

Solubility Rules

Chem Worksheet 15-1

Name _____

Many ionic compounds will dissolve in water so we say they are **soluble**. Sodium chloride (NaCl), and potassium nitrate (KNO₃) are two examples of soluble compounds. When these compounds are mixed with water they dissolve, and we describe them as aqueous (aq). There are many ionic compounds that do not dissolve in water, though. These are described as **insoluble**. An insoluble substance simply remains in the solid state (s) when added to water. The chart below can be used to predict whether the compounds are soluble or insoluble.

Solubility Table

	Anions						
	Acetate C ₂ H ₃ O ₂ ⁻	Carbonate CO ₃ ²⁻	Chloride Cl ⁻	Hydroxide OH ⁻	Iodide I ⁻	Nitrate NO ₃ ⁻	Sulfate SO ₄ ²⁻
Cations Aluminum Al ³⁺	S	I	S	I	S	S	S
Ammonium NH ₄ ⁺	S	S	S	S	S	S	S
Barium Ba ²⁺	S	I	S	S	S	S	I
Copper (II) Cu ²⁺	S	I	S	I	I	S	S
Lead (II) Pb ²⁺	S	I	S	I	I	S	I
Silver Ag ⁺	I	I	I	I	I	S	I
Sodium Na ⁺	S	S	S	S	S	S	S
Zinc Zn ²⁺	S	I	S	I	S	S	S

S - soluble

I - insoluble

Use the chart above to answer the following questions about solubility.

- Which of the following compounds are soluble? Which are insoluble?
 - Sodium iodide
 - Silver nitrate
 - Lead (II) chloride
 - Ammonium chloride
 - Copper (II) hydroxide
 - Aluminum hydroxide
- The following reactions take place in water. Rewrite each equation and specify whether each substance would be aqueous (aq) or solid (s).
 - Pb(NO₃)₂ () + BaI₂ () → PbI₂ () + Ba(NO₃)₂ ()
 - Ba(C₂H₃O₂)₂ () + CuSO₄ () → Cu(C₂H₃O₂)₂ () + BaSO₄ ()
 - ZnSO₄ () + 2AgNO₃ () → Zn(NO₃)₂ () + Ag₂SO₄ ()
 - Cu(NO₃)₂ () + 2NaOH () → Cu(OH)₂ () + 2NaNO₃ ()
 - Silver nitrate and sodium carbonate react to form silver carbonate and sodium nitrate .
- Which three anions form the most soluble compounds?
- Which two cations form the most soluble compounds?
- It is helpful to create a generate rule for solubility of compounds? Fill in the following blank to describe the solubility of some ionic compounds.
 - Compounds containing the ion sodium (Na⁺) are always _____.
 - Compounds containing the anion nitrate (NO₃⁻) are always _____.
 - Compounds containing the ion carbonate are usually _____. Exceptions include _____ and _____.

Solubility rules
Worksheet 8.2 – Solubility Rules

Name _____
Class Period _____

Note that precipitates are insoluble and are followed by (s). Species in solution are followed by (aq). Note the list of insoluble salts. These are precipitates.

Precipitation Reactions:

1. Circle the substances you should expect to be insoluble in water, based on the STAAR charts.

Barium hydroxide

Silver chloride

Strontium hydroxide

Hydrochloric acid

Lithium carbonate

Ammonium nitrate

Lithium sulfate

Calcium carbonate

Silver nitrate

Ammonium nitrate

Barium sulfate

Cadmium acetate

2. Write a balanced chemical equation including states of matter (s, l, g, aq) for the following:

Solutions of lead (II) nitrate and potassium iodide are mixed.

Does a precipitation reaction occur? Why or why not?

Predict the following products, include states of matter, and identify which products are soluble or insoluble in water.

