

3-9 What are the halogens and the noble gases?

Objectives

Locate the halogens and the noble gases on the periodic table. Identify the properties of the halogens and the noble gases.

Key Terms

halogens: elements that make up Group 17 in the periodic table

noble gases: elements that make up Group 18 in the periodic table

The Halogens Group 17 in the periodic table contains the five elements that make up the **halogens**. These elements—fluorine, chlorine, bromine, iodine, and astatine—have a similar atomic structure. The halogens can vary their physical states from solid to gas at room temperature. They can also change color when changing state. For example, bromine is a red-brown liquid that becomes a red gas at room temperature. Iodine is a gray-black solid that can become a blue-violet gas.

The halogens can also be quite dangerous. However, when they combine with other elements, they can form matter that is very useful. For example, chlorine combines with sodium to form table salt. Fluorine combines with other elements to form products that prevent tooth decay. Substances made with iodine can be used to help prevent infections. Figure 3-29 lists the halogens.

HALOGENS		
Element	Symbol	Uses
Fluorine	Fl	Prevents tooth decay
Chlorine	Cl	Purifies water
Bromine	Br	Used in photographic film
Iodine	I	Prevents infection
Astatine	At	Used in halogen lights

▲ Figure 3-29 The halogens can be found in Group 17 in the periodic table.

1 LIST: Name the five halogens.

The Noble Gases Look at Group 18 of the periodic table on page 67. What do the elements in Group 18 have in common? The six elements in the last group of the periodic table are gases. They are called the **noble gases**. All of these elements have similar properties and atomic structure.

In the past, these elements were also called inert gases. The word *inert* means “inactive.” At one time, these elements were thought to occur naturally as pure substances. Pure substances that occur naturally do not interact with other substances. However, scientists have discovered that noble gases can be forced to combine with other elements, such as fluorine.

2 DEFINE: What is a noble gas?

Familiar Noble Gases The six noble gases are helium, neon, argon, krypton, xenon, and radon. The names of some of the noble gases may be familiar to you. You have probably heard of helium and neon. If you have heard of kryptonite, krypton is not related to it. In fact, kryptonite, which is mentioned in fictional tales, is not a real substance. All the noble gases are found in small amounts in Earth’s atmosphere. Of all the noble gases, argon is the most plentiful. It makes up about 1% of the atmosphere. The names and chemical symbols of the six noble gases are listed in Figure 3-30.

NOBLE GASES		
Element	Symbol	Uses
Helium	He	Fills balloons
Neon	Ne	Lighting
Argon	Ar	Lighting
Krypton	Kr	Lighting
Xenon	Xe	Lighting
Radon	Rn	None

▲ Figure 3-30 The noble gases can be found in Group 18 in the periodic table.

3 LIST: Name the six noble gases.

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Lesson Review

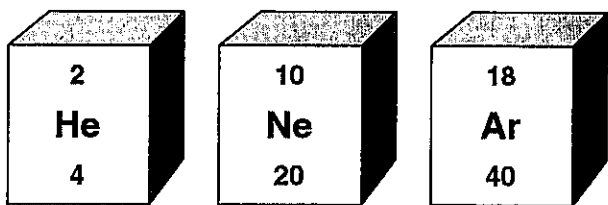
Write *true* if the statement is true. If the statement is false, change the underlined term to make the statement true. Write your answers in the spaces provided.

- _____ 1. Another name for the noble gases is the royal gases.
- _____ 2. The noble gases do not readily combine with other elements.
- _____ 3. The noble gases appear at the extreme left of the periodic table.
- _____ 4. The word *inert* means "active."
- _____ 5. The noble gas that is found in the largest percentage in Earth's atmosphere is helium.
- _____ 6. There are six noble gases.
- _____ 7. Helium is the gas used in photographic lamps.
- _____ 8. When electricity passes through neon, it gives off a bright red glow.

Skill Challenge

Skills: *interpreting a diagram, identifying*

The diagram below shows three squares from the periodic table. Refer to the diagram as you answer the questions.



1. What is the name of the middle element? _____
2. How many electrons does each element have? _____
3. How many electrons are in the first energy level for each element? _____
4. How many electrons are in the second energy level for each element? _____
5. How many electrons are in the third energy level for each element? _____
6. What do all three elements have in common? _____