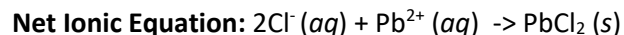
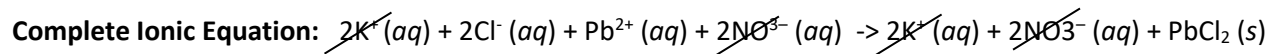
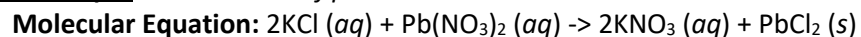


READ THIS: When two solutions of ionic compounds are mixed, a solid may form. This type of reaction is called a **precipitation reaction**, and the solid produced in the reaction is known as the **precipitate**. You can predict whether a precipitate will form using a list of solubility rules such as those found in the table below. When a combination of ions is described as insoluble, a precipitate forms. There are three types of equations that are commonly written to describe a precipitation reaction.

The **molecular equation** shows each of the substances in the reaction as compounds with physical states written next to the chemical formulas. The **complete ionic equation** shows each of the **aqueous** compounds as separate ions. Insoluble substances are not separated and these have the symbol (s) written next to them. Water is also not separated and it has a (l) written next to it. Notice that there are ions that are present on both sides of the reaction arrow \rightarrow that is, they do not react. These ions are known as **spectator ions** and they are eliminated from complete ionic equation by crossing them out. The remaining equation is known as the **net ionic equation**. *For example: The reaction of potassium chloride and lead II nitrate*



Directions: Write balanced molecular, ionic, and net ionic equations for each of the following reactions. Assume all reactions occur in aqueous solution. Include states of matter in your balanced equation.

1. Sodium chloride and lead II nitrate

Molecular Equation:

Complete Ionic Equation:

Net Ionic Equation:

2. Sodium carbonate and Iron II chloride

Molecular Equation:

Complete Ionic Equation:

Net Ionic Equation:

3. Magnesium hydroxide and hydrochloric acid

Molecular Equation:

Complete Ionic Equation:

Net Ionic Equation:

4. Potassium chromate and calcium chloride

Molecular Equation:

Complete Ionic Equation:

Net Ionic Equation:

5. Ammonium phosphate and zinc nitrate

Molecular Equation:

Complete Ionic Equation:

Net Ionic Equation:

6. Lithium hydroxide and barium chloride

Molecular Equation:

Complete Ionic Equation:

Net Ionic Equation:

7. Sodium carbonate and hydrochloric acid produces sodium chloride, carbon dioxide and water

Molecular Equation:

Complete Ionic Equation:

Net Ionic Equation:

8. Magnesium nitrate and sodium chromate

Molecular Equation:

Complete Ionic Equation:

Net Ionic Equation:

9. Iron III chloride and magnesium metal

Molecular Equation:

Complete Ionic Equation:

Net Ionic Equation:

10. Barium Bromide and sodium sulfate

Molecular Equation:

Complete Ionic Equation:

Net Ionic Equation:

11. Silver nitrate and magnesium iodide

Molecular Equation:

Complete Ionic Equation:

Net Ionic Equation:

12. Ammonium chromate and aluminum perchlorate

Molecular Equation:

Complete Ionic Equation:

Net Ionic Equation:

13. Nickel nitrate and sodium hydroxide

Molecular Equation:

Complete Ionic Equation:

Net Ionic Equation:

14. Hydrobromic acid (HBr) and lead II perchlorate

Molecular Equation:

Complete Ionic Equation:

Net Ionic Equation:

15. Potassium fluoride and magnesium nitrate

Molecular Equation:

Complete Ionic Equation:

Net Ionic Equation:

16. Sodium phosphate and nickel II perchlorate

Molecular Equation:

Complete Ionic Equation:

Net Ionic Equation:

17. Copper II chloride and silver acetate

Molecular Equation:

Complete Ionic Equation:

Net Ionic Equation:

Net Ionic Equation Worksheet - answers

- Molecular Equation:** $2\text{NaCl}(\text{aq}) + \text{Pb}(\text{NO}_3)_2(\text{aq}) \rightarrow \text{PbCl}_2(\text{s}) + 2\text{NaNO}_3(\text{aq})$
Ionic Equation: $2\text{Na}^+(\text{aq}) + 2\text{Cl}^-(\text{aq}) + \text{Pb}^{2+}(\text{aq}) + 2\text{NO}_3^-(\text{aq}) \rightarrow \text{PbCl}_2(\text{s}) + 2\text{Na}^+(\text{aq}) + 2\text{NO}_3^-(\text{aq})$
NIE: $2\text{Cl}^-(\text{aq}) + \text{Pb}^{2+}(\text{aq}) \rightarrow \text{PbCl}_2(\text{s})$
- Molecular Equation:** $\text{Na}_2\text{CO}_3(\text{aq}) + \text{FeCl}_2(\text{aq}) \rightarrow \text{FeCO}_3(\text{s}) + 2\text{NaCl}(\text{aq})$
Ionic Equation: $2\text{Na}^+(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) + \text{Fe}^{2+}(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow \text{FeCO}_3(\text{s}) + 2\text{Na}^+(\text{aq}) + 2\text{Cl}^-(\text{aq})$
NIE: $\text{CO}_3^{2-}(\text{aq}) + \text{Fe}^{2+}(\text{aq}) \rightarrow \text{FeCO}_3(\text{s})$
- Molecular Equation:** $\text{Mg}(\text{OH})_2(\text{aq}) + 2\text{HCl}(\text{aq}) \rightarrow \text{MgCl}_2(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$
Ionic Equation: $\text{Mg}^{2+}(\text{aq}) + 2\text{OH}^-(\text{aq}) + 2\text{H}^+(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow \text{Mg}^{2+}(\text{aq}) + 2\text{Cl}^-(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$
NIE: $2\text{OH}^-(\text{aq}) + 2\text{H}^+(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l})$
(your final answer would be: $\text{OH}^-(\text{aq}) + \text{H}^+(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$)
- Molecular Equation:** $\text{K}_2\text{Cr}_2\text{O}_7(\text{aq}) + \text{CaCl}_2(\text{aq}) \rightarrow 2\text{KCl}(\text{aq}) + \text{CaCr}_2\text{O}_7(\text{aq})$
Ionic Equation: $2\text{K}^+(\text{aq}) + \text{Cr}_2\text{O}_7^{2-}(\text{aq}) + \text{Ca}^{2+}(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow 2\text{K}^+(\text{aq}) + 2\text{Cl}^-(\text{aq}) + \text{Ca}^{2+} + \text{Cr}_2\text{O}_7^{2-}$
NIE: N/A, all spectator ions
- Molecular Equation:** $2(\text{NH}_4)_3\text{PO}_4(\text{aq}) + 3\text{Zn}(\text{NO}_3)_2(\text{aq}) \rightarrow 6\text{NH}_4\text{NO}_3(\text{aq}) + \text{Zn}_3(\text{PO}_4)_2(\text{s})$
Ionic Equation: $6\text{NH}_4^+(\text{aq}) + 2\text{PO}_4^{3-}(\text{aq}) + 3\text{Zn}^{2+}(\text{aq}) + 6\text{NO}_3^-(\text{aq}) \rightarrow 6\text{NH}_4^+(\text{aq}) + 6\text{NO}_3^-(\text{aq}) + \text{Zn}_3(\text{PO}_4)_2(\text{s})$
NIE: $2\text{PO}_4^{3-}(\text{aq}) + 3\text{Zn}^{2+}(\text{aq}) \rightarrow \text{Zn}_3(\text{PO}_4)_2(\text{s})$
- Molecular Equation:** $2\text{LiOH}(\text{aq}) + \text{BaCl}_2(\text{aq}) \rightarrow 2\text{LiCl}(\text{aq}) + \text{Ba}(\text{OH})_2(\text{aq})$
Ionic Equation: $2\text{Li}^+(\text{aq}) + 2\text{OH}^-(\text{aq}) + \text{Ba}^{2+}(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow 2\text{Li}^+(\text{aq}) + 2\text{Cl}^-(\text{aq}) + \text{Ba}^{2+} + 2\text{OH}^-$
NIE: N/A, all spectator ions
- Molecular Equation:** $\text{Na}_2\text{CO}_3(\text{aq}) + 2\text{HCl}(\text{aq}) \rightarrow 2\text{NaCl}(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$
Ionic Equation: $2\text{Na}^+(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) + 2\text{H}^+(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow 2\text{Na}^+(\text{aq}) + 2\text{Cl}^-(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$
NIE: $\text{CO}_3^{2-}(\text{aq}) + 2\text{H}^+(\text{aq}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$
- Molecular Equation:** $\text{Mg}(\text{NO}_3)_2(\text{aq}) + \text{Na}_2\text{CrO}_4(\text{aq}) \rightarrow 2\text{NaNO}_3(\text{aq}) + \text{MgCrO}_4(\text{s})$
Ionic Equation: $\text{Mg}^{2+}(\text{aq}) + 2\text{NO}_3^-(\text{aq}) + 2\text{Na}^+(\text{aq}) + \text{CrO}_4^{2-}(\text{aq}) \rightarrow 2\text{Na}^+(\text{aq}) + 2\text{NO}_3^-(\text{aq}) + \text{MgCrO}_4(\text{s})$
NIE: $\text{Mg}^{2+}(\text{aq}) + \text{CrO}_4^{2-}(\text{aq}) \rightarrow \text{MgCrO}_4(\text{s})$

9. **Molecular Equation:** $2 \text{FeCl}_3(\text{aq}) + 3 \text{Mg}(\text{s}) \rightarrow 3 \text{MgCl}_2(\text{aq}) + 2 \text{Fe}(\text{s})$
Ionic Equation: $2 \text{Fe}^{3+}(\text{aq}) + 6 \text{Cl}^{-}(\text{aq}) + 3 \text{Mg}(\text{s}) \rightarrow 3 \text{Mg}^{2+}(\text{aq}) + 6 \text{Cl}^{-}(\text{aq}) + 2 \text{Fe}(\text{s})$
NIE: $2 \text{Fe}^{3+}(\text{aq}) + 3 \text{Mg}(\text{s}) \rightarrow 3 \text{Mg}^{2+}(\text{aq}) + 2 \text{Fe}(\text{s})$
10. **Molecular Equation:** $\text{BaBr}_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2 \text{NaBr}(\text{aq})$
Ionic Equation: $\text{Ba}^{2+}(\text{aq}) + 2 \text{Br}^{-}(\text{aq}) + 2 \text{Na}^{+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2 \text{Na}^{+}(\text{aq}) + 2 \text{Br}^{-}(\text{aq})$
NIE: $\text{Ba}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{BaSO}_4(\text{s})$
11. **Molecular Equation:** $2 \text{AgNO}_3(\text{aq}) + \text{MgI}_2(\text{aq}) \rightarrow 2 \text{AgI}(\text{s}) + \text{Mg}(\text{NO}_3)_2(\text{aq})$
Ionic Equation: $2 \text{Ag}^{+}(\text{aq}) + 2 \text{NO}_3^{-}(\text{aq}) + \text{Mg}^{2+}(\text{aq}) + 2 \text{I}^{-}(\text{aq}) \rightarrow 2 \text{AgI}(\text{s}) + \text{Mg}^{2+}(\text{aq}) + 2 \text{NO}_3^{-}(\text{aq})$
NIE: $2 \text{Ag}^{+}(\text{aq}) + 2 \text{I}^{-}(\text{aq}) \rightarrow 2 \text{AgI}(\text{s})$ (your final answer would be: $\text{Ag}^{+}(\text{aq}) + \text{I}^{-}(\text{aq}) \rightarrow \text{AgI}(\text{s})$)
12. **Molecular Equation:** $3 (\text{NH}_4)_2\text{CrO}_4(\text{aq}) + 2 \text{Al}(\text{ClO}_4)_3(\text{aq}) \rightarrow \text{Al}_2(\text{CrO}_4)_3(\text{s}) + 6 \text{NH}_4\text{ClO}_4(\text{aq})$
Ionic Equation: $6 \text{NH}_4^{+}(\text{aq}) + 3 \text{CrO}_4^{2-}(\text{aq}) + 2 \text{Al}^{3+}(\text{aq}) + 6 \text{ClO}_4^{-}(\text{aq}) \rightarrow 6 \text{NH}_4^{+}(\text{aq}) + 6 \text{ClO}_4^{-}(\text{aq}) + \text{Al}_2(\text{CrO}_4)_3(\text{s})$
NIE: $3 \text{CrO}_4^{2-}(\text{aq}) + 2 \text{Al}^{3+}(\text{aq}) \rightarrow \text{Al}_2(\text{CrO}_4)_3(\text{s})$
13. **Molecular Equation:** $\text{Ni}(\text{NO}_3)_2(\text{aq}) + 2 \text{NaOH}(\text{aq}) \rightarrow \text{Ni}(\text{OH})_2(\text{s}) + 2 \text{NaNO}_3(\text{aq})$
Ionic Equation: $\text{Ni}^{2+}(\text{aq}) + 2 \text{NO}_3^{-}(\text{aq}) + 2 \text{Na}^{+}(\text{aq}) + 2 \text{OH}^{-}(\text{aq}) \rightarrow \text{Ni}(\text{OH})_2(\text{s}) + 2 \text{Na}^{+}(\text{aq}) + 2 \text{NO}_3^{-}(\text{aq})$
NIE: $\text{Ni}^{2+}(\text{aq}) + 2 \text{OH}^{-}(\text{aq}) \rightarrow \text{Ni}(\text{OH})_2(\text{s})$
14. **Molecular Equation:** $2 \text{HBr}(\text{aq}) + \text{Pb}(\text{ClO}_4)_2(\text{aq}) \rightarrow 2 \text{HClO}_4(\text{aq}) + \text{PbBr}_2(\text{s})$
Ionic Equation: $2 \text{H}^{+}(\text{aq}) + 2 \text{Br}^{-}(\text{aq}) + \text{Pb}^{2+}(\text{aq}) + 2 \text{ClO}_4^{-}(\text{aq}) \rightarrow 2 \text{H}^{+}(\text{aq}) + 2 \text{ClO}_4^{-}(\text{aq}) + \text{PbBr}_2(\text{s})$
NIE: $2 \text{Br}^{-}(\text{aq}) + \text{Pb}^{2+}(\text{aq}) \rightarrow \text{PbBr}_2(\text{s})$
15. **Molecular Equation:** $2 \text{KF}(\text{aq}) + \text{Mg}(\text{NO}_3)_2(\text{aq}) \rightarrow 2 \text{KNO}_3(\text{aq}) + \text{MgF}_2(\text{s})$
Ionic Equation: $2 \text{K}^{+}(\text{aq}) + 2 \text{F}^{-}(\text{aq}) + \text{Mg}^{2+}(\text{aq}) + 2 \text{NO}_3^{-}(\text{aq}) \rightarrow 2 \text{K}^{+}(\text{aq}) + 2 \text{NO}_3^{-}(\text{aq}) + \text{MgF}_2(\text{s})$
NIE: $2 \text{F}^{-}(\text{aq}) + \text{Mg}^{2+}(\text{aq}) \rightarrow \text{MgF}_2(\text{s})$
16. **Molecular Equation:** $2 \text{Na}_3\text{PO}_4(\text{aq}) + 3 \text{Ni}(\text{ClO}_4)_2(\text{aq}) \rightarrow 6 \text{NaClO}_4(\text{aq}) + \text{Ni}_3(\text{PO}_4)_2(\text{s})$
Ionic Equation: $6 \text{Na}^{+}(\text{aq}) + 2 \text{PO}_4^{3-}(\text{aq}) + 3 \text{Ni}^{2+}(\text{aq}) + 6 \text{ClO}_4^{-}(\text{aq}) \rightarrow 6 \text{Na}^{+}(\text{aq}) + 6 \text{ClO}_4^{-}(\text{aq}) + \text{Ni}_3(\text{PO}_4)_2(\text{s})$
NIE: $2 \text{PO}_4^{3-}(\text{aq}) + 3 \text{Ni}^{2+}(\text{aq}) \rightarrow \text{Ni}_3(\text{PO}_4)_2(\text{s})$
17. **Molecular Equation:** $\text{CuCl}_2(\text{aq}) + 2 \text{AgC}_2\text{H}_3\text{O}_2(\text{aq}) \rightarrow \text{Cu}(\text{C}_2\text{H}_3\text{O}_2)_2(\text{aq}) + 2 \text{AgCl}(\text{s})$
Ionic Equation: $\text{Cu}^{2+}(\text{aq}) + 2 \text{Cl}^{-}(\text{aq}) + 2 \text{Ag}^{+}(\text{aq}) + 2 \text{C}_2\text{H}_3\text{O}_2^{-}(\text{aq}) \rightarrow \text{Cu}^{2+}(\text{aq}) + 2 \text{C}_2\text{H}_3\text{O}_2^{-}(\text{aq}) + 2 \text{AgCl}(\text{s})$
NIE: $\text{Cl}^{-}(\text{aq}) + \text{Ag}^{+}(\text{aq}) \rightarrow \text{AgCl}(\text{s})$