

Precipitation Worksheet - Chemical Dropouts!

A **precipitation** reaction is a reaction in which two solutions are mixed to produce an insoluble solid called a precipitate.

Materials: White spotting plates and dropper bottles containing 0.1 M solutions of copper sulfate, mercury(II) nitrate, potassium chromate, potassium fluoride, potassium iodide, sodium chloride, sodium hydroxide, sodium sulfide, silver nitrate,

Teacher: Give directions in the handling & disposal of chemicals according to your risk assessment. Inform or check with students what the precipitate is for each reaction.

Students: 1. Complete the reactions which is an exchange of partners. Metals are named first.
2. Mix the chemicals and write the (color/colour) of the precipitate.

1. Sodium hydroxide + silver nitrate → Sodium nitrate + _____

2. Sodium hydroxide + copper sulfate → _____ + _____

3. Potassium iodide + lead nitrate → _____ + _____

4. Potassium iodide + mercury nitrate → _____ + _____

5. Potassium iodide + silver nitrate → _____ + _____

6. Sodium chloride + silver nitrate → _____ + _____

7. Mercury nitrate + potassium fluoride → _____ + _____

8. Copper sulfate + potassium iodide → _____ + _____

9. Mercury nitrate + sodium sulfide → _____ + _____

10. Silver nitrate + potassium chromate → _____ + _____

Precipitation Reaction Worksheet

A **precipitation** reaction is a reaction in which two solutions are mixed to produce an insoluble solid called a precipitate. A simplified set of solubility rules can be used to determine the precipitate.

Simplified Solubility Rules : If a compound contains one of the following chemicals it is always soluble

- A **Group I** element. Eg. Sodium, Na^+ or potassium, K^+
- An **ammonium** group, NH_4^+
- A **nitrate** group, NO_3^-
- An **acetate** group, CH_3COO^-

Student Instructions

- Complete the **word equation** for each precipitation reaction. Determine the precipitate.
- Write a **balanced equation** for each reaction. Include physical states (aq) = aqueous and (s) = solid

1. Sodium hydroxide + silver nitrate → Sodium nitrate + _____

2. Sodium hydroxide + copper sulfate → _____ + _____

3. Potassium iodide + lead nitrate → _____ + _____

4. Potassium iodide + mercury nitrate → _____ + _____

5. Potassium iodide + silver nitrate → _____ + _____

6. Sodium chloride + silver nitrate → _____ + _____

7. Mercury nitrate + potassium fluoride → _____ + _____

8. Copper sulfate + potassium iodide → _____ + _____

9. Mercury nitrate + sodium sulfide → _____ + _____

10. Silver nitrate + potassium chromate → _____ + _____

CHEMICAL PRECIPITATION REACTIONS - ANSWERS

Depending on the year level you may or may not include the balanced chemical equations.

Physical states: (s) = solid and (aq) = aqueous.

1. Sodium hydroxide + silver nitrate → sodium nitrate + silver hydroxide(s)
 $\text{NaOH(aq)} + \text{AgNO}_3\text{(aq)} \rightarrow \text{NaNO}_3\text{(aq)} + \text{AgOH(s)}$
The precipitate is brown. **Note:** Ag(OH)_2 actually becomes Ag_2O in aqueous solution.
2. Sodium hydroxide + copper sulfate → sodium sulfate + copper hydroxide(s)
 $2\text{NaOH(aq)} + \text{CuSO}_4\text{(aq)} \rightarrow \text{Na}_2\text{SO}_4\text{(aq)} + \text{Cu(OH)}_2\text{(s)}$
A blue gelatinous precipitate of copper hydroxide, Cu(OH)_2 is produced.
3. Potassium iodide + lead nitrate → potassium nitrate + lead iodide(s)
 $2\text{KI(aq)} + \text{Pb(NO}_3)_2\text{(aq)} \rightarrow 2\text{KNO}_3\text{(aq)} + \text{PbI}_2\text{(s)}$
A bright yellow precipitate of lead iodide, PbI_2 is produced.
4. Potassium iodide + mercury nitrate → mercury iodide(s) + potassium nitrate
 $2\text{KI(aq)} + \text{Hg(NO}_3)_2\text{(aq)} \rightarrow \text{HgI}_2\text{(s)} + 2\text{KNO}_3\text{(aq)}$
A bright orange precipitate of mercury iodide, PbI_2 is produced. **Note:** This is an unusual reaction as the precipitate dissolves in excess iodide solution and disappears as a complex ion is formed.
5. Potassium iodide + silver nitrate → potassium nitrate + silver iodide(s)
 $\text{KI(aq)} + \text{AgNO}_3\text{(aq)} \rightarrow \text{KNO}_3\text{(aq)} + \text{AgI(s)}$
A yellow white precipitate of silver iodide, AgI is produced.
6. Sodium chloride + silver nitrate → sodium nitrate + silver chloride(s)
 $\text{NaCl(aq)} + \text{AgNO}_3\text{(aq)} \rightarrow \text{NaNO}_3\text{(aq)} + \text{AgCl(s)}$
Note: Exposure of silver chloride, AgCl to UV light from the sun results in the decomposition of this compound. Black metallic silver is produced. $2\text{AgCl(s)} \rightarrow 2\text{Ag(s)} + \text{Cl}_2\text{(g)}$
7. Mercury nitrate + potassium fluoride → mercury fluoride(s) + potassium nitrate
 $\text{Hg(NO}_3)_2\text{(aq)} + 2\text{KF(aq)} \rightarrow \text{HgF}_2\text{(s)} + 2\text{KNO}_3\text{(aq)}$
An orange brown precipitate of mercury(II) fluoride, HgF_2 is produced.
8. Copper sulfate + potassium iodide → copper iodide(s) + potassium sulfate
 $\text{CuSO}_4\text{(aq)} + 2\text{KI(aq)} \rightarrow \text{CuI}_2\text{(s)} + \text{K}_2\text{SO}_4\text{(aq)}$
An olive green precipitate of copper iodide, CuI_2 is produced.
9. Mercury nitrate + potassium sulfide → mercury sulfide(s) + potassium nitrate
 $\text{Hg(NO}_3)_2\text{(aq)} + \text{K}_2\text{S(aq)} \rightarrow \text{HgS(s)} + 2\text{KNO}_3\text{(aq)}$
A black precipitate of mercury(II) sulfide, HgS is produced.
10. Silver nitrate + potassium chromate → silver chromate(s) + potassium nitrate
 $2\text{AgNO}_3\text{(aq)} + \text{K}_2\text{CrO}_4\text{(aq)} \rightarrow \text{Ag}_2\text{CrO}_4\text{(s)} + 2\text{KNO}_3\text{(aq)}$
A red-brown precipitate of silver chromate, Ag_2CrO_4 is produced.