

Net Ionic Equations

For reactions taking place in water, equations are often written in ionic form. In this method, only those ions taking part in the reaction are written. Other ions present in the solution but not involved in the reaction are known as spectator ions and are not included in the reaction.

- Strong acids, strong bases, and soluble salts are written as ions.
- Weak acids, weak bases, insoluble (& slightly soluble) salts are written as molecules.
- Covalent compounds are written as molecules

Solubility Rules

1. All common salts of group 1 metals and ammonium ion are soluble.
2. All common nitrates, chlorates, and acetates are soluble.
3. All binary compounds of group 17 (except F) with metals are soluble, except those of silver, mercury(I), and lead.
4. All sulfates are soluble, except those of barium, strontium, lead, calcium, silver, and mercury(I).
5. Except for those in rule 1, carbonates, hydroxides, oxides, and phosphates are insoluble.

Convert the following balanced equations to net ionic form.

1. $\text{H}_2\text{SiO}_3 + 2 \text{NaOH} \rightarrow \text{Na}_2\text{SiO}_3 + 2 \text{H}_2\text{O}$
2. $2 \text{HCl} + \text{Ba}(\text{OH})_2 \rightarrow \text{BaCl}_2 + 2 \text{H}_2\text{O}$
3. $4 \text{HCl} + 2 \text{Cr}(\text{NO}_3)_2 + 2 \text{HgCl}_2 \rightarrow 2 \text{CrCl}_3 + \text{Hg}_2\text{Cl}_2 + 4 \text{HNO}_3$
4. $2\text{Mn}(\text{NO}_3)_2 + 5\text{NaBiO}_3 + 14\text{HNO}_3 \rightarrow 2\text{NaMnO}_4 + 5\text{Bi}(\text{NO}_3)_3 + 7\text{H}_2\text{O} + 3 \text{NaNO}_3$
5. $2 \text{AgNO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{Ag}_2\text{SO}_4 + 2 \text{HNO}_3$
6. $4 \text{CuCNS}(\text{s}) + 7 \text{KIO}_3 + 14 \text{HCl} \rightarrow 4 \text{HCN} + 4 \text{CuSO}_4 + 7 \text{ICl} + 7 \text{KCl} + 5 \text{H}_2\text{O}$
7. $2\text{CuSO}_4 + 2\text{NH}_4\text{CNS} + \text{H}_2\text{SO}_3 + \text{H}_2\text{O} \rightarrow 2\text{CuCNS}(\text{s}) + (\text{NH}_4)_2\text{SO}_4 + 2\text{H}_2\text{SO}_4$
8. $6 \text{Cr}(\text{NO}_3)_2 + 3 \text{CuSO}_4 \rightarrow 3 \text{Cu} + 4 \text{Cr}(\text{NO}_3)_3 + \text{Cr}_2(\text{SO}_4)_3$
9. $3 \text{H}_2\text{SO}_4 + \text{MnO}_2 + 2 \text{KBr} \rightarrow \text{MnSO}_4 + \text{Br}_2 + 2 \text{KHSO}_4 + 2 \text{H}_2\text{O}$
10. $\text{H}_4\text{SiO}_4 + 4 \text{NaOH} \rightarrow \text{Na}_4\text{SiO}_4 + 4 \text{H}_2\text{O}$
11. $\text{Na}_2\text{S} + 2\text{HCl} \rightarrow 2\text{NaCl} + \text{H}_2\text{S}$
12. $\text{PbCl}_2 + \text{Na}_2\text{S} \rightarrow 2\text{NaCl} + \text{PbS}$
13. $2\text{AgClO}_4 + (\text{NH}_4)_2\text{SO}_4 \rightarrow 2\text{NH}_4\text{ClO}_4 + \text{Ag}_2\text{SO}_4$
14. $\text{Hg}_2(\text{ClO}_3)_2 + \text{SrCl}_2 \rightarrow \text{Sr}(\text{ClO}_3)_2 + \text{Hg}_2\text{Cl}_2$
15. $\text{MnO}_2 + 4\text{HCl} \rightarrow \text{MnCl}_2 + \text{Cl}_2 + 2\text{H}_2\text{O}$
16. $6\text{FeCl}_2 + 14\text{HCl} + \text{K}_2\text{Cr}_2\text{O}_7 \rightarrow 6\text{FeCl}_3 + 2\text{CrCl}_3 + 2\text{KCl} + 7\text{H}_2\text{O}$
17. $3\text{NaCl} + 4\text{Na}_2\text{CrO}_4 + 23\text{HBr} \rightarrow 3\text{HClO}_2 + 4\text{CrBr}_3 + 11\text{NaBr} + 10\text{H}_2\text{O}$
18. $\text{O}_3 + 3\text{KI} + 2\text{H}_2\text{SO}_4 \rightarrow \text{O}_2 + \text{KI}_3 + 2\text{KHSO}_4 + \text{H}_2\text{O}$