

# Intermolecular Forces and Solubility

Name: \_\_\_\_\_

Section: \_\_\_\_\_

Date: \_\_\_\_\_

**Purpose (goal of the experiment):**

## DATA AND OBSERVATIONS

### 1. Determining Solubility in Water

List the ionic compounds soluble in water. What intermolecular forces are present in solution?

List the ionic compounds insoluble in water. Explain why these compounds are insoluble in water.

List the molecular solids soluble in water. What intermolecular forces are present in solution?

List the molecular solids insoluble in water. Explain why these compounds are insoluble in water.

List the molecular liquids miscible in water. What intermolecular forces are present in solution?

List the molecular liquids immiscible in water. Explain why these compounds are immiscible in water.

## **2. Determining Solubility in Acetone**

List the ionic compounds soluble in acetone. What intermolecular forces are present in solution?

List the ionic compounds insoluble in acetone. Explain why these compounds are insoluble in acetone.

List the molecular solids soluble in acetone. What intermolecular forces are present in solution?

List the molecular solids insoluble in acetone. Explain why these compounds are insoluble in acetone.

List the molecular liquids miscible in acetone. What intermolecular forces are present in solution?

List the molecular liquids immiscible in acetone. Explain why these compounds are immiscible in acetone.

## **3. Determining Solubility in Hexane**

List the ionic compounds soluble in hexane. What intermolecular forces are present in solution?

List the ionic compounds insoluble in hexane. Explain why these compounds are insoluble in hexane.

List the molecular solids soluble in hexane. What intermolecular forces are present in solution?

List the molecular solids insoluble in hexane. Explain why these compounds are insoluble in hexane.

List the molecular liquids miscible in hexane. What intermolecular forces are present in solution?

List the molecular liquids immiscible in hexane. Explain why these compounds are immiscible in hexane.

#### **4. Effect of a surfactant**

What did you observe before adding the detergent? What about after? Explain.

#### **5. Solubility of Sodium Thiosulfate**

What did you observe after initial mixing? What about after heating? What did you observe after cooling to room temperature? What happened after adding the seed crystal? Explain your observations (describe the solution as saturated, unsaturated and supersaturated). Note: the solubility of sodium thiosulfate is 50 g/100 mL at 0 °C and 231 g/100 mL at 100 °C.

## Post Lab Questions

1. Barium compounds are generally considered toxic to humans. Yet patients routinely receive barium sulfate suspensions before they have upper and lower gastrointestinal tract X-ray taken. Considering your results explain why this procedure can be performed without danger to the patient.
2. Honey is a solution of two sugars, glucose and fructose. Once the jar has been opened, the honey sometimes forms a crystalline solid. Placing the honey container in a boiling water bath will reverse the process. Explain what is happening to the honey, using the appropriate solution terminology.
3. Acetone,  $\text{CH}_3\text{COCH}_3$  is called a hydrogen bond acceptor. It has an electronegative oxygen that can hydrogen-bond with the hydrogen on water, but it does not have a hydrogen that can hydrogen-bond to itself. Draw a picture of this interaction. Would dimethyl ether,  $\text{CH}_3\text{OCH}_3$  be miscible in water? Explain.
4. Predict the miscibility of dichloromethane ( $\text{CH}_2\text{Cl}_2$ ) in water. Explain.