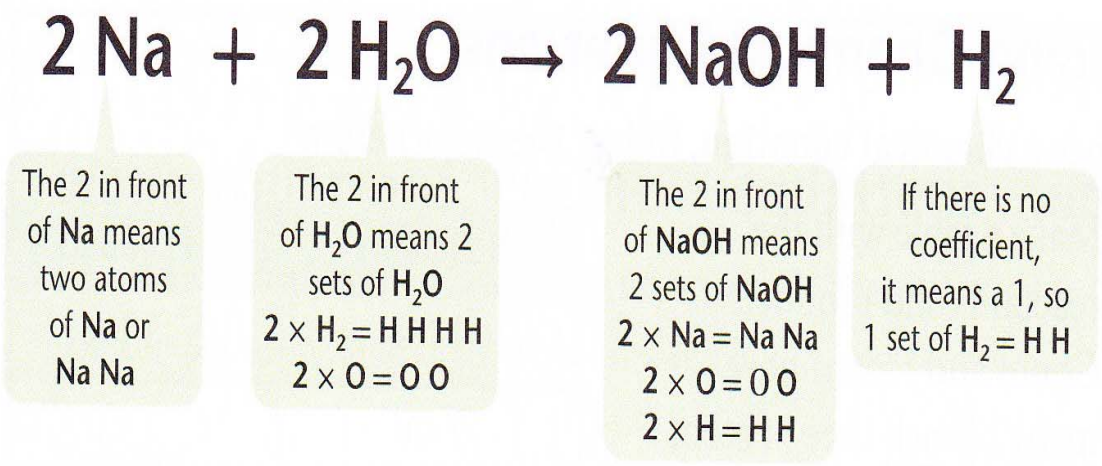
Lesson 14 Balancing Chemical Equations (Nelson Textbook Pages 218-221)

Learning Goals

- I can balance chemical equations.

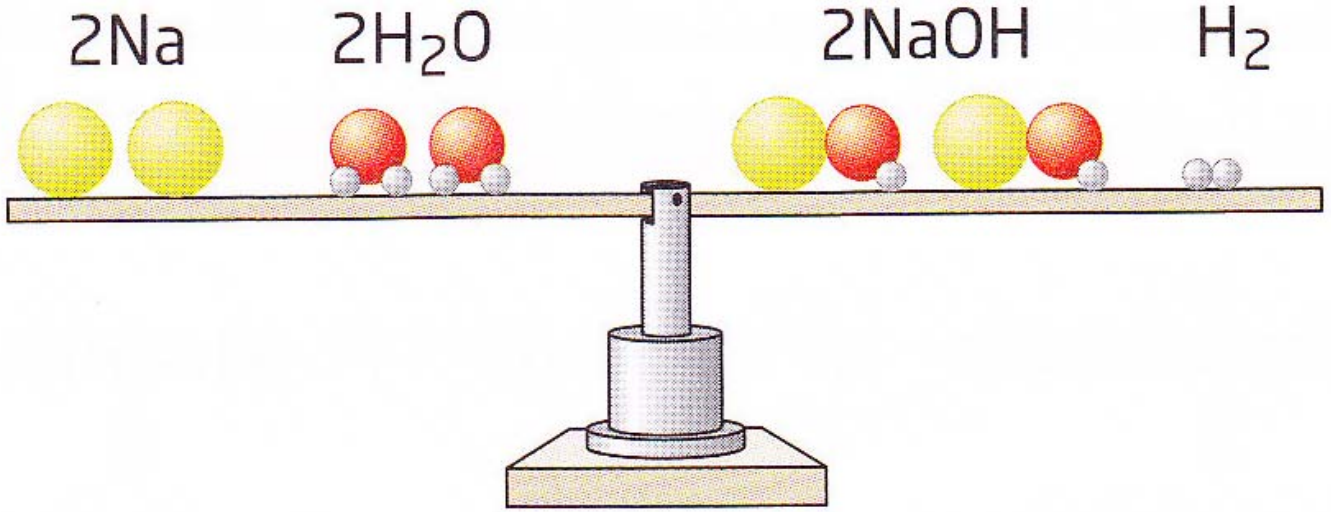
The Law of Conservation of Mass

- During a **chemical reaction**,
- **Total mass (reactants) = Total mass (products)**
- **Number of atoms (reactants) =**
- **Number of atoms (products)**



◀ **Figure 2.21** You can see that this equation is balanced because there are 2Na, 4H, and 2O in both the reactants (on the left) and the products (on the right).

$$2Na + 2H_2O \rightarrow 2NaOH + H_2$$



How to Balance a Chemical Equation

$$Na + H_2O \rightarrow NaOH + H_2$$

Reactants (Left)	Product (right)
Na = 2 (coefficient)	Na = 2 (coefficient)
H = 2 (coefficient) x 2 (subscript) = 4	H = 2 (coefficient) x 1 (subscript) + 2 (subscript) = 4
O = 2 (coefficient) x 1 (subscript) = 2	O = 2 (coefficient) x 1 (subscript) = 2

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Step 1 Make a table with the reactants and products. Count and record how many of each type of atom are on each side of the equation.

$$Na + CuCl_2 \rightarrow Cu + NaCl$$

Reactants	Products
1 Na	1 Na
1 Cu	1 Cu
2 Cl	1 Cl

Step 2 Identify an unbalanced atom. *Multiply* the compound on the other side of the equation, which contains that atom, by a coefficient to balance this atom in the reaction. Change the numbers in your table to indicate the change.

$$Na + CuCl_2 \rightarrow Cu + 2\ NaCl$$

Reactants	Products
1 Na	**2** Na
1 Cu	1 Cu
2 Cl	**2** Cl

Chlorine is unbalanced. Since there are only 2 Cl atoms on the product side, place the coefficient 2 in front of NaCl. (This means that you multiply NaCl by 2.) The coefficient must go in front of the whole compound, because it applies to the Na atoms and the Cl atoms in the whole compound.

Step 3 Repeat what you did in step 2 for any other unbalanced atoms, until all the atoms balance.

$$2\ Na + CuCl_2 \rightarrow Cu + 2\ NaCl$$

Reactants	Products
2 Na	**2** Na
1 Cu	1 Cu
2 Cl	**2** Cl

Now sodium is unbalanced. Since there are now 2 Na on the product side and there is only 1 Na on the reactant side, place the coefficient 2 in front of Na on the reactant side. (Multiply Na by 2.)

Step 4 Count the atoms on each side of the chemical equation to make sure that they are all balanced.