. Seal the reaction vial using a Teflon-coated cap. BE SURE THAT THE CAP IS SEALED. Shake the mixture for 1 minute, then add to the hot water bath using a wire hanger.
4. Watch the reactants for signs of bubbles. If present, remove the vial and then tighten the lid again.
5. After 20 minutes, remove the vial and set on the counter for 1-2 minutes to cool.
6. Place the vial in a beaker of ice water for 3 minutes
7. Add 5-10 mL of ice water in a test tube
8. Observe the contents of the reaction vial. There should be two layers, a lower aqueous layer containing unreacted hydrochloric acid and t-butyl alcohol and an upper layer containing t-butyl chloride. Using a Pasteur pipet, carefully remove the upper layer from the reaction vial. Slowly add this upper layer to the test tube containing ice water. If added too quickly, some of the product may boil away.
9. Cap the test tube tightly and carefully invert (do not shake) a couple of times. Release the pressure inside the tube by carefully removing the stopper.
10. Remove the upper t-butyl chloride layer from the test tube using a Pasteur pipet and place the product in a clean reaction vial.
11. Add a small amount of anhydrous magnesium sulfate (or sodium sulfate). Only add enough to cover the bottom of the vial. Gently swirl the vial. If the magnesium sulfate is free flowing and the t-butyl chloride is clear, the product is dry.
12. Transfer the clean, dry t-butyl chloride to another clean, tarred vial. Obtain the mass of the reactant and calculate the percent yield.

Data & Calculations

1. Record your data & observations following steps 2, 8, 11, & 12.
2. Calculate the theoretical yield for t-butyl chloride from your initial reactant amounts.
3. Which reactant was the limiting reactant? Be sure to show how you got that answer
4. Calculate the percent yield for the production of t-butyl chloride

Questions.

1. Write out the mechanism associated with this S_N1 reaction. Be sure to include the intermediate in this reaction
2. Explain the significance of the 1 & 2 in the S_N1 & S_N2 reaction mechanisms.
3. What is a racemic mixture? And which mechanism produces them? And which one doesn't? Be sure to explain your answers.
4. Explain the significance the role of a solution, as being protic or aprotic, has on the mechanism.
5. Explain how the substitution of a halide carbon dictates the type of mechanism.