CHAPTER 3

Study Guide

REVIEW THE BIG IDEA

In the periodic table, the elements are organized in order of increasing atomic number. The properties of the elements repeat in each period.

LESSON 1 Introduction to Atoms

- Atomic theory grew as a series of models that developed from experimental evidence.
- At the center of the atom is a tiny, dense nucleus containing protons and neutrons. Surrounding the nucleus is a cloudlike region of moving electrons.

Vocabulary

- atom
- electron
- nucleus
- proton
- energy level
- neutron
- atomic number
- isotope
- mass number

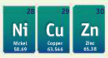
LESSON 2 Organizing the Elements

- Mendeleev noticed a pattern of properties in elements arranged by increasing atomic mass.
- The periodic table includes each element's atomic number, symbol, name, and atomic mass.
- The properties of an element can be predicted from its location in the periodic table.

Vocabulary

- atomic mass
- periodic table
- chemical symbol
- period
- group

LESSON 3 Metals



- The physical properties of metals include luster, malleability, ductility, and conductivity.
- Metals are classified as alkali metals, alkaline

LESSON 4 Nonmetals and Metalloids

- In general, most nonmetals are poor conductors. Solid nonmetals tend to be dull and brittle.

LESSON 1 Introduction to Atoms

1. The atomic number of an element is determined by the number of

a. protons. **b.** electrons.
c. neutrons. **d.** isotopes.

2. Two isotopes of an element have the same number of protons but different numbers of neutrons.

3. **Relate Cause and Effect** How can an atom be electrically neutral when it contains particles that are charged?

The atom has equal numbers of positively charged protons and negatively charged electrons.

4. **Relate Evidence and Explanation** How did Rutherford's experimental evidence lead to the development of a new atomic model?

Rutherford's evidence suggested that an atom's positive charge was concentrated in a tiny region of the atom. In Rutherford's model, an atom is mostly empty space with a positively charged nucleus in the center.

6. The rows in the periodic table are called

a. groups. **b.** periods.

c. nonmetals. **d.** metals.

7. Dmitri Mendeleev constructed the first periodic table, which is an arrangement of elements showing the repeating pattern of their properties

8. Apply Concepts Below is an entry taken from the periodic table. Identify the type of information given by each labeled item.

A. atomic number
B. chemical symbol
C. name
D. atomic mass

9. Make Generalizations Why aren't the atomic masses of most elements whole numbers?

The atomic mass is an average mass based on the combined percentages of all the isotopes of an element.

11. Of the following, the group that contains elements that are the most reactive is the

a. alkali metals. **b.** alkaline earth metals.
c. carbon family. **d.** noble gases.

12. A property of metals is high thermal conductivity, which is the ability of an object to transfer heat.

13. Predict Using the periodic table, predict which element—potassium, aluminum, or iron—is most reactive. Explain your answer.

Potassium is most reactive. The metals in Group 1 are more reactive than other metals.

14. Unlike metals, solid nonmetals are

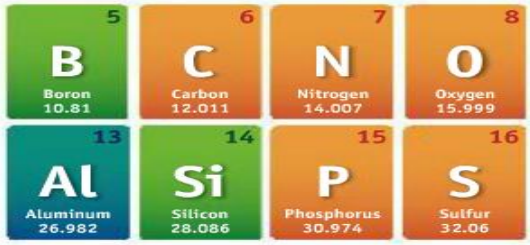
a. good conductors of heat and electric current.
b. malleable.
c. dull and brittle.
d. ductile.

15. Two elements that have properties similar to those of chlorine are Accept any two halogens (F, Br, I, and As).

16. **Infer** What property of the materials used in computer chips makes them useful as switches that turn electricity on and off?

The materials used in computer chips are semiconductors, which conduct electric current under some conditions and not under other conditions.

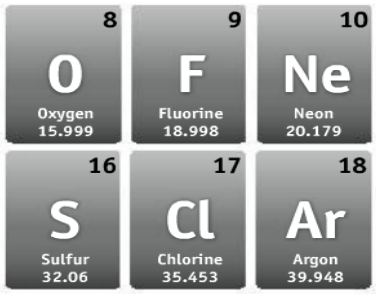
How is the periodic table organized?



21. A portion of the periodic table is shown above. Which element on the periodic table has properties that are most similar to those of nitrogen (N)? Explain.

Phosphorous would have properties most similar to nitrogen because it is in the same group. Elements in the same group have similar properties.

1. A portion of the periodic table is shown below.



Which elements are noble gases?

A oxygen, fluorine, and neon
B sulfur, chlorine, and argon
C fluorine and chlorine
D neon and argon

2. Why is the mass of a carbon atom greater than the total mass of its protons and electrons?

A The mass of a proton is greater than the mass of an electron.
B A proton is positively charged and an electron is negatively charged.
C Most of the atom's volume is the sphere-shaped cloud of electrons.
D The neutrons in the nucleus add mass to the atom.

3. Elements that are gases at room temperature are likely to be classified as which of the following?

A metals
B nonmetals
C metalloids
D semiconductors

4. Which property of aluminum makes it a suitable metal for soft-drink cans?

A It has good electrical conductivity.
B It can be hammered into a thin sheet (malleability).
C It can be drawn into long wires (ductility).
D It can reflect light (luster).

Element	Appearance	Reactivity	Conducts Electricity
A	Greenish-yellow gas	High	No
B	Shiny red solid	Moderate	Yes
C	Colorless gas	None	No
D	Silver-white solid	High	Yes

6. Identify each element as an alkali metal, transition metal, halogen, or noble gas. Explain your answers.