

Chemistry 100
Experiment 13

Instructors Initials _____

Name _____

Properties and Reactions of Organic Chemicals

Properties of hydrocarbons : Demonstration to be done by the instructor:

Place 2ml of each of the hydrocarbons in the table below in the appropriate test tube. Add 5 drops of water to each tube to test the solubility of each hydrocarbon. To the same tubes add a few drops of the bromine solution and record your observation.

Name	Structural Formula	Solubility in water? Yes or no?	Density more or less than 1 g/ml?	Bromine Test positive or negative	Saturated or Unsaturated?
Heptane					
2-pentene					

Dispose in halogenated organic waste container.

What kind of reaction is it when bromine reacts with an unsaturated hydrocarbon? _____

Draw the structure and name of the molecule that is produced in the above reaction:

Structure	Name

Properties of alcohols

Put 1ml (20 drops) of each of the following alcohols in their own numbered test tube. Put your stirring rod into a tube and touch it to a piece of pH paper. Record the color of the paper and pH. Clean your stirring rod between each alcohol. To each tube add about 2 ml of deionized water. Mix well and record if they dissolved or not.

Tube #	Name	Structural Formula	Primary, secondary or tertiary?	Solubility in water? Yes or no?	Color of pH paper	pH
1	Methanol					
2	Ethanol					
3	2-propanol					
4	2-methyl-2propanol					

Dispose in sink

Properties of organic acids

Put 5 drops of the acid if it is a liquid and about the size of a match head if it is a solid into numbered test tubes. To each tube add about 2 ml of water and mix. Record if the acid is soluble or not. Put your stirring rod into a tube and touch it to a piece of pH paper. Record the color of the paper and pH. Clean your stirring rod between each tube. To each tube add about a pea sized amount of sodium bicarbonate (NaHCO_3) and record if it reacted or not.

Tube #	Name	Structural Formula	State of matter	pH	Solubility in water?	Reaction with NaHCO_3
1	Ethanoic acid					
2	Citric acid					
3	Benzoic acid					
4	Salicylic acid					

Dispose in sink.

Reactions of alcohols with organic acids:

Esterification Be Careful concentrated sulfuric acid is very corrosive.

In a test tube put 15 drops of ethanoic (acetic) acid and 15 drops of pentanol (amyl alcohol). Add 10 drops of concentrated sulfuric acid. Stir with a clean stirring rod. Place the tube in a hot, but not boiling water bath for 3 minutes. Gently waft the odors toward your nose and identify the smell.

Structure of ethanoic (acetic) acid	Structure of pentanol (amyl alcohol)

Name of ester produced	Odor of Ester	Structure of ester

Dispose in sink.

Reactions of alcohols

Oxidation:

In each of four labeled test tubes add about 2ml of potassium dichromate $K_2Cr_2O_7$. Be careful potassium dichromate is toxic! Wash your hands. Then add 4 drops of dilute sulfuric acid. The bottle is on your reagent bench. Do not put your dropper into the bottle. Pour some into a beaker first. To tube #1 add nothing. This tube will serve as a control to compare to. To the other tubes add 6 drops of the alcohols listed in the table into the corresponding test tube. Place each tube in a water bath in the fume hood for a few minutes and make observations. Do not pour down the sink.

Tube #	Name	Structure	Primary, secondary or tertiary?	Observation	Did it oxidize? Yes or no?
1	Control	N/A	N/A		
2	Ethanol				
3	2-propanol				
4	2-methyl-2propanol				

Dispose in the Waste container labeled "Waste Potassium Dichromate Solutions"

Draw the structure, name, and class of the molecules that were produced in the above reaction:

Structure	Name	Class of organic compound

Reactions of aldehydes and ketones

Oxidation: Benedict's test

Put 3 ml of Benedict's reagent into 2 numbered tubes. To tube #1 add 15 drops of ethanal. To tube #2 add 15 drops of 2-propanone. Put each into a water bath of boiling water in the hood on a hot plate for 5 minutes. Record your observations.

Tube #	Name	Structure	Observation	Reaction ? Yes or no?
1	Ethanal			
2	2-propanone			

Dispose in Non-halogenated organic waste container

Draw the structure, name and class of the molecules that were produced in the above reaction:

Structure	Name	Class

Questions:

1. What is the name of the functional group on:

alcohols	aldehydes	ketones	carboxylic acids

2. What is the name of the class of compound formed when the following are oxidized:

1° alcohols	2° alcohols	aldehydes	ketones