Skills to Develop

• Correctly define a law as it pertains to science.
• State the law of conservation of matter.

In science, a law is a general statement that explains a large number of observations. Before being accepted, a law must be verified many times under many conditions. Laws are therefore considered the highest form of scientific knowledge and are generally thought to be inviolable. Scientific laws form the core of scientific knowledge.

One scientific law that provides the foundation for understanding in chemistry is the law of conservation of matter. It states that in any given system that is closed to the transfer of matter (in and out), the amount of matter in the system stays constant. A concise way of expressing this law is to say that the amount of matter in a system is conserved.

What does this mean for chemistry? In any chemical change, one or more initial substances change into a different substance or substances. Both the initial and final substances are composed of atoms because all matter is composed of atoms. According to the law of conservation of matter, matter is neither created nor destroyed, so we must have the same number and type of atoms after the chemical change as were present before the chemical change.

Before looking at explicit examples of the law of conservation of matter, we need to examine the method chemists use to represent chemical changes.

Summary

The amount of matter in a closed system is conserved.

Concept Review Exercises

1. What is the law of conservation of matter?
2. How does the law of conservation of matter apply to chemistry?

Answers

1. The law of conservation of matter states that in any given system that is closed to the transfer of matter, the amount of matter in the system stays constant
2. The law of conservation of matter says that in chemical reactions, the total mass of the products must equal the total mass of the reactants.

Exercises

1. Express the law of conservation of matter in your own words.
2. Explain why the concept of conservation of matter is considered a scientific law.

Answer

1. Matter may not be created or destroyed.

2. From Section 1.1, a scientific law is a "descriptive generalization about how some aspect of the natural world behaves under stated circumstances." For comparison, a scientific theory is "a well-substantiated explanation of some aspect of the natural world that can incorporate facts, laws, inferences, and tested hypotheses." The difference between law and theory is not clear cut. Both are supported by vast amounts of evidence and generally accepted by the scientific community. A law is more narrow, like this particular description about matter, whereas a theory might be more broad and often would often include more of an explanation why. Atomic Theory explains the reason behind the law of conservation of matter; in chemical reactions, atoms just rearrange, so have same mass before and after.