

## Chemical Equations and Balancing Review KEY – Types of Reactions

- a) decomposition
- b) neutralization (or double replacement)
- c) combination
- d) decomposition
- e) decomposition
- f) single replacement
- g) single replacement
- h) single replacement
- i) single replacement
- j) double replacement

- 1) neutralization (or double replacement)
- 2) double replacement
- 3) double replacement (the  $\text{H}_2\text{CO}_3$  that is formed decomposes into  $\text{CO}_2$  and  $\text{H}_2\text{O}$ )
- 4) double replacement
- 5) combustion
- 6) double replacement (the  $\text{H}_2\text{CO}_3$  that is formed decomposes into  $\text{CO}_2$  and  $\text{H}_2\text{O}$ )
- 7) combustion
- 8) double replacement
- 9) double replacement
- 10) double replacement
- 11) combustion
- 12) neutralization (or double replacement)
- 13) double replacement
- 14) double replacement
- 15) combustion
- 16) double replacement

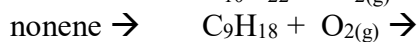
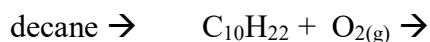
decane → combustion

nonene → combustion

## Chemical Equations and Balancing Review KEY – Reactants Translation to Formulas

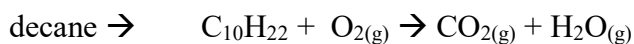
- a)  $\text{Li}_2\text{CO}_{3(s)} \rightarrow$
- b)  $\text{H}_2\text{CO}_{3(aq)} + \text{NH}_4\text{OH}_{(aq)} \rightarrow$
- c)  $\text{P}_{(s)} + \text{O}_{2(g)} \rightarrow$
- d)  $\text{AgHCO}_{3(s)} \rightarrow$
- e)  $\text{Ca}(\text{NO}_3)_{2(s)} \rightarrow$
- f)  $\text{H}_2\text{SO}_{4(aq)} + \text{Al}_{(s)} \rightarrow$
- g)  $\text{Zn}_{(s)} + \text{Pb}(\text{NO}_3)_{2(aq)} \rightarrow$
- h)  $\text{Fe}_2(\text{SO}_4)_{2(aq)} + \text{Cd}_{(s)} \rightarrow$
- i)  $\text{MnO}_{2(s)} + \text{Al}_{(s)} \rightarrow$
- j)  $\text{TiCl}_{4(aq)} + \text{H}_2\text{O}_{(l)} \rightarrow$

- 1)  $\text{H}_2\text{SO}_{4(aq)} + \text{Al}(\text{OH})_{3(s)} \rightarrow$
- 2)  $\text{Pb}(\text{NO}_3)_{2(aq)} + \text{FeBr}_{3(aq)} \rightarrow$
- 3)  $\text{HC}_2\text{H}_3\text{O}_{2(aq)} + \text{CaCO}_{3(s)} \rightarrow$
- 4)  $\text{CuS}_{(s)} + \text{Sn}(\text{BrO}_3)_{4(aq)} \rightarrow$
- 5)  $\text{C}_3\text{H}_7\text{OH}_{(l)} + \text{O}_{2(g)} \rightarrow$
- 6)  $\text{NaHCO}_{3(s)} + \text{H}_3\text{PO}_{4(aq)} \rightarrow$
- 7)  $\text{C}_6\text{H}_{6(l)} + \text{O}_{2(g)} \rightarrow$
- 8)  $\text{ZnCl}_{2(aq)} + \text{KOH}_{(aq)} \rightarrow$
- 9)  $\text{Co}_2(\text{SO}_4)_{3(aq)} + \text{H}_2\text{SeO}_{4(aq)} \rightarrow$
- 10)  $(\text{NH}_4)_3\text{PO}_{4(aq)} + \text{Ni}(\text{NO}_3)_{2(aq)} \rightarrow$
- 11)  $\text{C}_5\text{H}_{10(l)} + \text{O}_{2(g)} \rightarrow$
- 12)  $\text{HNO}_{3(aq)} + \text{Mg}(\text{OH})_{2(s)} \rightarrow$
- 13)  $\text{Bi}_2\text{S}_{3(s)} + \text{HCl}_{(aq)} \rightarrow$
- 14)  $\text{SbI}_{3(aq)} + (\text{NH}_4)_2\text{S}_{(aq)} \rightarrow$
- 15)  $\text{C}_7\text{H}_{16(l)} + \text{O}_{2(g)} \rightarrow$
- 16)  $\rightarrow \text{Bi}(\text{CrO}_4)_{2(s)} + \text{NaNO}_{3(aq)}$



## Chemical Equations and Balancing Review KEY – Completed Reactions (Unbalanced)

- a)  $\text{Li}_2\text{CO}_3(\text{s}) \rightarrow \text{Li}_2\text{O}(\text{s}) + \text{CO}_2(\text{g})$   
b)  $\text{H}_2\text{CO}_3(\text{aq}) + \text{NH}_4\text{OH}(\text{aq}) \rightarrow (\text{NH}_4)_2\text{CO}_3(\text{aq}) + \text{H}_2\text{O}(\text{l})$   
c)  $\text{P}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{P}_2\text{O}_5(\text{l})$   
d)  $\text{AgHCO}_3(\text{s}) \rightarrow \text{Ag}_2\text{CO}_3(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$   
e)  $\text{Ca}(\text{NO}_3)_2(\text{s}) \rightarrow \text{Ca}(\text{NO}_2)_2(\text{s}) + \text{O}_2(\text{g})$   
f)  $\text{H}_2\text{SO}_4(\text{aq}) + \text{Al}(\text{s}) \rightarrow \text{Al}_2(\text{SO}_4)_3(\text{aq}) + \text{H}_2(\text{g})$   
g)  $\text{Zn}(\text{s}) + \text{Pb}(\text{NO}_3)_2(\text{aq}) \rightarrow \text{Pb}(\text{s}) + \text{Zn}(\text{NO}_3)_2(\text{aq})$   
h)  $\text{Fe}_2(\text{SO}_4)_2(\text{aq}) + \text{Cd}(\text{s}) \rightarrow \text{N.R.}$   
i)  $\text{MnO}_2(\text{s}) + \text{Al}(\text{s}) \rightarrow \text{Al}_2\text{O}_3(\text{s}) + \text{Mn}(\text{s})$   
j)  $\text{TiCl}_4(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{TiO}_2(\text{s}) + \text{HCl}(\text{g})$
- 1)  $\text{H}_2\text{SO}_4(\text{aq}) + \text{Al}(\text{OH})_3(\text{s}) \rightarrow \text{Al}_2(\text{SO}_4)_3(\text{aq}) + \text{H}_2\text{O}(\text{l})$   
2)  $\text{Pb}(\text{NO}_3)_2(\text{aq}) + \text{FeBr}_3(\text{aq}) \rightarrow \text{Fe}(\text{NO}_3)_3(\text{aq}) + \text{PbBr}_2(\text{s})$   
3)  $\text{HC}_2\text{H}_3\text{O}_2(\text{aq}) + \text{CaCO}_3(\text{s}) \rightarrow \text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$   
4)  $\text{CuS}(\text{s}) + \text{Sn}(\text{BrO}_3)_4(\text{aq}) \rightarrow \text{Cu}(\text{BrO}_3)_2(\text{aq}) + \text{SnS}_2(\text{s})$   
5)  $\text{C}_3\text{H}_7\text{OH}(\text{l}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$   
6)  $\text{NaHCO}_3(\text{s}) + \text{H}_3\text{PO}_4(\text{aq}) \rightarrow \text{Na}_3\text{PO}_4(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$   
7)  $\text{C}_6\text{H}_6(\text{l}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$   
8)  $\text{ZnCl}_2(\text{aq}) + \text{KOH}(\text{aq}) \rightarrow \text{Zn}(\text{OH})_2(\text{s}) + \text{KCl}(\text{aq})$   
9)  $\text{Co}_2(\text{SO}_4)_3(\text{aq}) + \text{H}_2\text{SeO}_4(\text{aq}) \rightarrow \text{Co}_2(\text{SeO}_4)_3(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq})$   
10)  $(\text{NH}_4)_3\text{PO}_4(\text{aq}) + \text{Ni}(\text{NO}_3)_2(\text{aq}) \rightarrow \text{Ni}_3(\text{PO}_4)_2(\text{s}) + \text{NH}_4\text{NO}_3(\text{aq})$   
11)  $\text{C}_5\text{H}_{10}(\text{l}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$   
12)  $\text{HNO}_3(\text{aq}) + \text{Mg}(\text{OH})_2(\text{s}) \rightarrow \text{Mg}(\text{NO}_3)_2(\text{aq}) + \text{H}_2\text{O}(\text{l})$   
13)  $\text{Bi}_2\text{S}_3(\text{s}) + \text{HCl}(\text{aq}) \rightarrow \text{BiCl}_3 + \text{H}_2\text{S}(\text{aq})$   
14)  $\text{SbI}_3(\text{aq}) + (\text{NH}_4)_2\text{S}(\text{aq}) \rightarrow \text{NH}_4\text{I}(\text{aq}) + \text{Sb}_2\text{S}_3(\text{s})$   
15)  $\text{C}_7\text{H}_{16}(\text{l}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$   
16)  $\text{Na}_2\text{CrO}_4(\text{aq}) + \text{Bi}(\text{NO}_3)_3(\text{aq}) \rightarrow \text{Bi}(\text{CrO}_4)_3(\text{s}) + \text{NaNO}_3(\text{aq})$



## Chemical Equations and Balancing Review KEY – Balanced Reactions

- a)  $\text{Li}_2\text{CO}_3(\text{s}) \rightarrow \text{Li}_2\text{O}(\text{s}) + \text{CO}_2(\text{g})$
- b)  $\text{H}_2\text{CO}_3(\text{aq}) + 2 \text{NH}_4\text{OH}(\text{aq}) \rightarrow (\text{NH}_4)_2\text{CO}_3(\text{aq}) + 2 \text{H}_2\text{O}(\text{l})$
- c)  $4 \text{P}(\text{s}) + 5 \text{O}_2(\text{g}) \rightarrow 2 \text{P}_2\text{O}_5(\text{l})$
- d)  $2 \text{AgHCO}_3(\text{s}) \rightarrow \text{Ag}_2\text{CO}_3(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$
- e)  $\text{Ca}(\text{NO}_3)_2(\text{s}) \rightarrow \text{Ca}(\text{NO}_2)_2(\text{s}) + \text{O}_2(\text{g})$
- f)  $3 \text{H}_2\text{SO}_4(\text{aq}) + 2 \text{Al}(\text{s}) \rightarrow \text{Al}_2(\text{SO}_4)_3(\text{aq}) + 3 \text{H}_2(\text{g})$  (Al is more reactive than H, so a reaction takes place)
- g)  $\text{Zn}(\text{s}) + \text{Pb}(\text{NO}_3)_2(\text{aq}) \rightarrow \text{Pb}(\text{s}) + \text{Zn}(\text{NO}_3)_2(\text{aq})$  (Zn is more reactive than Pb, so a reaction takes place)
- h)  $\text{Fe}_2(\text{SO}_4)_2(\text{aq}) + \text{Cd}(\text{s}) \rightarrow \text{N.R.}$  (Cd is less reactive than Fe, so no reaction takes place)
- i)  $3 \text{MnO}_2(\text{s}) + 4 \text{Al}(\text{s}) \rightarrow 2 \text{Al}_2\text{O}_3(\text{s}) + 3 \text{Mn}(\text{s})$
- j)  $\text{TiCl}_4(\text{aq}) + 2 \text{H}_2\text{O}(\text{l}) \rightarrow \text{TiO}_2(\text{s}) + 4 \text{HCl}(\text{g})$

- 1)  $3 \text{H}_2\text{SO}_4(\text{aq}) + 2 \text{Al}(\text{OH})_3(\text{s}) \rightarrow \text{Al}_2(\text{SO}_4)_3(\text{aq}) + 6 \text{H}_2\text{O}(\text{l})$
- 2)  $3 \text{Pb}(\text{NO}_3)_2(\text{aq}) + 2 \text{FeBr}_3(\text{aq}) \rightarrow 2 \text{Fe}(\text{NO}_3)_3(\text{aq}) + 3 \text{PbBr}_2(\text{s})$
- 3)  $2 \text{HC}_2\text{H}_3\text{O}_2(\text{aq}) + \text{CaCO}_3(\text{s}) \rightarrow \text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$
- 4)  $2 \text{CuS}(\text{s}) + \text{Sn}(\text{BrO}_3)_4(\text{aq}) \rightarrow 2 \text{Cu}(\text{BrO}_3)_2(\text{aq}) + \text{SnS}_2(\text{s})$
- 5)  $2 \text{C}_3\text{H}_7\text{OH}(\text{l}) + 9 \text{O}_2(\text{g}) \rightarrow 6 \text{CO}_2(\text{g}) + 8 \text{H}_2\text{O}(\text{l})$
- 6)  $3 \text{NaHCO}_3(\text{s}) + \text{H}_3\text{PO}_4(\text{aq}) \rightarrow \text{Na}_3\text{PO}_4(\text{aq}) + 3 \text{CO}_2(\text{g}) + 3 \text{H}_2\text{O}(\text{l})$
- 7)  $2 \text{C}_6\text{H}_6(\text{l}) + 15 \text{O}_2(\text{g}) \rightarrow 12 \text{CO}_2(\text{g}) + 6 \text{H}_2\text{O}(\text{l})$
- 8)  $\text{ZnCl}_2(\text{aq}) + 2 \text{KOH}(\text{aq}) \rightarrow \text{Zn}(\text{OH})_2(\text{s}) + 2 \text{KCl}(\text{aq})$
- 9)  $\text{Co}_2(\text{SO}_4)_3(\text{aq}) + 3 \text{H}_2\text{SeO}_4(\text{aq}) \rightarrow \text{Co}_2(\text{SeO}_4)_3(\text{aq}) + 3 \text{H}_2\text{SO}_4(\text{aq})$
- 10)  $2 (\text{NH}_4)_3\text{PO}_4(\text{aq}) + 3 \text{Ni}(\text{NO}_3)_2(\text{aq}) \rightarrow \text{Ni}_3(\text{PO}_4)_2(\text{s}) + 6 \text{NH}_4\text{NO}_3(\text{aq})$
- 11)  $2 \text{C}_5\text{H}_{10}(\text{l}) + 15 \text{O}_2(\text{g}) \rightarrow 10 \text{CO}_2(\text{g}) + 10 \text{H}_2\text{O}(\text{l})$
- 12)  $2 \text{HNO}_3(\text{aq}) + \text{Mg}(\text{OH})_2(\text{s}) \rightarrow \text{Mg}(\text{NO}_3)_2(\text{aq}) + 2 \text{H}_2\text{O}(\text{l})$
- 13)  $\text{Bi}_2\text{S}_3(\text{s}) + 6 \text{HCl}(\text{aq}) \rightarrow 2 \text{BiCl}_3 + 3 \text{H}_2\text{S}(\text{aq})$
- 14)  $2 \text{SbI}_3(\text{aq}) + 3 (\text{NH}_4)_2\text{S}(\text{aq}) \rightarrow 6 \text{NH}_4\text{I}(\text{aq}) + \text{Sb}_2\text{S}_3(\text{s})$
- 15)  $\text{C}_7\text{H}_{16}(\text{l}) + 11 \text{O}_2(\text{g}) \rightarrow 7 \text{CO}_2(\text{g}) + 8 \text{H}_2\text{O}(\text{l})$
- 16)  $2 \text{Na}_2\text{CrO}_4(\text{aq}) + \text{Bi}(\text{NO}_3)_3(\text{aq}) \rightarrow \text{Bi}(\text{CrO}_4)_2(\text{s}) + 4 \text{NaNO}_3(\text{aq})$

