# **Chemical Elements Discussion Guide (for use during or after reading)**

1. Matter can be categorized as elements or compounds. How are these categories different from one another? (Introduction, What Are Chemical Elements?, p. 4-9)
   1. Matter refers to all the materials that make up the universe. Matter consists of atoms and can be categorized as elements or compounds. Chemical elements are matter that is made of only one type of atom. Compounds, on the other hand, are matter that is made of two or more types of atoms.
2. Describe what is found inside an atom. (Inside an Atom, p. 10-11)
   1. Atoms are made of many tiny particles. The center of an atom is its nucleus, which contains protons (positively charged particles) and neutrons (particles with no charge). Electrons (negatively charged particles) move freely around the nucleus and are organized into electron shells.
3. What are isotopes and why might some people consider them to be the “limited edition” version of atoms? (Inside an Atom, p. 10-11)
   1. Isotopes are one of two or more atoms of the same chemical element that differ in the number of neutrons they contain. Different isotopes of a chemical element will have different atomic masses because their number of neutrons vary.
   2. Some people might consider isotopes to be the “limited edition” version of atoms because they are all different versions of the same element. Isotopes are special versions of atoms because their different number of neutrons changes their structure.
4. Consider pages 12 and 13. According to the text, how did elements originate? (The Birth of Elements, p. 12-13)
   1. According to the text, a massive cosmic explosion caused the universe to expand about 13.8 billion years ago. Scientists refer to this explosion as the “big bang,” and believe that at this time much of the universe’s matter was made up of electrons and other basic particles. Scientists also believe that protons and neutrons formed within seconds of the “big bang,” allowing for the birth of atoms. It is thought that the lightest of the atoms, such as hydrogen and helium, formed within minutes of the “big bang,” and the remaining elements formed over hundreds of millions of years inside exploding stars.

1. What is the periodic table and how has it changed over time? (Discovering and Classifying Elements, p. 14-15)
   1. The periodic table is an organization system scientists use to keep track of all the known elements. A periodic table organizes elements based on their properties. This table has changed over time as scientist have discovered new elements.
2. What is an atomic number? Where can it be found on the periodic table? (Element Symbols and Atomic Number, p. 18-19)
   1. An element’s atomic number refers to its number of protons. Because each element has a unique number of protons, we can use atomic numbers to describe and organize them. The periodic table lists the elements in order according to their atomic number. It can often be found in the upper left-hand corner of each element box on the periodic table.
3. What is atomic mass? How is mass different from weight? (Atomic Mass, p. 20)
   1. Atomic mass refers to the amount of matter within an atom. Mass and weight are often used interchangeably but mean different things in science. Weight is the measure of gravity’s force pulling on a substance.
4. How are periods used to organize the periodic table? What do they represent? (Periods, p. 21-23)
   1. The periodic table can be thought of in rows, or periods. Elements in each period have the same number of electron shells. Elements in the first period have one electron shell, those in the second period have two electron shells, and so on.
5. The periodic table is also organized vertically to create groups, or families, of elements. What do elements in the same group tend to have in common? (Groups, p. 24-25)
   1. The periodic table is also organized vertically into groups of elements based on the way they form compounds. Groups of elements tend to form bonds in the same way because they have the same number of valence electrons, or electrons ready to be lost, gained, or shared.
6. Finally, the periodic table is organized into 10 classes of elements. Choose **two** from the text and describe their characteristics. (Classes of Elements, Classes of Metals, Metalloids, Nonmetals, p. 26-38)
   1. Students’ responses may vary but encourage them to determine whether the classes they chose represent metals, metalloids, or nonmetals. Students should also include information about the classes’ physical and/or chemical properties.