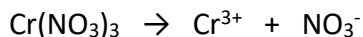


## Ch. 9 Lab :: Cations and Anions

**Directions:** You need to **read the background** and **important** information. It is important for your understanding of this lab and you will be quizzed on the information in the background. Then you will answer the pre-lab questions and illustrate your procedure.

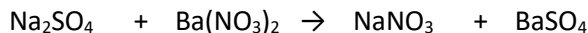
**Background:** The solutions used in this experiment are ionic compounds that have been dissolved into water. This physical change (dissolution) allows the ions that make up the ionic compounds to move freely around in the solution.



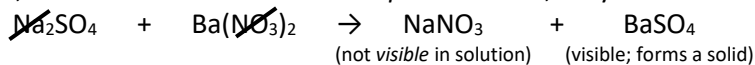
Students will be combining anion solutions with cation solutions to determine whether a reaction occurs by looking for evidence of a **precipitate**. A precipitate is a solid substance (cloudy appearance or color change) that forms when a cation and an anion chemically combine (lock on to each other) and settle out from the solution. An example of precipitate would be the hard water that forms on the inside of your shower. What are other examples of precipitate? Some ions never form solid precipitates and are always unchanged in the reaction. These ions are called **spectator ions**. Examples include Sodium ( $\text{Na}^+$ ) and Nitrate ( $\text{NO}_3^-$ ).

**Now let's see how the spectator ions get crossed out in a balanced equation.**

1) Sodium sulfate + Barium nitrate  $\rightarrow$  Sodium nitrate + Barium sulfate



2) However, if sodium and nitrate are the *spectator ions*, they will not react to form a solid.



3) Additionally, the cation solution will have the *spectator anion* and the anion solution will have the *spectator cation*.

4) The *spectator ions* in this example are **sodium ion and nitrate ion**.

Name \_\_\_\_\_ Period \_\_\_\_\_

**Ch. 9 Lab :: Cations and Anions  
PreLab Questions & Illustration**

Part 1: Write the *FORMULA* for each metallic or nonmetallic ion below. The ion that is participating in the reaction is bold. **Only write that ion and its charge on the line.**

Soluble Metallic Cations:

1. Iron (II) nitrate \_\_\_\_ **Fe<sup>2+</sup>** \_\_\_\_
2. Magnesium sulfate \_\_\_\_\_
3. Copper (II) sulfate \_\_\_\_\_
4. Lead (II) nitrate \_\_\_\_\_
5. Silver nitrate \_\_\_\_\_

Soluble Nonmetallic Anions

- A. Sodium **Carbonate** \_\_\_\_ **CO<sub>3</sub><sup>2-</sup>** \_\_\_\_
- B. Sodium **Chloride** \_\_\_\_\_
- C. Sodium **Hydroxide** \_\_\_\_\_
- D. Sodium **Iodide** \_\_\_\_\_
- E. Sodium **Phosphate** \_\_\_\_\_

List the spectator ion in 1-5 \_\_\_\_\_ and A-E \_\_\_\_\_

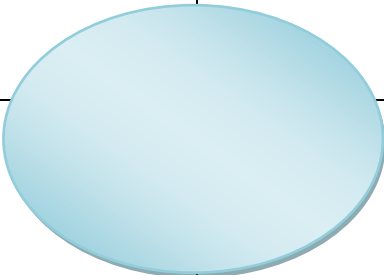
**Part 2: Answer the questions below using the data in part 1 or your periodic table.**

When you combine *Ion #2* above (Mg<sup>2+</sup>) with *Ion B* above (Cl<sup>-</sup>), you will get **Mg<sup>2+</sup> + Cl<sup>-</sup> = MgCl<sub>2</sub>** Use this method of combining to complete Part 2 below.

6. Write the chemical formula by combining the ion in #1 with the ion in A. \_\_\_\_\_
7. Write the chemical formula by combining the ion in #5 with ion in E. \_\_\_\_\_
9. List the transition metal ions that do not get roman numerals in their name. \_\_\_\_\_
10. The sodium and nitrate ions in this lab are called \_\_\_\_\_ ions.
11. A solid that forms from two liquids is called \_\_\_\_\_.
12. Is sodium nitrate a substance or a mixture? \_\_\_\_\_

- Now fill in the table below putting the word "**Precipitate**" in the circle. Use the information in the background to fill in this table.

Definition (in your own words)	Characteristics
Examples (from your own life)	Non-examples (from your own life)



**You will have a quiz next class over the pre-lab questions, naming and the introduction.**

**Procedure: Read the following procedures and illustrate the steps on the paper provided.**

**Soluble Metallic Cations:**

1. **Iron (III)** nitrate
2. **Magnesium** sulfate
3. **Copper (II)** sulfate
4. **Lead (II)** nitrate
5. **Silver** nitrate

**Soluble Nonmetallic Anions**

- A. Sodium **Carbonate**
- B. Sodium **Chloride**
- C. Sodium **Hydroxide**
- D. Sodium **Iodide**
- E. Sodium **Phosphate**

**Part 1:** ("Acetate sheet" is clear transparency sheet – ie. used for overhead projectors)

1. Place one drop of **Iron (III) nitrate** in column 1 on the acetate sheet. (One drop for each box for column 1)
2. Place one drop of **sodium carbonate** in row A on the acetate sheet. (One drop for each box in row A)
3. Continue with each solution – eg. magnesium sulfate is dropped into column 2 boxes and sodium chloride is dropped into row B boxes. (Each solution corresponds to the letter or number that it is assigned in the above lists.)
4. **FILL THE GRID COMPLETELY!!!!** All 25 boxes should now contain one drop of the cation solution and one drop of the anion solution.

		Cations (+)					
		1	2	3	4	5	6
Anions (-)	A						
	B						
	C						
	D						
	E						

(acetate sheet grid)

**\*If you cannot see the precipitate well, move the acetate sheet to the black counter top.**

**Contamination:**

**Use one container at a time. Do not allow the eye dropper to touch the sheet or the 1st drop of chemical already placed. Drop the drop about a ½ inch from the acetate sheet**

5. Observe the solutions that have now combined in each square. Do you see a precipitate?
6. If you cannot see the precipitates well, move your acetate sheet onto the black counter top.
7. Using your data, complete Data Table 1 in your lab packet

**Clean Up:**

9. Wipe off the clear acetate sheet with a wet paper towel & DRY completely.
10. Make sure all droppers are securely placed into correct bottles.
11. Return ALL dropper bottles into the plastic tray.
12. Wipe down your table with a damp paper towel and DRY.

**Part 2:** You cannot start part 2 until you have cleaned up.

13. Begin Data Table #2 (PEN ONLY. If you mess up, neatly cross out your mistake and rewrite it. No pencil or white out) You will determine if precipitate is present (write yes or no), if a physical or chemical change occurred (write P or C) and then write the name and formula for the new compound that has formed.

**PreLab Illustrations ::**

1. Illustrate procedure steps #1, 2, 4, 5, 6, 7 (6 boxes) and draw the clean up spread out over 2 boxes for a **total of 8 illustrated boxes.**
2. Each box needs at least two colors and equipment. Black and gray are not counted as colors.
3. Label all lab equipment.
4. Write a 5-7 word description about what is happening in each box.
5. Your illustration needs to be clearly labeled, colorful and contain an explanation. **You will lose points if you do not follow the directions.**

**LAB ATTIRE NEXT CLASS!!!**

**Go to the next page to draw your illustrations and follow the directions below.**

**Lab Illustrations::**

**Name:** \_\_\_\_\_ **Period:** \_\_\_\_\_

Summary:

Summary:

Summary:

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Summary: