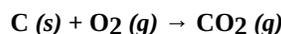


5.2: Chemical Equations

The processes that occur during a chemical change can be represented using a **chemical equation**. In a chemical equation, the chemical formulas for the substance or substances that *undergo* the chemical reaction (the **reactants**) and the formulas for the new substance or substances that are formed (the **products**) are both shown, and are linked by an **arrow**. The arrow in a chemical equation has the properties of an “equals sign” in mathematics, and because of this, ***in a chemical equation, there must be the same number and types of atoms on each side of the arrow.***

Reactants → Products

As an example of a chemical reaction, consider the reaction between solid carbon and oxygen gas to form carbon dioxide gas. This chemical equation for this reaction can be written as shown below.



In this equation, we have used **(s)** and **(g)** to represent the physical state of the reactants at the time of the reaction (solid and gas). Other abbreviations that are often used include **(l)** for liquid and **(aq)** to indicate that the reactant or product is dissolved in aqueous solution.

As we inspect this equation we see that there is one carbon atom on each side of the arrow and that there are two oxygen atoms on each side. An equation in which there are the same number and types of atoms on both sides of the arrow is referred to as **balanced**. As you write chemical equations, it is important to remember those elements that naturally occur as diatomic molecules (Table 1.1). Remember that when you include these as reactants or products, remember to indicate that they are diatomic by using the subscript “2”.

Table 1.1 Common Diatomic Elements

Element	Chemical Formula
Hydrogen	H ₂
Oxygen	O ₂
Nitrogen	N ₂
Fluorine	F ₂
Chlorine	Cl ₂
Bromine	Br ₂
Iodine	I ₂

? Exercise 5.2.1

- Write a chemical equation for the reaction of solid iron with solid sulfur to form solid iron(II) sulfide.
- Write a chemical equation for the reaction of solid carbon with solid magnesium oxide to form carbon monoxide gas and magnesium metal.

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