

## Chapter 3 Practice

### 3.1 Atoms: The Essential Building Blocks

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1. List four key features of Dalton's atomic theory.

- Elements are composed of atoms.
- The atoms of each element are unique.
- Atoms can combine in fixed ratios to form compounds.
- Atoms are not changed in a chemical reaction.

2. When it burns, 24.3 grams of magnesium can react completely with 16.0 grams of oxygen gas to form a new compound, magnesium oxide. No other compounds are formed. What mass of magnesium oxide is formed in this reaction?

Magnesium + oxygen reacts to form magnesium oxide

$$24.3 \text{ g} + 16.0 \text{ g} \rightarrow 40.3 \text{ g}$$

The mass after the reaction must be the same as the mass before the reaction.

### 3.2 The Periodic Table of the Elements

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3. Complete the table below to show the elements and symbols. See how many you can do by memory, then check yourself to see if you are correct.

Element	Symbol	Element	Symbol	Element	Symbol	Element	Symbol
hydrogen	H	nitrogen	N	bromine	Br	palladium	Pd
carbon	C	argon	Ar	iron	Fe	tin	Sn
silicon	Si	lead	Pb	silver	Ag	iodine	I
magnesium	Mg	gold	Au	chromium	Cr	lithium	Li

4. Using the periodic table, identify each element as a metal, a metalloid, or a nonmetal:

- a. carbon - nonmetal                      b. aluminum - metal  
c. germanium - metalloid                d. thorium - metal

### 3.3 Uncovering Atomic Structure

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5. Rank the following ideas or discoveries in the order they occurred:

Order	Event
2	Dalton's atomic theory
4	Thomson discovers the electron
5	Plum pudding model
6	Rutherford proposes the nucleus
1	Volta's electrochemical cell
3	Mendeleev's periodic table

### 3.4 Describing Atoms: Identity and Mass

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6. Write the atomic symbol, including the atomic number and the mass number, for each of the following:

a. a silicon atom with 14 neutrons  $^{28}_{14}\text{Si}$

b. a gallium atom with 39 neutrons  $^{70}_{31}\text{Ga}$

c. a hydrogen atom with 2 neutrons  $^3_1\text{H}$

d. a lithium atom with 4 neutrons  $^7_3\text{Li}$

7. Write an atomic symbol (including atomic number and mass number) for an **isotope** of carbon-12.

$^{13}_6\text{C}$  or  $^{14}_6\text{C}$  (atomic number same, mass number different)

8. Complete the table below:

Atom	Symbol	Protons	Neutrons	Atomic Number	Mass Number
Hydrogen	H	1	0	1	1
Sulfur	S	16	16	16	32
Tellurium	Te	52	76	52	128
Helium	He	2	2	2	4
Zirconium	Zr	40	51	40	91

### 3.5 Electrons – A Preview

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9. Briefly describe how each model of the atom described electron structure:

Model	Description
Plum pudding model	Negatively charged electrons spread through a positive medium.
Bohr model	Electrons orbit the nucleus like planets orbit the sun.
Quantum model	Electrons behave as energy waves that occupy different energy levels.

10. Calculate the overall charge on these atoms/ions:

a. A calcium ion with 20 protons, 20 neutrons, and 18 electrons  $+2$

b. An iron ion with 26 protons, 30 neutrons, and 23 electrons  $+3$

c. A platinum ion with 74 electrons  $78 - 74 = +4$

d. An iodide ion with 54 electrons  $53 - 54 = -1$

e. A phosphorous ion with 16 neutrons and 18 electrons  $15 - 18 = -3$