Advanced Chemistry: Formation of an Ester Lab Names

Procedure:

1. Set up a 400 mL-beaker as a hot bath
2. Obtain the mass of 1.2 mL of n-propyl alcohol and of 2.5 mL glacial acetic acid, then add them to a reaction vial. (To obtain a higher percent yield- dry the alcohol over anhydrous magnesium sulfate before massing)
3. Using a Beral-type pipet, add 5 drops of concentrated sulfuric acid to the reaction vial
4. Seal the vial. Mix the reactants by inverting the vial several times
5. Using tongs, place the vial into the hot bath. Be sure to watch for bubbles from under the cap, if so, retighten the cap
6. Heat the vial for 20-25 minutes
7. Remove the vial and place it on the table top to cool
8. Place the vial in a cool water bath for 3 minutes to cool
9. Add 10 mL of ice water in a small test tube for step 11
10. Carefully open the vial, be sure to go slow as the vial is under pressure and some product may squirt out.
11. Pour the contents of the reaction vial into the small test containing the ice water. Gently stir to dissolve all unreacted starting material. Rinse out the reaction vial with water. Transfer the organic (upper) layer containing the ester product back to the reaction vial using a Pasteur pipet.
12. Wash the crude ester product twice with 2 mL of 10% sodium carbonate solution and once with distilled water. Add the sodium carbonate solution slowly to prevent the mixture from bubbling out of the vial.
13. Remove as much of the lower aqueous layer as possible. Dry the organic layer with a small amount of anhydrous magnesium sulfate.
14. Using the appropriate technique for smelling chemicals, identify the aroma of the ester.
15. Obtain the mass of the ester

Data:

Mass of n-propyl alcohol _____ Mass of acetic acid _____ Mass of ester _____

Calculations:

1. Calculate the number of moles of reactants available
2. Calculate the number of moles of products expected (theoretical yield)
3. Calculate the number of moles of products obtained (actual yield)
4. Calculate the percent yield of your product.

Questions:

1. What is the name of your ester product?
2. Why is the percent yield lower if the alcohol is not dried?
3. Draw out the ester-forming mechanism for isobutyl alcohol and formic acid (methanoic acid).
4. Why are artificial flavorings used instead of natural flavorings?

Research:

5. What is a polyester? What are the significances of polyesters?
6. What is a fat molecule (triacylglycerol) and how is it synthesized?

Other Reactions: You can try these if time permits. Don't all try the same……

1. Amyl acetate	Amyl alcohol/acetic acid	Pineapple
2. n-Octyl acetate	n-octyl alcohol/acetic acid	Orange
3. Benzyl acetate	Benzyl alcohol/acetic acid	Peach
4. Isobutyl formate	Isobutyl alcohol/formic acid	Raspberry
5. Isoamyl acetate	Isoamyl alcohol/acetic acid	Banana
6. Methyl salicylate	Methanol/Salicylic acid	Wintergreen