

Concept Review

Section: Atomic Structure

1. **Draw** and label the parts of a helium atom. Include the mass and charge of each subatomic particle.

2. **Describe** the three main ideas of Dalton's atomic theory in your own words.

3. **Compare** the outermost electrons of an atom with the inner electrons of an atom in terms of energy.

4. **Compare** the positions of the electrons in Bohr's model of the atom with their positions according to modern atomic theory.

Concept Reviews

SECTION: ATOMIC STRUCTURE

1. Check students' drawings. Drawings should include two protons and two neutrons clustered in the nucleus and two electrons moving around outside the nucleus. Protons have a +1 charge, electrons have a -1 charge, and neutrons have a charge of zero.
proton mass = 1.67×10^{-27} kg
electron mass = 9.11×10^{-31} kg
neutron mass = 1.67×10^{-27} kg
2. Dalton proposed that each element is made up of unique atoms that cannot be subdivided, that all of the atoms of an element are the same, and that atoms from different elements join together to form molecules.
3. The outermost electrons of an atom have greater energy than the innermost electrons of an atom.
4. In both theories, electrons orbit the nucleus and each electron has an energy level associated with its location. In Bohr's model of the atom, electrons were thought to orbit the nucleus in set paths, much like planets orbiting the sun. In the modern atomic theory, the region in an atom where electrons are likely to be found is called an orbital. But the exact location of an electron cannot be determined according to this model.

SECTION: A GUIDED TOUR OF THE PERIODIC TABLE

1. **a.** Mn **b.** Pb **c.** C **d.** U **e.** Rn **f.** Ag
2. Atoms of elements that have the same number of valence electrons are located in the same group (column) of the periodic table.
3. The atomic number is the number of protons found in the nucleus of an atom. The mass number is the total number of protons plus neutrons found in the nucleus.
4. Atoms of Group 1 elements lose the one valence electron they have to form cations with a full outermost energy level. Atoms of Group 17 elements have seven valence electrons and gain one electron to form anions with a full outermost energy level.

5.

Isotope	Symbol	p	n	e ⁻
protium	${}^1_1\text{H}$	1	0	1
deuterium	${}^2_1\text{H}$	1	1	1
tritium	${}^3_1\text{H}$	1	2	1

6. The average atomic mass of hydrogen is listed in the periodic table as 1.01 amu. This value is closest to the atomic mass of protium (the most common hydrogen isotope), which has an atomic mass of about 1.0 amu (one proton and no neutrons).

SECTION: FAMILIES OF ELEMENTS

1. **a.** alkali metal **b.** semiconductor
c. transition metal **d.** alkaline-earth metal
2. **a.** other nonmetal **b.** halogen **c.** noble gas **d.** other nonmetal
3. **a.** no **b.** no **c.** yes **d.** yes **e.** no **f.** no
4. Chlorine is reactive because it needs to gain only one more electron to have a full outermost energy level. Argon is not reactive because it has a full outermost energy level.
5. **a.** similar **b.** similar **c.** different
d. similar, both unreactive

SECTION: USING MOLES TO COUNT ATOMS

1. A mole is 6.022×10^{23} particles.
2. **a.** yes **b.** no **c.** yes **d.** yes
3. A large counting unit like the mole is used to count atoms because atoms are too small to count individually.
4. **a.** 40.08 g/mol **c.** 32.07 g/mol
b. 58.93 g/mol **d.** 16.00 g/mol
5. List the given and unknown values. Write down the form of the molar mass that will convert moles to grams (grams in the numerator, moles in the denominator). Multiply the amount of the element by the conversion factor, and solve.
6. **a.** 12 g of Ne **c.** 150 g of Se
b. 658 g of Xe **d.** 650 g of Au
7. **a.** 0.35 mol of H **c.** 0.50 mol of Cr
b. 37.5 mol of B **d.** 0.26 mol of S