

LAD G1b (pg 1 of 4) Double Replacement Reactions - Precipitation type

Name _____

Introduction:

Solubility is an intensive property between one substance (the solute) and a liquid (the solvent) that describes the degree to which the solute will dissolve in the solvent. Remember that the term "salt" is a general term for any ionic compound. Some salts are soluble in water and some are not. If a salt dissolves in water, the resulting solution is considered an aqueous solution. The solubility of salts must be individually tested and chemists have compiled charts of information that show which salts are considered soluble and those which are insoluble (i.e. not soluble).

The general term SOLUBLE means able to be dissolved to a "reasonable" degree. INSOLUBLE means NOT able to be dissolved to any reasonable degree. Of course different salts can dissolve in water in different amounts. The "solubility of a substance" is actually a quantitative property describing the maximum amount of solute that can dissolve in a particular amount of water, the solvent, at a particular temperature. Temperature is important because it does affect the amount of solute that can dissolve. In this LAD all solutions will be at room temperature. In this LAD, insoluble will mean any substance in solution that is visible to the naked eye.

In this LAD soluble salts will be combined with other soluble salts. If the resulting combination is soluble, it will be considered no reaction (NR). If the combination results in the formation of an insoluble salt, it will be considered a chemical reaction. An insoluble salt that is formed this way is called a precipitate. In this LAD a salt will be considered insoluble if a solid substance can be seen in the remaining solvent.

15 combinations will be tested. Four aqueous solutions (1, 2, 3, 4) which all contain soluble alkali salts, will be individually combined with three other aqueous solutions (A, B, C) which all contain soluble nitrate salts.

- 1 potassium hydroxide
- 2 sodium carbonate
- 3 sodium chromate
- 4 potassium iodide
- 5 sodium sulfide

- A nickel(II) nitrate
- B silver nitrate
- C cobalt(II) nitrate

Two solubility facts to remember:

- ALL nitrate salts are soluble
- ALL alkali salts are soluble

Procedure: *Goggles must be worn at all times during the lab.*

Use the chart on page 3 to record the results of testing each combination.

DO NOT CONTAMINATE THE DROPPERS BY TOUCHING THE TIP OF THE DROPPER TO A DIFFERENT SOLUTION WHEN DROPPING THE SOLUTIONS INTO THE WELL-PLATE.

When testing, use a small squirt of each solution (3 or 4 drops). (Try to use the same size squirt for each of the two test solutions that are put together.) Check the results by sliding the well plate over the black desk AND over a white piece of paper to help see any precipitates that may have been formed.

Disposal:

Dump the solutions in the well plate into the disposal bucket. Then the well-plates can be washed in the soapy tub in the sink. Dry off and wipe EACH WELL PLATE with a tissue to remove any remaining precipitate.

PreLAD: write the formulas below, and do the preLAD on page 3.

1 potassium hydroxide _____

A nickel(II) nitrate _____

2 sodium carbonate _____

B silver nitrate _____

3 sodium chromate _____

C cobalt(II) nitrate _____

4 potassium iodide _____

5 sodium sulfide _____

New Concepts, Skills & Ideas – Work on these before, during, and after the LAD.

1. What is a salt?
2. What is a soluble salt?
3. What is a solution? What is a solute and solvent?
4. What is an aqueous solution?
5. What are two ways that you can determine if a salt is soluble?
6. What does a soluble salt look like in water? What does an insoluble salt look like in water?
7. At the particle level, what actually happens to a soluble salt when it dissolves in water?
8. In this lab, what is our definition of insoluble? What do you see in the dish if a precipitate forms?
9. Who are the alkali ions? What is an alkali salt? Who is the nitrate ion? What is a nitrate salt?
10. In addition to the nitrate, what do all nitrate salts have in common?
11. In addition to the alkali ion, what do all alkali salts have in common?
12. What is a precipitate? What is needed for a precipitate to form from two soluble solutions?
13. Even though it was not done in the lab, would a reaction occur if solution 1 were combined with solution 2 or 3? Explain.

Data Collection: *Move the plastic well-plate over white and black backgrounds to maximize your viewing experience.*

Since alkali and nitrate salts are always soluble, those ions can NEVER be a part of any precipitate. The non-alkali, non-nitrate ion in each of the reactants are the ions that become can potentially become part of the precipitate molecule.

PreLAD:

Along the sides and top of the data chart below, write the name of each compound and then write ONLY the symbol for the anions for compounds 1–5 along the sides and the symbol for the cations for compounds A–C along the top.

During LAD:

1. For any combination that produces no reaction write NR.
2. Record “ppt” if a precipitate forms, the color of it, and any other special observations (texture, amount, etc).
3. Write the formula of the precipitate in the box. Do NOT write the entire reaction.

PostLAD:

For any combination that produced a precipitate, write a reactions. For half of the precipitates write the balanced overall reaction, and for the other half, write the balanced net ionic equation, on the back of this sheet or a separate sheet of paper.

	A	B	C
1			
2			
3			
4			
5			

Overall Equations

1 + A

1 + B

1 + C

2 + A

2 + B

2 + C

3 + A

Net Ionic Equations

3 + B

3 + C

4 + A

4 + B

4 + C

5 + A

5 + B

5 + C