Balancing Chemical Equations 1

When we balance chemical equations, we are trying to figure out how many molecules of each type participate in the reaction. Because we know we are dealing with the particular compounds in the reaction **we may *not* change any of the subscripts in the formulas for the chemicals**. The subscripts tell us how many of each atom are in the molecule, and changing the make-up of the molecule changes the chemicals.

Example 1: Balance the following reaction: __ Na + __ I_2 → __ NaI

Solution: Since the sodium occurs as a single atom on the left side of the equation, it will be easy to balance sodium. We should start with iodine.

We can copy the subscripts on the iodine on each side of the equation to the coefficient on the other side of the equation, like this:

__ Na + 1 I_2 → 2 NaI

Now there are two iodine atoms on each side of the equation. Iodine is balanced. Now we need to balance sodium. There are two sodium atoms on the right, so we write a 2 as a coefficient to balance sodium (and we can remove the coefficient of 1 in front of iodine):

2 Na + I_2 → 2 NaI

EXERCISES

Balance the following equations by writing in coefficients in front of the molecules.

1) ___ H_2 + ___ N_2 → ___ NH_3 [*Hint: Balance the hydrogen first.*]

2) ___ P + ___ O_2 → ___ P_2O_3 [*Hint: Balance the oxygen first.*]

3) ___ Fe + ___ $C\ell_2$ → ___ $FeC\ell_3$ [*Hint: Balance the chlorine first.*]

4) ___ Cr + ___ H_2O → ___ Cr_2O_3 + ___ H_2 [*Hint: Balance the oxygen first.*]

5) ___ C_2H_4 + ___ O_2 → ___ CO_2 + ___ H_2O [*Hint: Balance the C and H first.*]

6) ___ $A\ell$ + ___ FeO → ___ $A\ell_2O_3$ + ___ Fe [*Hint: Balance the oxygen first.*]

7) ___ Pb + ___ H_2SO_4 → ___ $PbSO_4$ + ___ SO_2 + ___ H_2O
[*Hint: Balance the sulphur first.*]

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8) ___ NH_3 + ___ O_2 → ___ H_2O + ___ N_2 [*Hint: Balance the hydrogen first.*]

9) ___ Li + ___ H_2O → ___ LiOH + ___ H_2 [*Hint: Balance the hydrogen first.*]

10) ___ $Fe(OH)_2$ + ___ H_2O_2 → ___ $Fe(OH)_3$ [*Hint: Balance the H and O first.*]

11) ___ PbS + ___ H_2O_2 → ___ $PbSO_4$ + ___ H_2O [*Hint: Balance the oxygen first.*]

12) ___ Ag + ___ HNO_3 → ___ $AgNO_3$ + ___ NO_2 + ___ H_2O
[*Hint: Balance the hydrogen first.*]

SOLUTIONS

(1) **3** H_2 + N_2 → **2** NH_3
(2) **4** P + **3** O_2 → **2** P_2O_3
(3) **2** Fe + **3** $C\ell_2$ → **2** $FeC\ell_3$
(4) **2** Cr + **3** H_2O → Cr_2O_3 + **3** H_2
(5) C_2H_4 + **3** O_2 → **2** CO_2 + **2** H_2O
(6) **2** $A\ell$ + **3** FeO → $A\ell_2O_3$ + **3** Fe
(7) Pb + **2** H_2SO_4 → $PbSO_4$ + SO_2 + **2** H_2O
(8) **4** NH_3 + **3** O_2 → **6** H_2O + **2** N_2
(9) **2** Li + **2** H_2O → **2** LiOH + H_2
(10) **2** $Fe(OH)_2$ + H_2O_2 → **2** $Fe(OH)_3$
(11) PbS + **4** H_2O_2 → $PbSO_4$ + **4** H_2O
(12) Ag + **2** HNO_3 → $AgNO_3$ + NO_2 + H_2O