

ATOMIC STRUCTURE

In many ways, this lesson is the start of your journey into chemistry. In this foundational lesson, we will learn about the building blocks of matter: atoms. Alchemists, the precursors to chemists, had a saying: “As above, so below”. A modern interpretation of this saying is that the properties of what we can see can help us understand the properties of what we cannot. In this lesson, we will learn how the properties of atoms determine the properties of the world around us.

MATTER

Look around you and note any object that you could touch. Each of those objects is made of matter. In fact matter is anything that has both mass and volume, in other words, anything that we could measure the mass of (no matter how small that mass may be) that also takes up space. For example, consider a flower, say a daisy.



If I were to put the daisy on a scale, it would have a mass. The flower would also occupy a measurable amount of space, meaning it has volume. As the daisy would have both mass and volume, it would be considered matter. On the other hand, the image of that daisy would not be considered matter as the image has no mass, and therefore, is not considered to be matter. Instead, the image is made of energy. If power were to suddenly stop flowing to your screen, you would no longer see the image as the light hitting your eye would no longer be coming from the screen.

We can also see that the matter surrounding us is not all the same. Water has very different properties from plastic which, in turn, has different properties from wood. As we see here, the term matter is a very broad term, and we can sort matter into different categories; however, to do this, we must first look at the building blocks of our universe: atoms.

ELEMENTS and ATOMS

The world around and within us consists of atoms. Everything that we touch or feel is made out of these basic building blocks. But what exactly is an atom? To answer this question, we first must understand what the term “element” means.

An element is a form of matter that cannot be broken down any further by chemical reactions. Examples of elements include iron, hydrogen, and helium. Each element has specific properties. For example, iron rusts in air and hydrogen is explosive. Each element is represented by a chemical symbol such as Fe for iron or H for hydrogen. You may have seen these in the past on a periodic table, which we will be looking to further understand in this lesson.

Now that we know the term element, we can answer our original question: “What is an atom”? To illustrate, let us think of a chunk of the element iron.

Imagine you are able to divide a chunk of iron in half as many times as you want, no matter how small the chunk becomes. Would this chunk of iron be iron, no matter how small the pieces became?

Answer:

There is a point that we could no longer divide the iron where, if we divided the iron any further, this material would no longer have the properties of iron. The term for this smallest possible bit of iron is an atom of iron. Atoms are the smallest particle of an element that still has the properties of that element.