Esters

Materials:
- Hot water bath
- Several small test tubes
- Conc. Sulfuric Acid (H_2SO_4)
- Various alcohols
- Various acids

** Use caution with all of the above chemicals – they are very caustic
Wash immediately with soap and water and report all spills to the teacher

Procedure:
1. Pick one of the listed combinations of acid-alcohol to form an ester
2. Add 30 drops of the alcohol and 10 drops of the acid to the test tube
3. Add 10 drops of the sulfuric acid
4. Loosely cap with a piece of aluminum foil and place in the hot water bath for 5 minutes
5. After the 5 minutes check for an odor by wafting fumes towards your nose
6. If there is an alcohol smell, replace the cap and heat for a few more minutes
7. If the smell is overpowering, add an equal amount of water, shake, and check
8. Wash with plenty of soap and water

ALCOHOL	ACID	SMELL
Isoamyl (3-methyl-1-butanol)	Butyric (butanoic acid) (in hood!!!)	apricot
Isoamyl	Salicylic (ask teacher for structure)	pineapple
Amyl (1-pentanol)	Acetic (ethanoic acid)	banana
Octyl (1-octanol)	Acetic	orange
Methyl (methanol)	Salicylic	wintergreen
Ethyl (ethanol)	Butyric	pineapple
Ethyl	Benzoic (ask teacher for structure)	pear
Methyl	Butyric	apple
Isoamyl	Acetic	banana

Questions: 1. How are esters used in the candy and gum industry?

2. How would you prepare grape also known as ethyl decanoate?

3. Why was a hot water bath used instead of a direct flame?

4. Use structural formulas to write an esterification reaction for all nine of the listed smells: