

ACID ON METAL REACTIONS

Complete the word equations and then write a balanced chemical equation for each.

1. hydrochloric acid + zinc metal $\longrightarrow$ zinc chloride + hydrogen gas
$$2 \text{HCl}_{(aq)} + \text{Zn}_{(s)} \longrightarrow \text{ZnCl}_{2(aq)} + \text{H}_{2(g)}$$
2. sulfuric acid + magnesium metal $\longrightarrow$ magnesium sulfate + hydrogen gas
$$\text{H}_2\text{SO}_{4(aq)} + \text{Mg}_{(s)} \longrightarrow \text{MgSO}_{4(aq)} + \text{H}_{2(g)}$$
 balanced.
3. hydrochloric acid + aluminium metal $\longrightarrow$ aluminium chloride + hydrogen gas
$$6 \text{HCl}_{(aq)} + 2 \text{Al}_{(s)} \longrightarrow 2 \text{AlCl}_{3(aq)} + 3 \text{H}_{2(g)}$$
4. ethanoic acid + calcium metal $\longrightarrow$ calcium ethanoate + hydrogen gas
$$2 \text{CH}_3\text{COOH}_{(aq)} + \text{Ca}_{(s)} \longrightarrow \text{Ca}(\text{CH}_3\text{COO})_{2(aq)} + \text{H}_{2(g)}$$
5. sulfuric acid + sodium metal $\longrightarrow$ sodium sulfate + hydrogen gas
$$\text{H}_2\text{SO}_{4(l)} + 2 \text{Na}_{(s)} \longrightarrow \text{Na}_2\text{SO}_{4(aq)} + \text{H}_{2(g)}$$
6. hydrochloric acid + potassium metal $\longrightarrow$ Potassium chloride + hydrogen gas
$$2 \text{HCl}_{(aq)} + 2 \text{K}_{(s)} \longrightarrow 2 \text{KCl}_{(aq)} + \text{H}_{2(g)}$$
7. phosphoric acid + magnesium metal $\longrightarrow$ magnesium phosphate + hydrogen gas
$$2 \text{H}_3\text{PO}_{4(aq)} + 3 \text{Mg}_{(s)} \longrightarrow \text{Mg}_3(\text{PO}_4)_{2(s)} + 3 \text{H}_{2(g)}$$
8. ethanoic acid + sodium metal $\longrightarrow$ sodium ethanoate + hydrogen gas
$$2 \text{CH}_3\text{COOH}_{(aq)} + 2 \text{Na}_{(s)} \longrightarrow 2 \text{NaCH}_3\text{COO}_{(aq)} + \text{H}_{2(g)}$$
9. sulfuric acid + zinc metal $\longrightarrow$ zinc sulfate + hydrogen gas
$$\text{H}_2\text{SO}_{4(aq)} + \text{Zn}_{(s)} \longrightarrow \text{ZnSO}_{4(aq)} + \text{H}_{2(g)}$$
 balanced.
10. phosphoric acid + potassium metal $\longrightarrow$ potassium phosphate + hydrogen gas
$$2 \text{H}_3\text{PO}_{4(aq)} + 6 \text{K}_{(s)} \longrightarrow 2 \text{K}_3\text{PO}_{4(aq)} + 3 \text{H}_{2(g)}$$

ACID ON CARBONATES/HYDROGEN CARBONATES

Complete the word equations and then write a balanced chemical equation for each.

1. magnesium carbonate + sulfuric acid $\rightarrow$ magnesium sulfate + carbon dioxide + water
$$\text{MgCO}_3(s) + \text{H}_2\text{SO}_4(aq) \rightarrow \text{MgSO}_4(aq) + \text{CO}_2(g) + \text{H}_2\text{O}(l)$$

balanced.
2. zinc carbonate + hydrochloric acid $\rightarrow$ zinc chloride + carbon dioxide + water
$$\text{ZnCO}_3(s) + 2\text{HCl}(aq) \rightarrow \text{ZnCl}_2(aq) + \text{CO}_2(g) + \text{H}_2\text{O}(l)$$
3. aluminium carbonate + nitric acid $\rightarrow$ aluminium nitrate + carbon dioxide + water
$$\text{Al}_2(\text{CO}_3)_3(s) + 6\text{HNO}_3(aq) \rightarrow 2\text{Al}(\text{NO}_3)_3(aq) + 3\text{CO}_2(g) + 3\text{H}_2\text{O}(l)$$
4. calcium hydrogen carbonate + phosphoric acid $\rightarrow$ calcium phosphate + carbon dioxide + water
$$3\text{Ca}(\text{HCO}_3)_2 + 2\text{H}_3\text{PO}_4(aq) \rightarrow \text{Ca}_3(\text{PO}_4)_2(s) + 6\text{CO}_2(g) + 6\text{H}_2\text{O}(l)$$
5. potassium hydrogen carbonate + nitric acid $\rightarrow$ potassium nitrate + carbon dioxide + water
$$\text{KHCO}_3(aq) + \text{HNO}_3(aq) \rightarrow \text{KNO}_3(aq) + \text{CO}_2(g) + \text{H}_2\text{O}(l)$$

balanced.
6. iron (III) carbonate + sulfuric acid $\rightarrow$ iron (III) sulfate + carbon dioxide + water
$$\text{Fe}_2(\text{CO}_3)_3(s) + 3\text{H}_2\text{SO}_4(aq) \rightarrow \text{Fe}_2(\text{SO}_4)_3(aq) + 3\text{CO}_2(g) + 3\text{H}_2\text{O}(l)$$
7. sodium hydrogen carbonate + acetic acid $\rightarrow$ sodium acetate + carbon dioxide + water
$$\text{NaHCO}_3(aq) + \text{CH}_3\text{COOH}(aq) \rightarrow \text{NaCH}_3\text{COO}(aq) + \text{CO}_2(g) + \text{H}_2\text{O}(l)$$

balanced.
8. magnesium hydrogen carbonate + hydrochloric acid $\rightarrow$ magnesium chloride + carbon dioxide + water
$$\text{Mg}(\text{HCO}_3)_2(s) + 2\text{HCl}(aq) \rightarrow \text{MgCl}_2(aq) + 2\text{CO}_2(g) + 2\text{H}_2\text{O}(l)$$
9. copper (II) carbonate + phosphoric acid $\rightarrow$ copper (II) phosphate + carbon dioxide + water
$$3\text{CuCO}_3(s) + 2\text{H}_3\text{PO}_4(aq) \rightarrow \text{Cu}_3(\text{PO}_4)_2(s) + 3\text{CO}_2(g) + 3\text{H}_2\text{O}(l)$$
10. calcium hydrogen carbonate + sulfuric acid $\rightarrow$ calcium sulfate + carbon dioxide + water
$$\text{Ca}(\text{HCO}_3)_2(s) + \text{H}_2\text{SO}_4(aq) \rightarrow \text{CaSO}_4(aq) + 2\text{CO}_2(g) + 2\text{H}_2\text{O}(l)$$