

Be able to answer the following:

1. What are the four state symbols and what do they indicate?
2. What are some indications of the occurrence of a chemical reaction?
3. What do the coefficients in a chemical equation represent?
4. What must you Never, Never, Ever change when balancing a chemical equation?
5. What are the seven elements that exist as diatomic molecules when by themselves?
6. What are oxidation and reduction? Be able to identify the element that is oxidized and the element that is reduced in a chemical reaction and what their products are.
7. What is an aqueous solution?
8. What is a precipitate?

Balance each of the following reactions and indicate the reaction type in the blank at right.

- |   | Reaction Type               |
|---|-----------------------------|
| 1. $\underline{\quad}$ Li <sub>2</sub> O (s) + $\underline{\quad}$ H <sub>2</sub> O (l) $\longrightarrow$ $\underline{2}$ LiOH (aq)   | <u>Synthesis</u>            |
| 2. $\underline{\quad}$ Ca(ClO <sub>3</sub> ) <sub>2</sub> (s) $\xrightarrow{\Delta}$ $\underline{\quad}$ CaCl <sub>2</sub> (s) + $\underline{3}$ O <sub>2</sub> (g)                         | <u>Decomposition</u>        |
| 3. $\underline{2}$ NaBr (aq) + $\underline{\quad}$ F <sub>2</sub> (g) $\longrightarrow$ $\underline{2}$ NaF (aq) + $\underline{\quad}$ Br <sub>2</sub> (l)                                  | <u>Single Replacement</u>   |
| 4. $\underline{\quad}$ C <sub>3</sub> H <sub>12</sub> (l) + $\underline{8}$ O <sub>2</sub> (g) $\longrightarrow$ $\underline{5}$ CO <sub>2</sub> (g) + $\underline{6}$ H <sub>2</sub> O (g) | <u>Combustion</u>           |
| 5. $\underline{\quad}$ Au <sub>2</sub> S <sub>3</sub> (aq) + $\underline{3}$ H <sub>2</sub> (g) $\longrightarrow$ $\underline{2}$ Au (s) + $\underline{3}$ H <sub>2</sub> S (g)             | <u>Single Replacement</u>   |
| 6. $\underline{4}$ Fe (s) + $\underline{3}$ O <sub>2</sub> (g) $\longrightarrow$ $\underline{2}$ Fe <sub>2</sub> O <sub>3</sub> (s)   | <u>Synthesis/Combustion</u> |

- | <u>Reaction</u>   | <u>Type(s)</u>              |
|---|-----------------------------|
| 7. Aqueous barium chloride mixes with aqueous aluminum sulfate to form solid barium sulfate and aqueous aluminum chloride.<br>$3 \text{BaCl}_2 (\text{aq}) + \text{Al}_2(\text{SO}_4)_3 (\text{aq}) \longrightarrow 3 \text{BaSO}_4 (\text{s}) + 2 \text{AlCl}_3 (\text{aq})$         | <u>Double Replacement</u>   |
| 8. Solid antimony reacts in oxygen gas to form solid tetraantimony hexoxide.<br>$4 \text{Sb} (\text{s}) + 3 \text{O}_2 (\text{g}) \longrightarrow \text{Sb}_4\text{O}_6 (\text{s})$   | <u>Synthesis/Combustion</u> |
| 9. Solid potassium chlorate is heated in a test tube and produces solid potassium chloride and oxygen gas.<br>$2 \text{KClO}_3 (\text{s}) \xrightarrow{\Delta} 2 \text{KCl} (\text{s}) + 3 \text{O}_2 (\text{g})$   | <u>Decomposition</u>        |
| 10. Liquid isopropanol (C <sub>3</sub> H <sub>7</sub> OH) reacts with oxygen gas to form gaseous carbon dioxide and water vapor.<br>$2 \text{C}_3\text{H}_7\text{OH} (\text{l}) + 9 \text{O}_2 (\text{g}) \longrightarrow 6 \text{CO}_2 (\text{g}) + 8 \text{H}_2\text{O} (\text{g})$ | <u>Combustion</u>           |

DETERMINE the products and write the BALANCED EQUATION for each for each of these single-replacement reactions as if the reaction occurs. Determine whether the reaction would occur. Then write the Net Ionic Equations

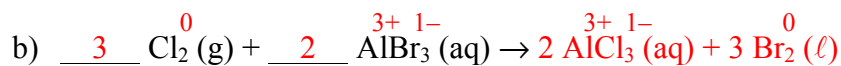
11.  $2 \text{Li (s)} + \text{ZnCl}_2 \text{ (aq)} \rightarrow 2 \text{LiCl (aq)} + \text{Zn (s)}$  Reaction occurs  
 $\text{Zn}^{2+} \rightarrow \text{Zn}$  is above  $\text{Li} \rightarrow \text{Li}^+$   
 $2 \text{Li}^0 \text{ (s)} + \text{Zn}^{2+} \text{ (aq)} + 2 \text{Cl}^- \text{ (aq)} \rightarrow 2 \text{Li}^+ \text{ (aq)} + 2 \text{Cl}^- \text{ (aq)} + \text{Zn}^0 \text{ (s)}$   
 $2 \text{Li}^0 \text{ (s)} + \text{Zn}^{2+} \text{ (aq)} \rightarrow 2 \text{Li}^+ \text{ (aq)} + \text{Zn}^0 \text{ (s)}$
12.  $\text{Cu} + \text{Na}_2\text{SO}_4 \text{ (aq)} \rightarrow \text{CuSO}_4 \text{ (aq)} + 2 \text{Na (s)}$  NR Reaction does not occur  
 $\text{Na}^+ \rightarrow \text{Na}$  is below  $\text{Cu} \rightarrow \text{Cu}^{2+}$   
 $\text{Cu}^0 \text{ (s)} + 2 \text{Na}^+ \text{ (aq)} + \text{SO}_4^{2-} \text{ (aq)} \rightarrow \text{Cu}^{2+} \text{ (aq)} + \text{SO}_4^{2-} \text{ (aq)} + 2 \text{Na}^0 \text{ (s)}$   
 $\text{Cu}^0 \text{ (s)} + 2 \text{Na}^+ \text{ (aq)} \rightarrow \text{Cu}^{2+} \text{ (aq)} + 2 \text{Na}^0 \text{ (s)}$

Determine the reactant formulas for the following scenarios, then complete the reactions as above.

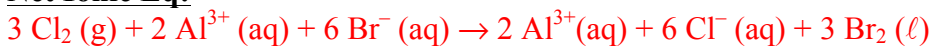
13. Solid iron wire is placed into a solution of copper(II) chloride.  
 $\text{Fe (s)} + \text{CuCl}_2 \text{ (aq)} \rightarrow \text{FeCl}_2 \text{ (aq)} + \text{Cu (s)}$   
 $\text{Fe}^0 \text{ (s)} + \text{Cu}^{2+} \text{ (aq)} + 2 \text{Cl}^- \text{ (aq)} \rightarrow \text{Fe}^{2+} \text{ (aq)} + 2 \text{Cl}^- \text{ (aq)} + \text{Cu}^0 \text{ (s)}$   
 $\text{Fe}^0 \text{ (s)} + \text{Cu}^{2+} \text{ (aq)} \rightarrow \text{Fe}^{2+} \text{ (aq)} + \text{Cu}^0 \text{ (s)}$
14. Fluorine gas is bubbled through a solution of gallium(III) iodide.  
 $3 \text{F}_2 \text{ (g)} + 2 \text{GaI}_3 \text{ (aq)} \rightarrow 2 \text{GaF}_3 \text{ (aq)} + 3 \text{I}_2 \text{ (s)}$   
 $3 \text{F}_2 \text{ (g)} + 2 \text{Ga}^{3+} \text{ (aq)} + 6 \text{I}^- \text{ (aq)} \rightarrow 2 \text{Ga}^{3+} \text{ (aq)} + 6 \text{F}^- \text{ (aq)} + 3 \text{I}_2 \text{ (s)}$   
 $3 \text{F}_2 \text{ (g)} + 6 \text{I}^- \text{ (aq)} \rightarrow 6 \text{F}^- \text{ (aq)} + 3 \text{I}_2 \text{ (s)}$  REDUCE:  $\text{F}_2 \text{ (g)} + 2 \text{I}^- \text{ (aq)} \rightarrow 2 \text{F}^- \text{ (aq)} + \text{I}_2 \text{ (s)}$
15. Label these changes as either oxidation or reduction:  
 a)  $\text{F}^- \text{ (aq)} \rightarrow \text{F}_2 \text{ (g)}$  oxidation      c)  $\text{Zn}^{2+} \text{ (aq)} \rightarrow \text{Zn}^0 \text{ (s)}$  reduction  
 b)  $\text{Al}^0 \text{ (s)} \rightarrow \text{Al}^{3+} \text{ (aq)}$  oxidation      d)  $\text{I}_2^0 \text{ (s)} \rightarrow \text{I}^- \text{ (aq)}$  reduction
16. Put in all charges (oxidation numbers) in the following substances.  
 a)  $\overset{2+}{\text{Ni}}\overset{1-}{\text{Br}}_2$     b)  $\overset{0}{\text{Co}}$     c)  $\overset{3+}{\text{Au}}\overset{1-}{\text{Cl}}_3$     d)  $\overset{0}{\text{F}}_2$     e)  $\overset{1+}{\text{H}}\overset{1-}{\text{Br}}$     f)  $\overset{0}{\text{Mg}}$     g)  $\overset{1+}{\text{K}}\overset{1-}{\text{F}}$

17. Complete these reactions, put in all oxidation numbers and then write the net ionic equation. (Only write substances whose charges change, not spectator ions.) Then indicate which substance is being oxidized, which is being reduced, and what their products are. [Remember LEO-GER!]

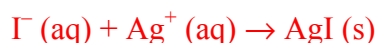
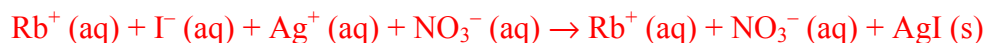
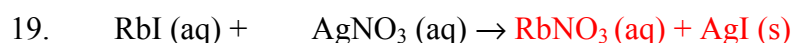
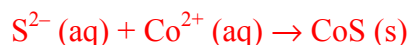
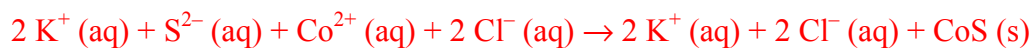
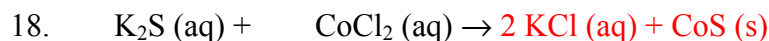
- a)  $\overset{0}{3} \text{Mg (s)} + \overset{3+}{2} \overset{1-}{\text{AuCl}}_3 \text{ (aq)} \rightarrow \overset{2+}{3} \overset{1-}{\text{MgCl}}_2 \text{ (aq)} + \overset{0}{2} \text{Au (s)}$   
**Net Ionic Eq:**  
 $3 \text{Mg (s)} + 2 \text{Au}^{3+} \text{ (aq)} + 6 \text{Cl}^- \text{ (aq)} \rightarrow 3 \text{Mg}^{2+} \text{ (aq)} + 6 \text{Cl}^- \text{ (aq)} + 2 \text{Au (s)}$   
 $3 \text{Mg (s)} + 2 \text{Au}^{3+} \text{ (aq)} \rightarrow 3 \text{Mg}^{2+} \text{ (aq)} + 2 \text{Au (s)}$   
 Oxidized: Mg      Product: Mg<sup>2+</sup>  
 Reduced: Au<sup>3+</sup>      Product: Au



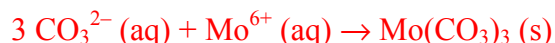
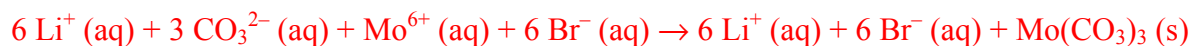
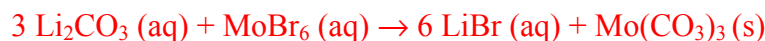
**Net Ionic Eq:**



For the following skeleton equations, determine the correct product formulas & states, then balance. Then write complete ionic and net ionic equations.



20. Lithium carbonate solution reacts with molybdenum(VI) bromide solution.



21. Sodium chloride solution reacts with lead(II) chlorate solution.

