

- Calculate the atomic weight of an element from the masses of individual atoms and a knowledge of natural abundances. (Section 2.4)
- Describe how elements are organized in the periodic table by atomic number and by similarities in chemical behavior, giving rise to periods and groups. (Section 2.5)
- Identify the locations of metals and nonmetals in the periodic table. (Section 2.5)
- Distinguish between molecular substances and ionic substances in terms of their composition. (Sections 2.6 and 2.7)
- Distinguish between empirical formulas and molecular formulas. (Section 2.6)
- Describe how molecular formulas and structural formulas are used to represent the compositions of molecules. (Section 2.6)
- Explain how ions are formed by the gain or loss of electrons and be able to use the periodic table to predict the charges of common ions. (Section 2.7)
- Write the empirical formulas of ionic compounds, given the charges of their component ions. (Section 2.7)
- Write the name of an ionic compound given its chemical formula or write the chemical formula given its name. (Section 2.8)
- Name or write chemical formulas for binary inorganic compounds and for acids. (Section 2.8)
- Identify organic compounds and name simple alkanes and alcohols. (Section 2.9)

## Key Equations

$$\text{Atomic weight} = \sum \left[ (\text{isotope mass}) \times (\text{fractional isotope abundance}) \right] \text{ over all isotopes of the element} \quad [2.1]$$

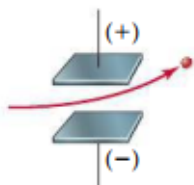
Calculating atomic weight as a fractionally weighted average of isotopic masses.

## Exercises

### Visualizing Concepts

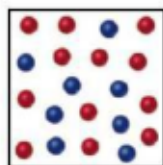
These exercises are intended to probe your understanding of key concepts rather than your ability to utilize formulas and perform calculations. Exercises with red numbers have answers in the back of the book.

- 2.1** A charged particle is caused to move between two electrically charged plates, as shown here.



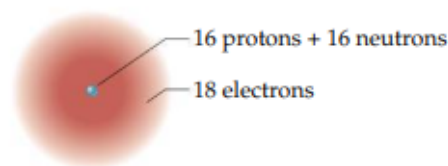
(a) Why does the path of the charged particle bend? (b) What is the sign of the electrical charge on the particle? (c) As the charge on the plates is increased, would you expect the bending to increase, decrease, or stay the same? (d) As the mass of the particle is increased while the speed of the particles remains the same, would you expect the bending to increase, decrease, or stay the same? [Section 2.2]

- 2.2** The following diagram is a representation of 20 atoms of a fictitious element, which we will call nevadium (Nv). The red spheres are  $^{293}\text{Nv}$ , and the blue spheres are  $^{295}\text{Nv}$ . (a) Assuming that this sample is a statistically representative sample of the element, calculate the percent abundance of each element. (b) If the mass of  $^{293}\text{Nv}$  is 293.15 amu and that of  $^{295}\text{Nv}$  is 295.15 amu, what is the atomic weight of Nv? [Section 2.4]

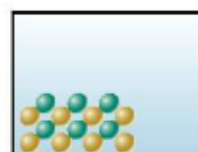


- 2.3** Four of the boxes in the following periodic table are colored. Which of these are metals and which are nonmetals? Which one is an alkaline earth metal? Which one is a noble gas? [Section 2.5]

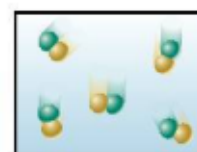
- 2.4** Does the following drawing represent a neutral atom or an ion? Write its complete chemical symbol including mass number, atomic number, and net charge (if any). [Sections 2.3 and 2.7]



- 2.5** Which of the following diagrams most likely represents an ionic compound, and which represents a molecular one? Explain your choice. [Sections 2.6 and 2.7]



(i)



(ii)