

What's That Smell?

Purpose

Illustrate the variety of odors that are produced from esters.

Materials

- Organic alcohols in dropper bottles (see chart below for suggested alcohols)
- Organic acids in dropper bottles (see chart below for suggested acids)
- Sulfuric acid, H_2SO_4 (18 M)
- Sodium carbonate, Na_2CO_3
- Test tubes
- Test tube holder
- Bunsen burner

Safety

- Read the SDS sheets for all chemicals before using them.
- Wear safety glasses and gloves.
- Waft vapors when detecting odors.
- Concentrated acids are used.

Procedure

1. In a test tube, add 15 drops of ethanol to 20 drops of glacial acetic acid.
2. Add one drop of concentrated sulfuric acid.
3. Mix the reactants by gently tapping the test tube.
4. Gently heat the bottom of the test tube for several minutes. Keeping the test tube on a slight angle helps control vapor loss. If the solution starts to boil, remove it from the heat.
5. Add a small amount of sodium carbonate to neutralize any excess acid.
6. Carefully smell by wafting. Dilute with water if the smell is too strong.
7. See the chart for more combinations. Use 0.5 g of solid acids such as salicylic acid.

Results

- Vary depending on the organic acid and alcohol used (see reference chart below).

Follow-up Teaching Notes:

- Ester reference chart

Acid	Alcohol	Odor
acetic acid	ethanol	nail polish remover
acetic acid	1-butanol	raspberries
acetic acid	2-butanol	strawberries
acetic acid	1-pentanol	pear
acetic acid	isoamyl alcohol	banana
benzoic acid	ethanol	cherry
salicylic acid	methanol	Wintergreen
anthranilic acid	methanol	Grape
butanoic acid	ethanol	pineapple

- The concentrated sulfuric acid acts a catalyst and as a dehydrating agent for the condensation reaction between the alcohol and the carboxylic acid.

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- When using butyric acid, perform the demonstration in a fume hood due to the bad butyric acid odor.

Connections

- Organic synthesis, esters, condensation reactions.

Disposal/Clean-up

- Dispose of the esters down the drain with lots of water. Check local codes before any disposal activity.