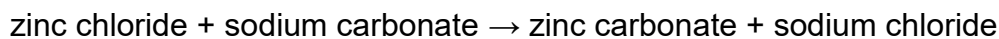




Ionic Equations Practice Sheet

Note: Chem 0861 students should do the molecular equations only.

Example 1: Write the molecular, total ionic and net ionic equations for the following word equation:



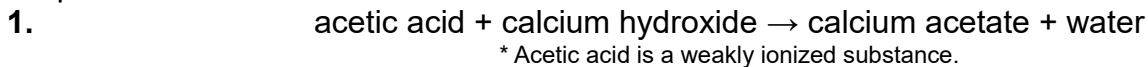
Solution: We'll do each type of equation separately.

zinc chloride + sodium carbonate → zinc carbonate + sodium chloride	
<p>Molecular Equation: [1] Write the correct formula for each substance. [Note that subscripts were chosen to give each compound a charge of zero.] [2] Balance the equation. [3] Indicate the states of all substances.</p>	$\text{Zn}^{2+} \text{Cl}^{-} \quad \text{Na}^{+} \text{CO}_3^{2-} \quad \text{Zn}^{2+} \text{CO}_3^{2-} \quad \text{Na}^{+} \text{Cl}^{-}$ $\text{ZnCl}_2 + \text{Na}_2\text{CO}_3 \rightarrow \text{ZnCO}_3 + \text{NaCl}$ $\text{ZnCl}_2 + \text{Na}_2\text{CO}_3 \rightarrow \text{ZnCO}_3 + 2 \text{NaCl}$ $\text{ZnCl}_2(\text{aq}) + \text{Na}_2\text{CO}_3(\text{aq}) \rightarrow \text{ZnCO}_3(\text{s}) + 2 \text{NaCl}(\text{aq})$
<p>Total Ionic Equation: [1] Write all aqueous substances as ions. Leave solids, liquids and gases.</p> <p>[A common mistake is to write Na_2^{+}, but there is no such ion. Sodium ions are always Na^{+}; it's just that there's two of them. Another mistake is to think of NaCl as a solid. It can be, but these equations take place in water, and NaCl is soluble in water.]</p>	$\text{Zn}^{2+}(\text{aq}) + 2 \text{Cl}^{-}(\text{aq}) + 2 \text{Na}^{+}(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) \rightarrow \text{ZnCO}_3(\text{s}) + 2 \text{Na}^{+}(\text{aq}) + 2 \text{Cl}^{-}(\text{aq})$
<p>Net Ionic Equation: [1] Remove all ions that appear on both sides of the equation. They're spectator ions, and we don't include them if they just sit there.</p>	$\text{Zn}^{2+}(\text{aq}) + 2 \text{Cl}^{-}(\text{aq}) + 2 \text{Na}^{+}(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) \rightarrow \text{ZnCO}_3(\text{s}) + 2 \text{Na}^{+}(\text{aq}) + 2 \text{Cl}^{-}(\text{aq})$ $\text{Zn}^{2+}(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) \rightarrow \text{ZnCO}_3(\text{s})$



EXERCISES

Write the molecular, total ionic and net ionic equations for the following word equations, where possible:



a) molecular eq'n

b) total ionic eq'n

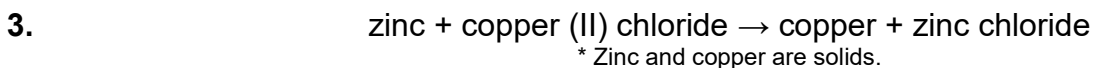
c) net ionic eq'n



a) molecular eq'n

b) total ionic eq'n

c) net ionic eq'n



a) molecular eq'n

b) total ionic eq'n

c) net ionic eq'n



a) molecular eq'n

b) total ionic eq'n

c) net ionic eq'n



5. sodium carbonate + potassium nitrate → potassium carbonate + sodium nitrate
a) molecular eq'n

b) total ionic eq'n

c) net ionic eq'n

6. sodium carbonate + hydrochloric acid → sodium chloride + water + carbon dioxide
* Carbon dioxide is a gas

a) molecular eq'n

b) total ionic eq'n

c) net ionic eq'n

SOLUTIONS

- (a) $2 \text{HC}_2\text{H}_3\text{O}_2 (\ell) + \text{Ca}(\text{OH})_2 (\text{aq}) \rightarrow \text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2 (\text{aq}) + 2 \text{H}_2\text{O} (\ell)$
(b) $2 \text{HC}_2\text{H}_3\text{O}_2 (\ell) + \text{Ca}^{2+} (\text{aq}) + 2 \text{OH}^- (\text{aq}) \rightarrow \text{Ca}^{2+} (\text{aq}) + 2 \text{C}_2\text{H}_3\text{O}_2^- (\text{aq}) + 2 \text{H}_2\text{O} (\ell)$
(c) $\text{HC}_2\text{H}_3\text{O}_2 (\ell) + \text{OH}^- (\text{aq}) \rightarrow \text{C}_2\text{H}_3\text{O}_2^- (\text{aq}) + \text{H}_2\text{O} (\ell)$
- (a) $\text{H}_2\text{SO}_4 (\text{aq}) + \text{Ba}(\text{NO}_3)_2 (\text{aq}) \rightarrow \text{BaSO}_4 (\text{s}) + 2 \text{HNO}_3 (\text{aq})$
(b) $2 \text{H}^+ (\text{aq}) + \text{SO}_4^{2-} (\text{aq}) + \text{Ba}^{2+} (\text{aq}) + 2 \text{NO}_3^- (\text{aq}) \rightarrow \text{BaSO}_4 (\text{s}) + 2 \text{H}^+ (\text{aq}) + 2 \text{NO}_3^- (\text{aq})$
(c) $\text{SO}_4^{2-} (\text{aq}) + \text{Ba}^{2+} (\text{aq}) \rightarrow \text{BaSO}_4 (\text{s})$
- (a) $\text{Zn} (\text{s}) + \text{CuCl}_2 (\text{aq}) \rightarrow \text{Cu} (\text{s}) + \text{ZnCl}_2 (\text{aq})$
(b) $\text{Zn} (\text{s}) + \text{Cu}^{2+} (\text{aq}) + 2 \text{Cl}^- (\text{aq}) \rightarrow \text{Cu} (\text{s}) + \text{Zn}^{2+} (\text{aq}) + 2 \text{Cl}^- (\text{aq})$
(c) $\text{Zn} (\text{s}) + \text{Cu}^{2+} (\text{aq}) \rightarrow \text{Cu} (\text{s}) + \text{Zn}^{2+} (\text{aq})$
- (a) $\text{H}_2\text{SO}_4 (\text{aq}) + \text{Ba}(\text{OH})_2 (\text{aq}) \rightarrow \text{BaSO}_4 (\text{s}) + 2 \text{H}_2\text{O} (\ell)$
(b) $2 \text{H}^+ (\text{aq}) + \text{SO}_4^{2-} (\text{aq}) + \text{Ba}^{2+} (\text{aq}) + 2 \text{OH}^- (\text{aq}) \rightarrow \text{BaSO}_4 (\text{s}) + 2 \text{H}_2\text{O} (\ell)$
(c) *same as (b), since there are no spectator ions*
- No reaction since all products remain aqueous*
- (a) $\text{Na}_2\text{CO}_3 (\text{aq}) + 2 \text{HCl} (\text{aq}) \rightarrow 2 \text{NaCl} (\text{aq}) + \text{H}_2\text{O} (\ell) + \text{CO}_2 (\text{g})$
(b) $2 \text{Na}^+ (\text{aq}) + \text{CO}_3^{2-} (\text{aq}) + 2 \text{H}^+ (\text{aq}) + 2 \text{Cl}^- (\text{aq}) \rightarrow 2 \text{Na}^+ (\text{aq}) + 2 \text{Cl}^- (\text{aq}) + \text{H}_2\text{O} (\ell) + \text{CO}_2 (\text{g})$
(c) $\text{CO}_3^{2-} (\text{aq}) + 2 \text{H}^+ (\text{aq}) \rightarrow \text{H}_2\text{O} (\ell) + \text{CO}_2 (\text{g})$

