2.5: Conservation of Mass

When substances undergo chemical changes their physical state is usually dramatically altered. Despite this dramatic change, however, no matter is lost or created. We can show this with the reaction of magnesium metal with oxygen to form magnesium oxide. Instead of burning the magnesium metal openly in the air, if you were to *seal* the magnesium and air together in a glass vessel, weigh it, heat it to promote reaction, and then weigh the vessel again, you would find that there was *no change* in total mass. The mass of the product, magnesium oxide, would *exactly* equal the masses of the substances that reacted (oxygen gas and magnesium metal).

This is analogous to an experiment performed by the French chemist, Lavoisier, in the 1770s in which he heated metallic tin (Sn) with air in a closed vessel. This, and other experiments of the time, provided the data that led to the **law of mass conservation**. Formally, the law states, *there is no detectable change in the total mass of materials when they react chemically to form new materials*.

Basically, what the *conservation law* says is that whenever a chemical change occurs, the total mass of the substances reacting must equal the total mass of the substances that are produced. Sometimes this is stated as *mass is conserved* or *mass is neither created nor destroyed in a chemical reaction.* For example, when charcoal is burned in oxygen, the mass of the (charcoal + oxygen) must equal the mass of the (carbon dioxide, water vapor and ash) that is produced. The conservation of mass is one of the fundamental principles on which modern chemistry is based.