Name:	Class Period:
Lab Partner	Lab Partner

OBSERVING IONIC REACTIONS

Introduction

A teaspoon of salt is added to a glass of water, and the crystals disappear. You hear of a factory contaminating a river with mercury salts, harming fishing. Even though the dissolving of a salt is a very common process, and one of which can have great significance environmentally, the actual process of how a solid dissolves remains one of the least understood processes in science.

However, it is known that many dissolving crystals form ions that migrate and diffuse in a suitable liquids medium. These related ions can then recombine by attracting oppositely charged ions to them. If the solubility of this newly formed compound is very low, the result is that a precipitate forms. And, it can be said that an ionic reaction has taken place.

In this investigation you will observe some ionic reactions very closely and will be able to watch actual precipitates form. From the chemical formulas of the compounds involved, you will determine the ions released during the dissolving process and the new substances created.

Materials

Copper (II) chloride crystals	Sodium carbonate crystals	2 Petri dishes
Potassium iodide crystals	Lead (II) nitrate crystals	scoopulas
Cobalt chloride crystals	distilled water	chemistry reference tables

Procedure: Be Sure to RECORD everything in your data section.

1. Set two Petri dishes on a paper towel on the lab table. Fill both with distilled water. Allow the water to stand on the lab table for 3-4 minutes without disturbing it.
2. One lab partner should have a scoopula with a few crystals of Na_2CO_3 and the other partner should have a scoopula with a few crystals of $CuCl_2$. At the same time, carefully add the crystals to the water at opposite sides of the Petri dish. See figure 1.

Figure 1

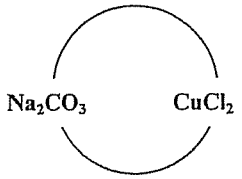
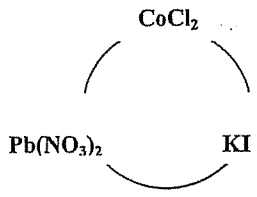


Figure 2



3. Make as many observations as possible for the next 5 minutes. Draw your observations in the proper section of your lab report.
4. To the second Petri dish add a few crystals of $CoCl_2$ to the top of the dish (at the 12:00 position). As soon as possible, add small amounts of KI and $Pb(NO_3)_2$ equidistant from the $Pb(NO_3)_2$ (at the 4:00 and 8:00 positions). **See figure 2.**
5. Observe and record observations for the next 5 minutes. Draw your observations in the proper section of your lab report.
6. Before you leave the laboratory, deposit the solutions into the sink. Wash out the dishes and wash your hands thoroughly with soap and water.

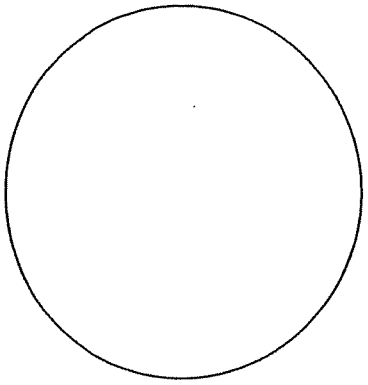
PURPOSE (in your own words, what were you trying to determine): _____

_____

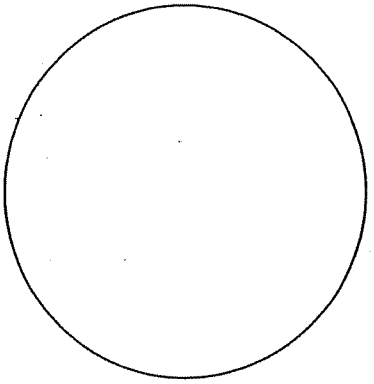
_____

DATA AND OBSERVATIONS (*do this using colored pencils*):

Sodium carbonate and Copper (II) chloride



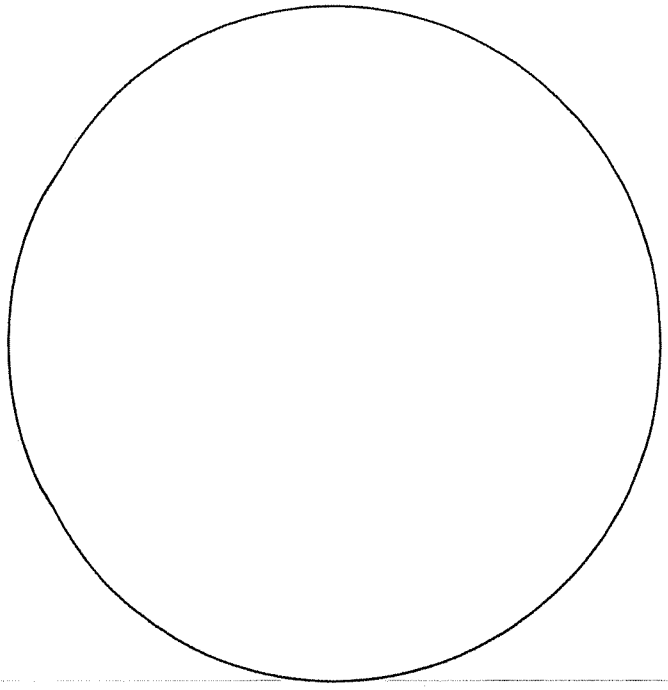
Potassium iodide, Lead (II) nitrate and Cobalt chloride



DATA ANALYSIS (In pencil, draw the salts dissociating in the Petri dishes on a molecular level)

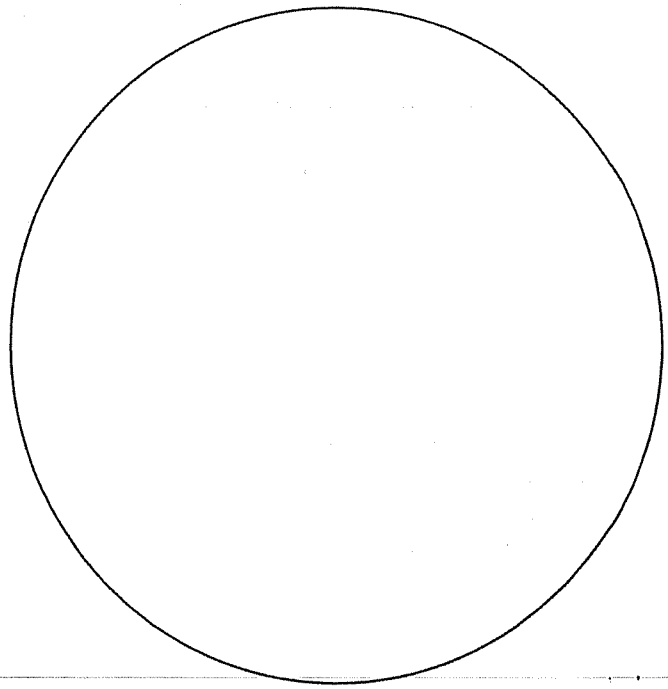
Ex. $NaCl \rightarrow Na^{+} + Cl^{-}$

Sodium carbonate and Copper (II) chloride



Dish 1

Potassium iodide, Lead (II) nitrate and Cobalt chloride



Dish 2

QUESTIONS:

1. Based on your **observations of Dish 1:**
   a) **write** the **balanced** equation for the reaction of sodium carbonate and copper (II) chloride
   b) Use **Reference Table F** to determine which **product is the precipitate (solids).**
   c) **Indicate** which product is *soluble or insoluble.* **Label** the precipitate as a solid in the equation.

__ _____ + __ _____ → __ _____ __ + __ _____ __

2. Based on your **observations of Dish 2:**
   a) **write** the **balanced** equations for the reactions that actually **occurred** between potassium iodide, lead (II) nitrate and cobalt chloride.
   b) Use **Reference Table F** to determine which **products are the precipitates (solids).**
   c) **Indicate** which product is *soluble or insoluble.* **Label** the precipitate as a solid in the equation. (**Hint:** only two reactions took place)

__ _____ + __ _____ → __ _____ __ + __ _____ __

__ _____ + __ _____ → __ _____ __ + __ _____ __

3. **Which** possible chemical reaction did not happen in Dish 2? _____

   Why not? _____

4. **Define** dissociation: _____

_____

5. **Write** the **balanced** chemical equation for the following *double replacement* reactions. Use **Table F** to **label** the products *soluble or insoluble.* **Label the precipitate as a solid.**

   a) Barium chloride and Potassium carbonate

__ _____ + __ _____ → __ _____ __ + __ _____ __

   b) Lead (II) nitrate and Sodium phosphate

__ _____ + __ _____ → __ _____ __ + __ _____ __

Name: _____

1) A dilute, aqueous potassium nitrate solution is *best* classified as a

A) homogeneous mixture
B) heterogeneous compound
C) heterogeneous mixture
D) homogeneous compound

2) Which one of the following compounds is insoluble in water?

A) $CaCrO_4$ B) Na_2S C) $KClO_3$ D) $BaSO_4$

3) Hexane (C_6H_{14}) and water do *not* form a solution. Which statement explains this phenomenon?

A) Hexane is ionic and water is polar.
B) Hexane is nonpolar and water is ionic.
C) Hexane is nonpolar and water is polar.
D) Hexane is polar and water is nonpolar.

4) The solubility of $KClO_3(s)$ in water increases as the

A) pressure on the solution increases
B) temperature of the solution increases
C) pressure on the solution decreases
D) temperature of the solution decreases

5) Solubility data for four different salts in water at 60° C are shown in the table below.

Salt	Solubility in Water at 60° C
A	10 grams/50 grams H_2O
B	20 grams/60 grams H_2O
C	30 grams/120 grams H_2O
D	40 grams/80 grams H_2O

Which salt is *most* soluble at 60° C?

A) *A* B) *B* C) *C* D) *D*

6) At room temperature, the solubility of which solute in water would be *most* affected by a change in pressure?

A) sodium nitrate B) methanol C) sugar D) carbon dioxide

7) Which of the following compounds is *least* soluble in water?

A) aluminum acetate B) iron (III) hydroxide C) potassium sulfate D) copper (II) chloride

8) Which ion, when combined with chloride ions, Cl^-, forms an insoluble substance in water?

A) Fe^{2+} B) Zn^{2+} C) Pb^{2+} D) Mg^{2+}

9) Which two solutions, when mixed together, will undergo a double replacement reaction and form a white, solid substance?

A) KCl(aq) and LiCl(aq)
B) KCl(aq) and $AgNO_3$(aq)
C) NaCl(aq) and $LiNO_3$(aq)
D) $NaNO_3$(aq) and $AgNO_3$(aq)

10) The equation for the saturated solution equilibrium of potassium nitrate (KNO_3) is shown below.

$$KNO_3(s) + \text{energy} \overset{H_2O}{\rightleftharpoons} K^+(aq) + NO_3^-(aq)$$

(a) Using the key below, diagram the products in the given box. [*Indicate the exact arrangement of the particles you diagram.*]

KEY:
Water molecule
K^+
NO_3^-

(b) Compare the rate of dissolving KNO_3 with the rate of recrystallization of KNO_3 for the saturated solution.