LOOKING BACK

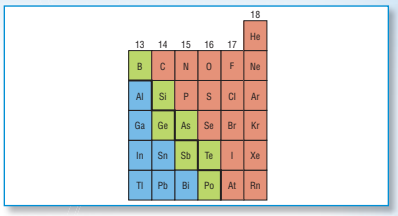
KEY CONCEPTS SUMMARY

Elements cannot be broken down into simpler substances.

- Elements are the building blocks of all substances. (6.1)
- All substances on Earth are made of one or more elements. (6.1, 6.3)
- Elements are arranged on the periodic table. (6.1)
- A compound is a pure substance composed of two or more different elements that are chemically joined. (6.1, 6.3)

Metals and non-metals have characteristic physical properties.

- Metals are elements that have lustre, and are conductors, malleable, and ductile. (6.1, 6.2)
- Non-metals are elements that are mostly gases or dull, powdery solids. (6.1, 6.2)

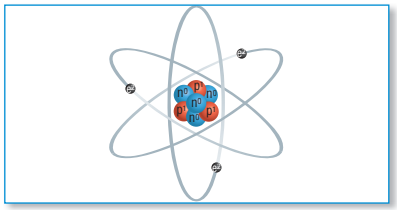


Elements are organized according to their atomic number and electron arrangement on the periodic table.

- The columns of the periodic table represent groups or families of elements with similar properties. (6.4, 6.5, 6.7)
- Elements in the same family have the same number of electrons in their outermost orbits. (6.7)

Atomic models evolved as a result of experimental evidence.

- John Dalton proposed that matter is made of tiny indivisible particles called atoms. (6.6)
- J. J. Thomson proposed that atoms are positively charged, with negatively charged electrons evenly distributed within them. (6.6)
- Ernest Rutherford proposed that atoms are mostly empty space, with a positively charged centre that is surrounded by negatively charged electrons. (6.6)
- Niels Bohr proposed that electrons occupy fixed orbits around the nucleus. (6.6)



Atoms contain protons and neutrons in a central core surrounded by electrons.

- The Bohr–Rutherford model of the atom consists of positively charged protons and neutral neutrons in the nucleus and negatively charged electrons orbiting the nucleus. (6.6)

Elements can be both beneficial and harmful to humans and to the environment.

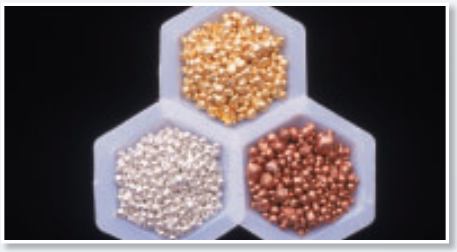
- Some elements are harmful to humans in very small quantities. (6.1, 6.4, 6.5, 6.7)
- Some elements are essential nutrients that humans and other living things need in order to survive. (6.1, 6.4)
- Some elements are beneficial to humans, but their extraction can be harmful to the environment. (6.8)

WHAT DO YOU THINK NOW?

You thought about the following statements at the beginning of the chapter. You may have encountered these ideas in school, at home, or in the world around you. Consider them again and decide whether you agree or disagree with each one.

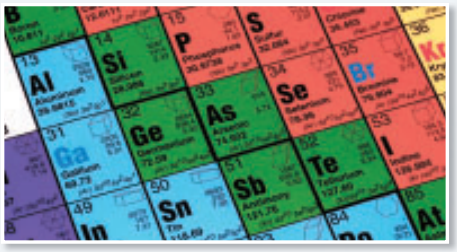
1 Water is a common element.
Agree/disagree?

4 It is easy to change one element into another.
Agree/disagree?



2 Gold, silver, and copper are all metals because they are shiny and flexible.
Agree/disagree?

5 "Harmful" is a relative term: a harmful amount of a substance for one person may not be harmful for another person.
Agree/disagree?



3 Elements are arranged alphabetically on the periodic table.
Agree/disagree?

6 Scientific theories are educated guesses that have been proven to be correct.
Agree/disagree?

How have your answers changed since then? What new understanding do you have?

Vocabulary

element (p. 211)
element symbol (p. 211)
compound (p. 211)
metal (p. 212)
non-metal (p. 213)
metalloid (p. 213)
chemical family (p. 220)
alkali metal (p. 220)
alkaline earth metal (p. 221)
noble gas (p. 221)
halogen (p. 222)
period (p. 222)
atom (p. 228)
electron (p. 229)
proton (p. 230)
neutron (p. 231)
atomic number (p. 234)
mass number (p. 235)
isotope (p. 235)
atomic mass (p. 235)
Bohr–Rutherford diagram (p. 236)

BIG Ideas

- **Elements and compounds have specific physical and chemical properties that determine their practical uses.**
- **The use of elements and compounds has both positive and negative effects on society and the environment.**