

REVIEWING CONCEPTS

- Explain each of the following in terms of Dalton's atomic theory:
 - the law of conservation of mass
 - the law of definite proportions
 - the law of multiple proportions (3-1)
 - According to the law of conservation of mass, if element A has an atomic mass of 2 mass units and element B has an atomic mass of 3 mass units, what mass would be expected for compound AB? for compound A_2B_3 ? (3-1)
 - What is an atom?
 - What two regions make up all atoms? (3-2)
 - Describe at least four properties of electrons that were determined based on the experiments of Thomson and Millikan. (3-2)
 - Summarize Rutherford's model of an atom, and explain how he developed this model based on the results of his famous gold-foil experiment. (3-2)
 - What one number identifies an element? (3-2)
 - What are isotopes?
 - How are the isotopes of a particular element alike?
 - How are they different? (3-3)
 - Copy and complete the following table concerning the three isotopes of silicon, Si. (Hint: See Sample Problem 3-1.) (3-3)
- | Isotope | Number of protons | Number of electrons | Number of neutrons |
|---------|-------------------|---------------------|--------------------|
| Si-28 | | | |
| Si-29 | | | |
| Si-30 | | | |
- What is the atomic number of an element?
 - What is the mass number of an isotope?
 - In the nuclear symbol for deuterium, ${}^2_1\text{H}$, identify the atomic number and the mass number. (3-3)
 - What is a nuclide? (3-3)
 - Use the periodic table and the information that follows to write the hyphen notation for each isotope described.
 - atomic number = 2, mass number = 4
 - atomic number = 8, mass number = 16
 - atomic number = 19, mass number = 39 (3-3)
 - What nuclide is used as the standard in the relative scale for atomic masses?
 - What is its assigned atomic mass? (3-3)
 - What is the atomic mass of an atom if its mass is approximately equal to the following?
 - $\frac{1}{3}$ that of carbon-12
 - 4.5 times as much as carbon-12 (3-3)
 - What is the definition of a mole?
 - What is the abbreviation for mole?
 - How many particles are in one mole?
 - What name is given to the number of particles in a mole? (3-3)
 - What is the molar mass of an element?
 - To two decimal places, write the molar masses of carbon, neon, iron, and uranium. (3-3)
 - Suppose you have a sample of an element.
 - How is the mass in grams of the element converted to amount in moles?
 - How is the mass in grams of the element converted to number of atoms? (3-3)

PROBLEMS

The Mole and Molar Mass

- What is the mass in grams of each of the following? (Hint: See Sample Problems 3-2 and 3-5.)
 - 1.00 mol Li
 - 1.00 mol Al
 - 1.00 molar mass Ca
 - 1.00 molar mass Fe
 - 6.022×10^{23} atoms C
 - 6.022×10^{23} atoms Ag
- How many moles of atoms are there in each of the following? (Hint: See Sample Problems 3-3 and 3-4.)
 - 6.022×10^{23} atoms Ne
 - 3.011×10^{23} atoms Mg
 - 3.25×10^5 g Pb
 - 4.50×10^{-12} g O

Relative Atomic Mass

- Three isotopes of argon occur in nature— ${}^{36}_{18}\text{Ar}$, ${}^{38}_{18}\text{Ar}$, and ${}^{40}_{18}\text{Ar}$. Calculate the average atomic mass of argon to two decimal places, given the following relative atomic masses and abundances of each of the isotopes: argon-36 (35.97 amu; 0.337%), argon-38 (37.96 amu; 0.063%), and argon-40 (39.96 amu; 99.600%).