

## Experiment #1

### Identification of a Compound: Physical Properties

Gold is yellow, roses are red, salt is white and crystalline, lead is “heavy”, and water is a colorless, clear liquid. These are all physical properties of chemical substances. Physical properties are often used for the identification of a chemical substance. The more common physical properties include: color, odor, density, solubility, melting point, boiling point, and whether the substance is a solid, liquid, or gas at a given temperature.

In this experiment the chemical properties of a compound are used for its identification. The purpose of this experiment is to identify a chemical compound from the data collected on its solubility, density and boiling point.

#### A. Density

- a. Follow the procedure described in your lab manual.

#### B. Boiling Point

- a. Assemble the Boiling Point Apparatus (**CAUTION**: the liquid may be flammable – keep it away from an open flame)
  - i. Place 10 drops of the unknown liquid into a 75-mm test tube.
  - ii. Position the test tube beside the thermometer bulb using a rubber band.
  - iii. Invert (open end down) a 10-cm capillary tube in the liquid.
  - iv. Place the apparatus into the water bath.
- b. Measure the Boiling Point
  - i. Slowly heat the water in the water bath while stirring with the stirring rod.
  - ii. When a rapid and continuous stream of bubbles escapes the capillary tube, discontinue heating the water bath.
  - iii. The streams of bubbles slow as the bath cools. When the bubbles cease to escape and before the liquid re-enters the capillary tube, record the temperature (the boiling point).
- c. Repeat the Measurement
  - i. Determine the boiling point a second time. The same volume of liquid may be used.
  - ii. However, the capillary tube must be removed and re-inserted before heating resumes.
- d. Disposal
  - i. Dispose the leftover unknown liquid in the “Waste Liquids” container.

#### C. Solubility

- a. Solubility in Cyclohexane
  - i. Into a 75-mm test tube add 1 mL of cyclohexane.
  - ii. Add three drops of your liquid unknown to the same 75-mm test tube.
  - iii. Agitate the contents.
  - iv. Does each drop of unknown dissolve? Partially dissolve?
  - v. Record your observations
- b. Solubility in Ethanol
  - i. Repeat the same test as before (section C.a.) except replace the 1 mL of cyclohexane with ethanol.
- c. Solubility in Water
  - i. Repeat the same test as before (section C.a.) except replace the 1 mL of cyclohexane with water.

Compound	Density (g/mL)	Boiling Point (°C)	Solubility		
			Water	Cyclohexane	Ethanol
Acetone	0.79	56	s	s	s
2-butanone	0.805	80	s	s	s
Cyclohexane	0.79	80.74	i	---	s
Cyclohexane	0.81	83	i	s	s
Ethanol	0.79	79	s	s	---
Ethylacetate	0.90	77	sls	s	s
Heptane	0.684	98	i	s	s
n-hexane	0.66	68	i	s	s
1-hexene	0.67	63	i	s	s
Isopropanol	0.79	83	s	s	s
Methanol	0.79	65	s	s	s
n-propanol	0.805	97	s	s	s
water	1.00	100	---	i	s

Symbols used: i = insoluble, sls = slightly soluble, s = soluble

## Data

A.

Mass of vessel	
Mass of vessel + Unknown sample	
Volume of vessel	

B

Boiling point temperature (trial 1)	
Boiling point temperature (trial 2)	
Boiling point temperature (trial 3)	
Boiling point temperature (trial 4, if needed)	

C

	<i>Soluble with</i>		
	<b>cyclohexane</b>	<b>ethanol</b>	<b>water</b>
<b>Unknown</b>			

## Calculations

A (show the calculation for the unknown's density)

## Results

By comparing your data with the table on the first page determine what the identity of your unknown is.

Unknown Number	
Identity of unknown	

Give me some reasons why your measurements could be wrong. In other words, list sources of error and explain how it would affect your end results.