

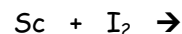
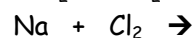
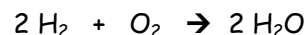
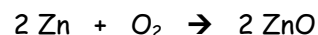
Reaction Prediction

Types of Chemical Reactions

Combination (also known as addition, composition, or synthesis)

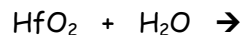
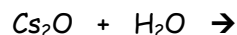
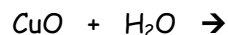
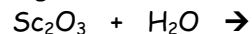
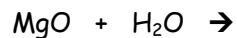
General Formula: $A + B \rightarrow AB$

Element + Element \rightarrow Compound

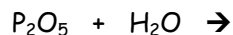
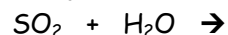


Compound + Compound \rightarrow Compound

metallic oxide + water \rightarrow metallic hydroxide



nonmetallic oxide + water \rightarrow acid

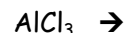
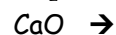
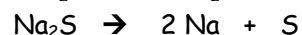
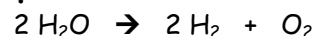


Decomposition (the opposite of combination)

General Formula: $AB \rightarrow A + B$

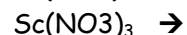
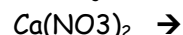
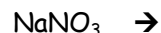
binary compounds (two elements only)

Compound \rightarrow Element + Element



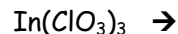
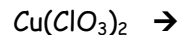
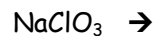
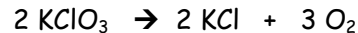
Nitrates (NO_3^-)

___ nitrate \rightarrow ___ nitrite + oxygen



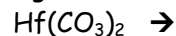
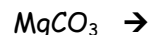
Chlorates (ClO_3^-)

___ chlorate \rightarrow ___ chloride + oxygen



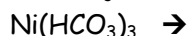
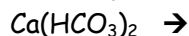
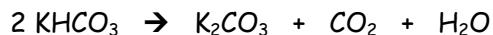
Carbonates (CO_3^{2-})

___ carbonate \rightarrow ___ oxide + carbon dioxide



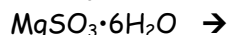
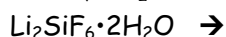
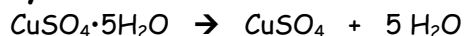
Bicarbonates (HCO_3^-)

___ bicarbonate \rightarrow ___ carbonate + carbon dioxide + water



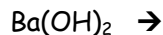
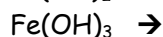
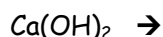
Hydrates ($\bullet\text{H}_2\text{O}$)

___ hydrate \rightarrow salt + water



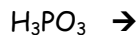
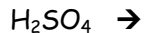
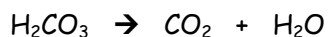
Hydroxides (OH^-)

___ hydroxide \rightarrow ___ oxide + water

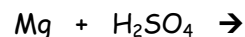
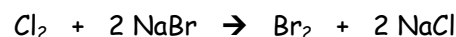
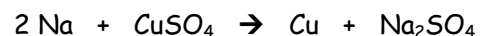


Acids (HA)

acid \rightarrow nonmetallic oxide + water



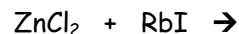
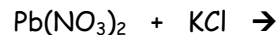
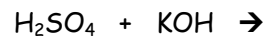
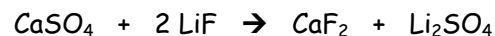
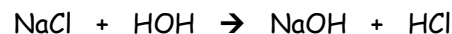
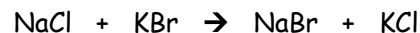
Note: The reaction will only occur if element A is more active than the element it is replacing. For metals, use the activity series. The most active metals are listed first (at the top). For nonmetals, use the periodic table. The activity of nonmetals increases up and to the right. Fluorine is the most active nonmetal.



Double Displacement (also known as double replacement)

General Formula: $\text{AB} + \text{CD} \rightarrow \text{AD} + \text{CB}$

Note: The positive ion in the first compound switches places with the positive ion in the second compound.



Single Displacement (also known as single replacement)

General Formula: $\text{A} + \text{BC} \rightarrow \text{B} + \text{AC}$ (if A is a metal)

$\text{A} + \text{BC} \rightarrow \text{C} + \text{BA}$ (if A is a nonmetal)

Combination Reactions

Predict the product and write balanced reactions for each of the following.

1. Hydrogen burned in oxygen.
2. Sodium plus iodine.
3. Calcium burned in chlorine.
4. Carbon burned in oxygen.
5. Hydrogen combined with nitrogen.
6. Sulfur burned in air.
7. Magnesium burned in hydrogen.
8. Zinc plus bromine.
9. Water plus carbon dioxide.
10. Sulfur dioxide plus water.
11. Sodium plus hydrogen.
12. Hydrogen burned in chlorine.
13. Iron burned in chlorine.
14. Copper plus fluorine.
15. Aluminum burned in air.
16. Calcium oxide plus water.
17. Iron combined with sulfur.
18. Zinc burned in chlorine.
19. Lithium oxide plus water.
20. Barium oxide plus water.

Decomposition Reactions

Predict the products and write balanced reactions for each of the following:

1. The heating of magnesium carbonate.
2. The heating of sodium chlorate.
3. The electrolysis of water.
4. The decomposition of calcium carbonate.
5. The heated of mercuric oxide.
6. The electrolysis of sodium chloride.
7. Ferric hydroxide heated.
8. Aluminum hydroxide heated.
9. Sodium carbonate heated.
10. Barium hydroxide heated.
11. The electrolysis of calcium bromide.
12. The heating of carbonic acid.
13. Decomposition of sulfuric acid.
14. Decomposition of calcium chlorate.
15. Heating of potassium bromate.
16. Decomposition of sulfurous acid.
17. Electrolysis of aluminum oxide.
18. Zinc carbonate heated.
19. Decomposition of phosphoric acid.
20. Heating of sodium tetraborate trihydrate.

Single Displacement Reactions

Predict the products and write balanced reactions for each of the following:

1. Chlorine plus sodium iodide.
2. Zinc and phosphoric acid.
3. Sodium and water.
4. Calcium and hydrochloric acid.
5. Calcium plus water.
6. Zinc sulfate plus sodium.
7. Ferrous chloride plus aluminum.
8. Ammonium iodide and chlorine.
9. Nickel and sulfuric acid.
10. Strontium and water.
11. Mercuric sulfate and zinc.
12. Potassium and water.
13. Carbonic acid plus aluminum.
14. Copper(II) nitrate and zinc.
15. Sodium nitrate and potassium.
16. Silver acetate and copper.
17. Iron added to sulfuric acid.
18. Zinc plus cupric sulfate.
19. Magnesium nitrate added to copper.
20. Cuprous chlorate plus magnesium.

Double Displacement

Predict the products and write balanced reactions for each of the following:

1. Sodium chloride and silver nitrate.
2. Barium chlorate and potassium phosphate.
3. Ammonium chloride and potassium hydroxide.
4. Potassium nitrate plus cupric sulfate.
5. Sulfuric acid plus potassium hydroxide.
6. Hydrochloric acid and calcium carbonate.
7. Stannous chloride plus sodium nitrate.
8. Strontium chlorate and sodium acetate.
9. Lithium hydroxide and aluminum bromide.
10. Sodium sulfate plus chloric acid.
11. Hydrochloric acid plus zinc hydroxide.
12. Sodium acetate and aluminum bromide.
13. Bromic acid and magnesium hydroxide.
14. Sodium carbonate plus calcium chloride.
15. Potassium chloride and silver nitrate.
16. Barium hydroxide plus ammonium sulfate.
17. Ferric chloride and potassium hydroxide.
18. Manganese(II) bromide and sodium hydroxide.
19. Hydrochloric acid and sodium sulfate.
20. Sulfurous acid and aluminum hydroxide.

Reaction Prediction - Review

- Directions:
1. State the type of reaction.
 2. If the reaction occurs, write the symbols, complete and balance the equation.
 3. If the reaction does not occur, state why not.

1. potassium + iodine →
2. water $\xrightarrow{\text{electrolyzed}}$
3. zinc + lead(II) chloride →
4. sodium nitrate + ammonium chloride →
5. mercury + cadmium nitrate →
6. manganese + sodium →
7. silver nitrate + hydrogen sulfide →
8. potassium bromide $\xrightarrow{\text{electrolyzed}}$
9. tin + copper(II) sulfate →
10. iron(III) nitrate + sodium chromate →
11. calcium + iodine →
12. magnesium + hydrochloric acid →
13. carbon + oxygen →
14. platinum + lead(II) nitrate →
15. lithium oxide + water →
16. aluminum + sulfuric acid →
17. ammonium phosphate + lithium hydroxide →
18. chlorine + fluorine →
19. sodium carbonate $\xrightarrow{\Delta}$
20. potassium chlorate $\xrightarrow{\Delta}$
21. hydrogen + sodium →
22. calcium oxide + water →
23. aluminum + hydrochloric acid →
24. calcium hydroxide + nitric acid →
25. aluminum + magnesium →
26. magnesium + zinc nitrate →
27. dinitrogen pentoxide + water →
28. sodium chlorate $\xrightarrow{\Delta}$
29. barium nitrate + sodium dichromate →
30. calcium phosphate + aluminum sulfate →
31. zinc carbonate $\xrightarrow{\Delta}$
32. potassium + fluorine →
33. sodium + nitric acid →
34. sodium + water →
35. ferric iodide + cupric nitrate →
36. lead + sulfuric acid →
37. sulfur dioxide + water →
38. oxygen + sulfur →
39. potassium nitrate $\xrightarrow{\Delta}$
40. sodium bicarbonate $\xrightarrow{\Delta}$
41. ferrous carbonate + phosphoric acid →
42. sulfur trioxide + water →
43. plumbous chlorate + sodium sulfate →
44. barium carbonate $\xrightarrow{\Delta}$
45. neon + potassium →
46. silver iodide + ferrous sulfide →
47. bromine + sodium chloride →
48. zinc + sulfuric acid →
49. ammonium phosphate + aluminum chloride →
50. mercuric oxide $\xrightarrow{\Delta}$
51. ammonium nitrite + barium hydroxide →
52. magnesium + water →
53. magnesium + acetic acid →
54. silver + barium →
55. plumbous hydroxide $\xrightarrow{\Delta}$
56. carbonic acid $\xrightarrow{\Delta}$
57. lithium + curium(III) fluoride →
58. zinc + aluminum nitrate →
59. potassium + water →
60. zinc + water →
61. zinc + phosphoric acid →
62. gold + hydrochloric acid →
63. calcium bicarbonate $\xrightarrow{\Delta}$
64. copper(II) sulfate pentahydrate $\xrightarrow{\Delta}$
65. sulfur dioxide + water →
66. dinitrogen trioxide + water →
67. barium oxide + water →
68. nickel(II) chlorate →
69. iron + copper(II) nitrate →
70. calcium hydroxide $\xrightarrow{\Delta}$
71. lithium carbonate $\xrightarrow{\Delta}$
72. barium oxide + water →
73. aluminum + water →
74. potassium + water →
75. sulfur trioxide + water →
76. magnesium bromate + aluminum dichromate →
77. cupric silicate + potassium phosphite →
78. nickel(III) bicarbonate + zinc →