Key

Predicting Products of Chemical Reactions

This worksheet is designed to help you predict products of simple reactions of the four basic reaction types (synthesis, decomposition, single replacement, and double replacement) and combustion reactions.

For the first few reactions, the type of reaction is listed, you should predict the products, then balance. Further questions just have the reactants listed and you should decide on the type of reaction, as well as the correct products. Many of these reactions fall into the category of redox reactions, though do not let that confuse you...each can be described in terms of the four basic reaction types (except the combustion reactions).

Although states (s, l, g, aq) of the reactants and products are very important in a chemical reaction, don't worry about determining those for these problems. Rather, focus on what products might result from the reactants given. Pay particular attention to the ionic charge of species that you know form ions with only one possible charge (*e.g.*, alkali metals, alkaline earth metals, halogens, etc.)

1. Synthesis: $Mg + I_2 \rightarrow MgI_2$
2. Double displacement: $CuCl_2 + H_2S \rightarrow CuS + 2HCl$
3. Double displacement: $NaOH + HClO_4 \rightarrow NaClO_4 + H_2O$
4. Decomposition: $ZnCO_3 + heat \rightarrow ZnO + CO_2$
5. Single replacement: $2HCl + Zn \rightarrow H_2 + ZnCl_2$
6. Single: $2Na + MgCl_2 \rightarrow 2NaCl + Mg$
7. Double: $CaCl_2 + K_2CO_3 \rightarrow CaCO_3 + 2KCl$
8. Syn: $2K + Cl_2 \rightarrow 2KCl$
9. Double: $3BaCl_2 + 2K_3PO_4 \rightarrow Ba_3(PO_4)_2 + 6KCl$
10. Double: $H_2SO_4 + 2KOH \rightarrow 2H_2O + K_2SO_4$
11. Decomp: $Al_2(CO_3)_3 + heat \rightarrow Al_2O_3 + 3CO_2$
12. Syn: $4Al + 3O_2 \rightarrow 2Al_2O_3$
13. Double: $Pb(NO_3)_2 + 2KOH \rightarrow Pb(OH)_2 + 2KNO_3$
14. Double: $H_2SO_4 + BaCl_2 \rightarrow 2HCl + BaSO_4$
15. Single: $Ca + 2AgCl \rightarrow CaCl_2 + 2Ag$
16. Double: $H_3PO_4 + FeBr_3 \rightarrow 3HBr + FePO_4$
17. Syn: $6Li + N_2 \rightarrow 2Li_3N$
18. Double: $2HCl + Mg(OH)_2 \rightarrow 2H_2O + MgCl_2$
19. Decomp: $Mg(OH)_2 + heat \rightarrow MgO + H_2O$
20. Decomp: $2Fe(OH)_3 + heat \rightarrow Fe_2O_3 + 3H_2O$

Convert each of the following word equations to formula equations.

You <u>DO</u> <u>NOT</u> have to balance the equations. You DO have to write correct chemical formulas.

1. Iron reacts with sulfur to produce iron (II) sulfide

   $Fe + S \rightarrow FeS$

2. Calcium oxide reacts with water to produce calcium hydroxide

   $CaO + H_2O \rightarrow Ca(OH)_2$

3. Hydrogen reacts with chlorine to form hydrochloric acid

   $H_2 + Cl_2 \rightarrow HCl$

4. Sodium reacts with chlorine to produce sodium chloride

   $Na + Cl_2 \rightarrow NaCl$

5. Aluminum reacts with iron (III) oxide to produce aluminum oxide and iron

   $Al + Fe_2O_3 \rightarrow Al_2O_3 + Fe$

6. Hydrogen reacts with nitrogen to produce ammonia (NH_3)

   $H_2 + N_2 \rightarrow NH_3$

7. Hydrogen reacts with oxygen to produce water

   $H_2 + O_2 \rightarrow H_2O$

8. Potassium chloride reacts with silver nitrate to form potassium nitrate and silver chloride

   $KCl + AgNO_3 \rightarrow KNO_3 + AgCl$

9. Sodium hydroxide reacts with carbon dioxide to produce sodium carbonate and water

   $NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$

10. Calcium oxide reacts with carbon dioxide to produce calcium carbonate

    $CaO + CO_2 \rightarrow CaCO_3$

11. Sodium iodide reacts with bromine to produce sodium bromide and iodine

    $NaI + Br_2 \rightarrow NaBr + I_2$

12. Hydrobromic acid reacts with oxygen to produce water and bromine

    $HBr + O_2 \rightarrow H_2O + Br_2$

13. Silver nitrate reacts with zinc to produce zinc nitrate and silver

    $AgNO_3 + Zn \rightarrow Zn(NO_3)_2 + Ag$

14. Ammonia reacts with oxygen to produce nitrogen monoxide and water

    $NH_3 + O_2 \rightarrow NO + H_2O$

15. Aluminum sulfate reacts with barium chloride to produce aluminum chloride and barium sulfate

    $Al_2(SO_4)_3 + BaCl_2 \rightarrow AlCl_3 + BaSO_4$

16. Zinc reacts with sulfuric acid (H_2SO_4) to produce zinc sulfate and hydrogen

    $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

17. Iron (III) oxide reacts with carbon monoxide to produce iron and carbon dioxide

    $Fe_2O_3 + CO \rightarrow Fe + CO_2$

18. Methane (CH_4) reacts with oxygen to form carbon dioxide and water

    $CH_4 + O_2 \rightarrow CO_2 + H_2O$

19. Iron (III) chloride reacts with sodium carbonate to produce sodium chloride and iron (III) carbonate

    $FeCl_3 + Na_2CO_3 \rightarrow NaCl + Fe_2(CO_3)_3$

20. Butane (C_2H_6) reacts with oxygen to form carbon dioxide and water

    $C_2H_6 + O_2 \rightarrow CO_2 + H_2O$