# Wkst 3.4: Predicting Products of Chemical Reactions

Part A: write the products in a balanced chemical equation for the following reactions, and give the type of the chemical reaction.

| | EQUATION | | | | | | | | TYPE |
|---|---|---|---|---|---|---|---|---|---|
| 1. | $Cr(MnO_4)_3$ | + | 3 K | → | 3 $KMnO_4$ | + | Cr | | Single Displacement |
| 2. | 4 Na | + | C | → | $Na_4C$ | | | | Combination |
| 3. | $V(NO_3)_5$ | + | 5 $AgCH_3CO_2$ | → | $V(CH_3CO_2)_5$ | + | 5 $AgNO_3$ | | Double Displacement |
| 4. | 8 $SCl_2$ | → | $S_8$ | + | 8 $Cl_2$ | | | | Decomposition |
| 5. | $N_2$ | + | 3 $H_2$ | → | 2 $NH_3$ | | | | Combination |
| 6. | $Mn(CO_3)_3$ | + | 3 Zn | → | 3 $ZnCO_3$ | + | Mn | | Single displacement |
| 7. | $Fe(NO_2)_2$ | + | $Mg(OH)_2$ | → | $Mg(NO_2)_2$ | + | $Fe(OH)_2$ | | Double displacement |
| 8. | 8 $F_2$ | + | $S_8$ | → | 8 $SF_2$ | | | | Combination |
| 9. | 2 $H_3PO_2$ | + | 3 $Hg(OH)_2$ | → | $Hg_3(PO_2)_2$ | + | 6 $H_2O$ | | Neutralisation |
| 10. | 2 $C_4H_{10}$ | + | 13 $O_2$ | → | 8 $CO_2$ | + | 10 $H_2O$ | | Combustion |
| 11. | $Ca(HCO_3)_2$ | → | Ca | + | $H_2$ | + | 2 C | + 3 $O_2$ | Decomposition |

## *Do You Know?*

*To burn 38 L of gasoline in an internal combustion engine requires 77 000 L of oxygen or 390 000 L of air. This is the amount of air breathed by 30 people in one day.*

1. a. $2C_2H_2(g) + 5O_2 \longrightarrow 4CO_2(g) + 2H_2O(g)$
   combustion
   b. $Zn(s) + CuSO_4(aq) \longrightarrow ZnSO_4(aq) + Cu(s)$
   single replacement
   c. $Cl_2(aq) + 2KI(aq) \longrightarrow 2KCl(aq) + I_2(aq)$
   single replacement
   d. $2H_2O_2(l) \longrightarrow 2H_2O(l) + O_2(g)$
   decomposition
   e. $MgCl_2(s) \longrightarrow Mg(s) + Cl_2$
   decomposition
   f. $Fe(s) + I_2(s) \longrightarrow FeI_2(s)$
   synthesis
   g. $16Cu(s) + S_8(l) \longrightarrow 8Cu_2S(s)$
   synthesis
   h. $C_6H_{12}O_6(aq) + 6O_2(aq) \longrightarrow 6CO_2(aq) + 6H_2O(l)$
   combustion
   i. $FeCl_2(aq) + K_2S(aq) \longrightarrow FeS(s) + 2KCl(aq)$
   double replacement
   j. $H_2SO_4(aq) + 2NaOH(aq) \longrightarrow Na_2SO_4(aq) + 2H_2O(l)$
   double replacement, water forming
   k. $Pb(NO_3)_2(aq) + K_2CrO_4(aq) \longrightarrow PbCrO_4(s) + 2KNO_3(aq)$
   double replacement
   l. $4Cr(s) + 3SnCl_4(aq) \longrightarrow 4CrCl_3(aq) + 3Sn(s)$
   single replacement
   m. $C_2H_5OH(l) + 3O_2(g) \longrightarrow 2CO_2(g) + 3H_2O(g)$
   combustion
2. a. $Zn(s) + MgSO_4(aq) \longrightarrow$ N.R.
   b. $Cd(s) + O_2(g) \longrightarrow CdO(s)$
   c. $HgO(s) \longrightarrow Hg(l) + O_2(g)$
   d. $HCl(aq) + KOH(aq) \longrightarrow KCl(aq) + H_2O(l)$
   e. $C_5H_{12}(l) + O_2(g) \longrightarrow CO_2(g) + H_2O(g)$
   f. $Sr(s) + O_2(g) \longrightarrow SrO(s)$
   g. $Br_2(aq) + CaCl_2(aq) \longrightarrow$ N.R.
   h. $Zn(s) + Ni(NO_3)_2(aq) \longrightarrow Zn(NO_3)_2(aq) + Ni(s)$
   i. $ZnSO_4(aq) + SrCl_2(aq) \longrightarrow SrSO_4(s) + ZnCl_2(aq)$
   j. $AlCl_3(aq) + NaCO_3(aq) \longrightarrow Al_2(CO_3)_3(s) + NaCl(aq)$
   k. $Fe(s) + S_8(s) \longrightarrow FeS(s)$
   l. $C_6H_6(l) + O_2(g) \longrightarrow CO_2(g) + H_2O(g)$
   m. $Pb(s) + KNO_3(aq) \longrightarrow$ N.R.
   n. $HNO_3(aq) + Sr(OH)_2(aq) \longrightarrow Sr(NO_3)_2(aq) + H_2O(l)$
3. a. $Zn(s) + MgSO_4(aq) \longrightarrow$ N.R.
   b. $2Cd(s) + O_2(g) \longrightarrow 2CdO(s)$
   c. $2HgO(s) \longrightarrow 2Hg(l) + O_2(g)$
   d. $HCl(aq) + KOH(aq) \longrightarrow KCl(aq) + H_2O(l)$
   e. $C_5H_{12}(l) + 8O_2(g) \longrightarrow 5CO_2(g) + 6H_2O(g)$
   f. $2Sr(s) + O_2(g) \longrightarrow 2SrO(s)$
   g. $Br_2(aq) + CaCl_2(aq) \longrightarrow$ N.R.
   h. $Zn(s) + Ni(NO_3)_2(aq) \longrightarrow Zn(NO_3)_2(aq) + Ni(s)$
   i. $ZnSO_4(aq) + SrCl_2(aq) \longrightarrow SrSO_4(s) + ZnCl_2(aq)$
   j. $2AlCl_3(aq) + 3Na_2CO_3(aq) \longrightarrow Al_2(CO_3)_3(s) + 6NaCl(aq)$
   k. $8Fe(s) + S_8(s) \longrightarrow 8FeS(s)$
   l. $2C_6H_6(l) + 15O_2(g) \longrightarrow 12CO_2(g) + 6H_2O(g)$
   m. $Pb(s) + KNO_3(aq) \longrightarrow$ N.R.
   n. $2HNO_3(aq) + Sr(OH)_2(aq) \longrightarrow Sr(NO_3)_2(aq) + 2H_2O(l)$
4. a. single replacement
   b. synthesis, combustion
   c. decomposition
   d. water-forming
   e. combustion
   f. synthesis, combustion
   g. single replacement
   h. single replacement
   i. double replacement
   j. double replacement
   k. synthesis
   l. combustion
   m. single replacement
   n. water-forming