

# 8th Grade Science



June 2021

Dear Belov**ED** Scholars,

I hope you are looking forward to an enjoyable summer. Attached you will find information and activities about Atomic Structure and the Periodic Table. The contents of the packet will provide you with the preparation and foundation for the 8th Grade Science curriculum. Your goal must be to master the concepts and vocabulary and retain them. You are responsible for completing the packet over the summer.

**Below is a list of what can be found in this packet:**

- **An Atom Apart Article and accompanying Questions and Crossword Puzzle worksheets**
- <https://drive.google.com/file/d/1X-vt5AXfuEcrtpxhfU596DWvvysgXrbK/view?usp=sharing>
- **An Atom Apart Questions Google Answer Form [An Atom Apart Article Answer Form](#)**
- **An Atom Apart Crossword Puzzle Google Answer Form [Crossword Puzzle Answer Form](#)**
- **Periodic Table Questions and the Periodic Table Vocabulary Worksheets [Worksheets](#)**
- **Lesson 2, Periodic Table Text [Lesson 2: The Periodic Table](#)**

Upon returning to school, your packet will be checked and graded for completion and count as your first homework grade. We will review the packet and an assessment will be given. We are going to have an exciting, challenging and fun year. I look forward to working with you all next year. I hope you have a great summer!

Best of luck to you all,

Mrs. Fields  
8th Grade Science

**Standards:**

**SEP.2:** Use models to predict and/or describe phenomena

**MS-PS1.1:** Use models to describe the atomic composition of simple molecules and extended structures.

**RST.6-8.1:** Cite specific textual evidence to support analysis of science and technical texts.

**RST.6-8.2:** Determine the central ideas or conclusions of a text.

Name: \_\_\_\_\_

# An Atom Apart

by Leslie Cargile

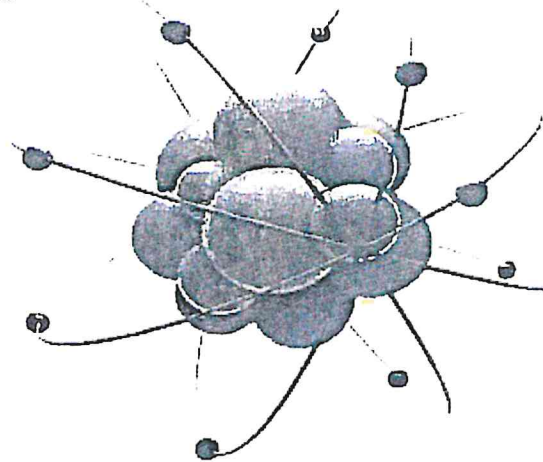
Have you ever walked through a cloud of gnats on a hot summer, only to have them follow you? No matter how you swat at them, or even if you run, they won't leave you alone. If so, then you have something in common with an atom.

Atoms are the building blocks of molecules, which when combined, make up everything. From the smallest one-celled amoeba, to every person who has ever lived, to the largest and brightest stars in the sky, atoms are everywhere.

Even way back in the time of ancient Greece, they wondered about atoms. That's where the word comes from, ancient Greece. The word *A'tomos*, when translated into English, means: *something that cannot be divided any further*. So what's an atom look like? Up until very recently no one could say one way or another.

Technically we can't see individual atoms, since there are no microscopes powerful enough. Since technology improves all the time, it may not be long before we can actually see a whole atom through a special microscope. Even though scientists cannot see atoms with microscopes, they have developed ways to detect them and learn about them.

Atoms are made up of three basic parts; protons, neutrons, and electrons. There is a core, or *nucleus*, and an electron cloud. The nucleus is made up of positively charged protons and neutral neutrons. The nucleus is held closely together by *electromagnetic force*.



Protons and neutrons make up the nucleus of the atom. A cloud of electrons orbits the nucleus.

The negatively charged electrons are bound to the nucleus, and zap around it in a cloud. Do you remember the cloud of gnats? The gnats would be the electrons zipping around you, the nucleus.

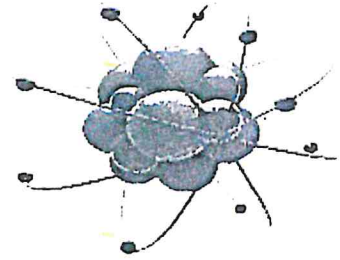
There are different ways atoms are classified. They can be classified into elements, like oxygen, carbon, or hydrogen. All of the elements known to man so far can be found on the periodic table. The number of protons an atom has decides the chemical element. The number of electrons defines the atom's chemical properties, like its melting temperature and boiling point.

The study of atoms and tiny particles that are even smaller is called quantum mechanics. Scientists still have much to learn about atoms. Maybe you will enter the study of quantum mechanics and find a brand new element. Maybe they'll even name it after you!

Name: \_\_\_\_\_

# An Atom Apart

by Leslie Cargile



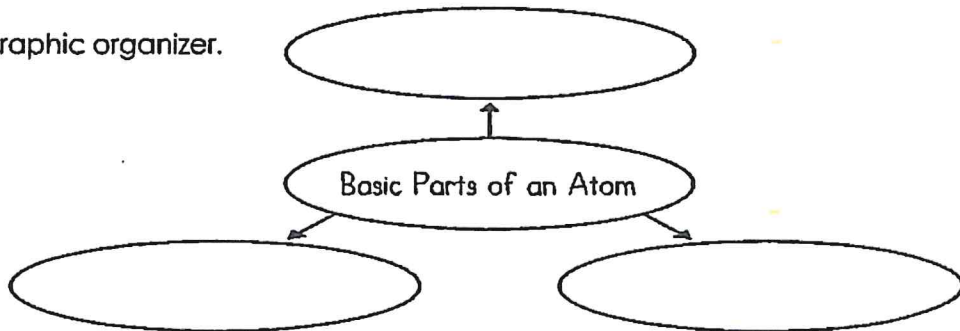
1. What are atoms?
  - a. tiny particles that make up all matter
  - b. tiny particles that can only be seen with a microscope
  - c. tiny particles that look like gnats
  - d. particles that are so large they cannot be seen

2. What does the word A'tomos mean in ancient Greece?

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3. Complete the graphic organizer.



4. What is quantum mechanics?

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5. If you wanted to find the chemical element of an atom, you would need to...

- |                                   |                                 |
|-----------------------------------|---------------------------------|
| a. know how many electrons it has | b. know how many protons it has |
| c. know its melting temperature   | d. see it with a microscope     |

6. The author begins this article by comparing a cloud of gnats to an atom. In this scenario, what do the gnats represent? What does the person walking through the gnats represent?

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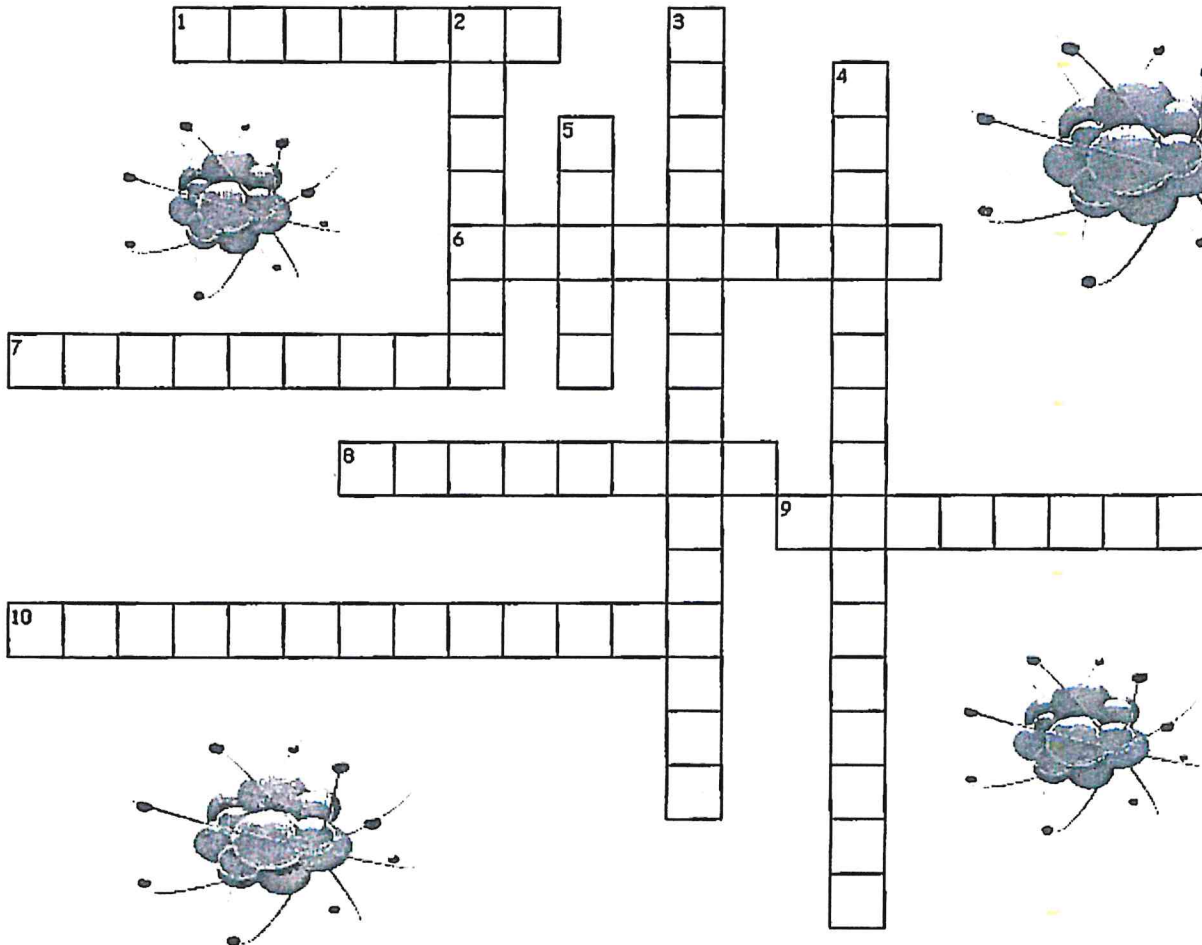
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**Something to Think About:** If you discovered a new element that was added to the periodic table, what would you name it?

Name: \_\_\_\_\_

# An Atom Apart

## Vocabulary Crossword



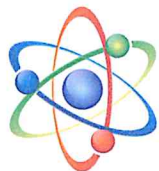
### Across

1. positively charged parts of an atom
6. negatively charged parts of an atom
7. atoms are the building blocks for...
8. the number of electrons in atoms determine an element's \_\_\_ properties
9. neutrally charged parts of an atom
10. a chart which lists all of the known elements

### Down

2. protons and neutrons are found in this part of an atom
3. type of force that holds the nucleus of an atom together
4. area of science that studies tiny particles like atoms
5. the word a'tomos comes from this language

Name \_\_\_\_\_ Class \_\_\_\_\_



Read LESSON 2, The Periodic Table to answer the following questions.

Who discovered the periodic table? \_\_\_\_\_

The modern periodic table is arranged in order of increasing \_\_\_\_\_

What is the Atomic Number, Chemical Symbol and Atomic Mass for Zinc?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Find the element identified by the atomic number 51 on the periodic table. Use the information to fill in the blanks below.

Name of element \_\_\_\_\_

Chemical symbol \_\_\_\_\_

Atomic mass \_\_\_\_\_

The horizontal rows in the periodic table are called \_\_\_\_\_

How many horizontal rows are there in the periodic table? \_\_\_\_\_

Where are metals located on the periodic table? \_\_\_\_\_

Name a metal and its atomic number \_\_\_\_\_

Where are nonmetals located on the periodic table? \_\_\_\_\_

Name a nonmetal and its element symbol \_\_\_\_\_

Where are metalloids located on the periodic table? \_\_\_\_\_

Name a nonmetal and its atomic mass \_\_\_\_\_

Which row on the periodic table would you find rare earth metals? \_\_\_\_\_

Which two elements are found in significant quantities in nature and are located in the Actinides series? \_\_\_\_\_

How many groups/families are in the periodic table? \_\_\_\_\_

What is the name of group 1? \_\_\_\_\_

Name an element in Group 1 \_\_\_\_\_

What is the name of group 2? \_\_\_\_\_

What is the element symbol for Magnesium? \_\_\_\_\_

What is the name of groups 3-12? \_\_\_\_\_

What is the name of group 13? \_\_\_\_\_

What is the name of group 14? \_\_\_\_\_

Name the nonmetal in group 14? \_\_\_\_\_

What is the name of group 15? \_\_\_\_\_

What is the name of group 16? \_\_\_\_\_



## Atomic Structure and The Periodic Table Vocabulary

### Word Bank:

Proton	Metals	Periodic table	Period
Neutron	Nucleus	Metalloids	Nonmetal
Electron	Atomic number	Group	

Directions: On the line, write the vocabulary word from the word bank that matches the definition.

\_\_\_\_\_ An atomic particle that is positively charged.

\_\_\_\_\_ An atomic particle that has no charge.

\_\_\_\_\_ The part of the atom that contains protons and neutrons.

\_\_\_\_\_ The atomic particle that is negatively charged and moves around the outside of the nucleus.

\_\_\_\_\_ The number of protons in an atom's nucleus, which serves to identify an atom.

\_\_\_\_\_ A table showing a repeating pattern of properties of the elements.

\_\_\_\_\_ The elements in a column of the periodic table.

\_\_\_\_\_ Each horizontal row in the periodic table.

\_\_\_\_\_ Elements that conduct electricity, heat well, and have a shiny appearance.

\_\_\_\_\_ The elements on the far right side of the periodic table that have properties opposite of metals.

\_\_\_\_\_ Elements that have properties of both metals and nonmetals.



# 2

# The Periodic Table

## Guiding Questions

- Why do elements need to be organized?
- How was the periodic table developed?
- What information about elements is provided by the periodic table?

## Connections

**Literacy** Determine Central Ideas

**Math** Sequence

MS-PS1-1

## Vocabulary

atomic mass  
 periodic table  
 chemical symbol  
 period  
 group

## Academic Vocabulary

representation



### VOCABULARY APP

Practice vocabulary on a mobile device.

## Quest CONNECTION

Find out what you can tell about an unknown substance by observing its physical properties.

## Connect It!

**Circle and label the different types of recyclable materials you see in Figure 1.**

**Apply Concepts** What things in your home do you sort and organize?

**Infer** What problems might it cause if a company tried to recycle materials without sorting them first?

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## Organizing the Elements

Do you organize things according to their properties? Are all of your books together in your locker? Are your clothes organized according to whether they are winter clothes or summer clothes? **Figure 1** shows how sorting recyclable materials puts them into groups that are all recycled the same way.

Organizing things usually makes them easier to use because you can better know their properties, or characteristics. Items grouped together are likely to have some properties that are similar.

Scientists also had a need to organize elements. By 1869, a total of 63 elements had been discovered. A few were gases. Two were liquids. Most were solid metals. Some reacted explosively as they formed compounds. Others reacted slowly. Scientists wondered whether the properties of elements followed a pattern. One of these scientists, Dmitri Mendeleev (men duh LAY ef), discovered a set of patterns that applies to all the elements.

### Organizing with a Purpose

**Figure 1** Recyclable items must be sorted into groups based on the properties of their materials.

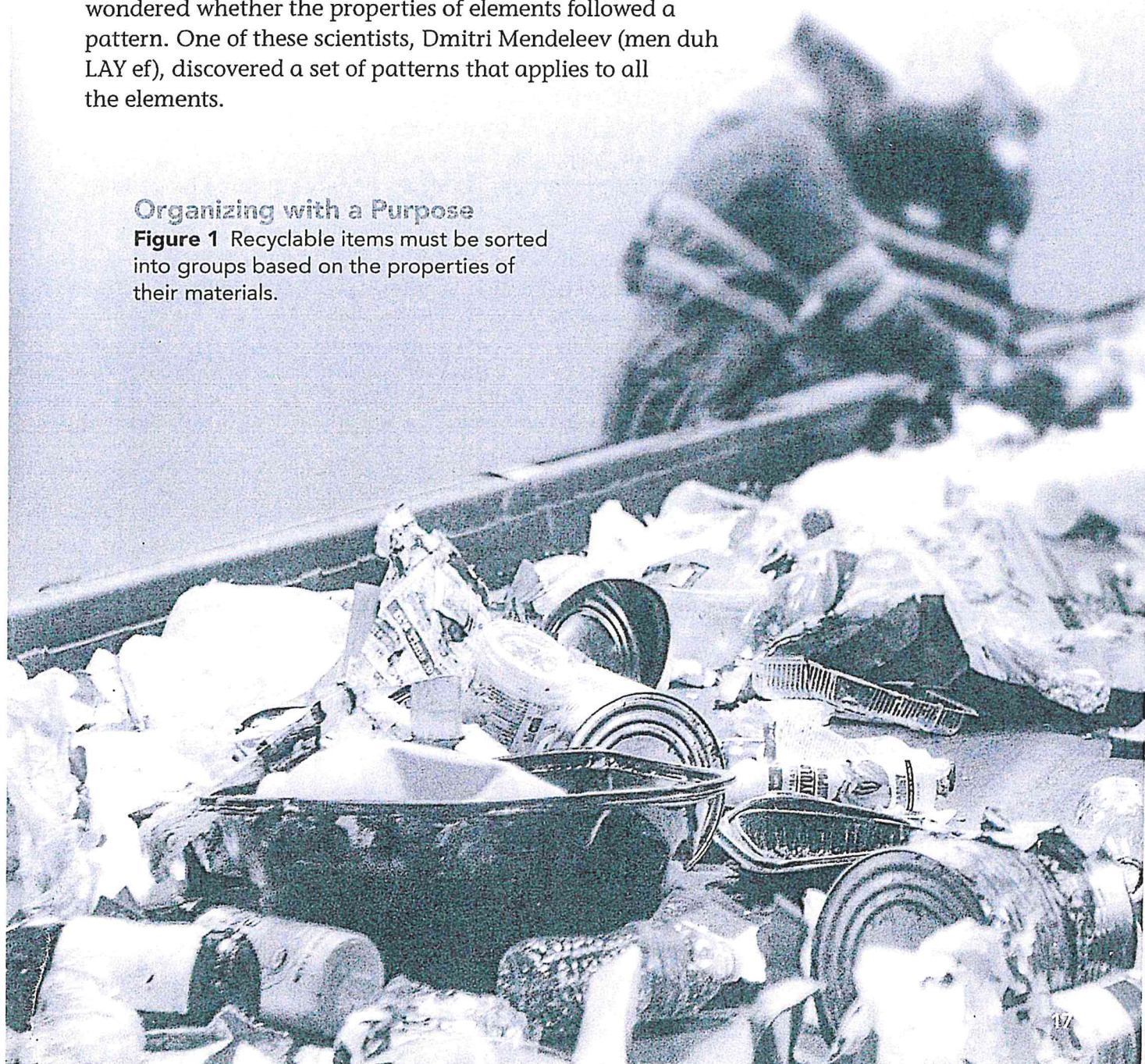
### HANDS-ON LAB

Begin investigating the organization of the periodic table.

### Literacy Connection

#### Determine Central Ideas

In the text, underline a reason that you might organize your DVDs into comedies, dramas, and action movies.





Bromine  
Chlorine  
Iodine

### Similar Properties

**Figure 2** At room temperature, chlorine is a gas, bromine is a liquid, and iodine is a solid. However, all three elements share some physical properties. They also have very similar chemical properties. They are grouped in the same column on the periodic table. What common property do you observe?

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.....



Watch a video to observe patterns in daily life as they relate to the periodic table.

**Mendeleev's Work** Mendeleev knew that some elements had similar chemical and physical properties. For example, silver and copper are both shiny metals. Mendeleev thought these similarities were important clues to a hidden pattern. To find that pattern, Mendeleev noted each element's melting point, density, and color. He also included the element's atomic mass.

As you read in the previous lesson, scientists use atomic mass units (amu) to determine the mass of an element. An element's **atomic mass** is the average mass of all the isotopes of that element. Mendeleev noticed that a pattern of properties appeared when he arranged the elements in order of increasing atomic mass. He found that the pattern of the properties repeated regularly.

**The Periodic Table** The **periodic table** is a chart showing all of the elements arranged according to the repeating pattern of their properties. (The word *periodic* means "in a regular, repeated pattern.") Mendeleev created the first periodic table in 1869. He arranged his table according to each element's atomic mass. **Figure 2** shows three elements that have similar properties and were, therefore, grouped together.

In his periodic table, Mendeleev also left blank spaces. He predicted that the blank spaces would be filled by elements that had not yet been discovered. He even correctly predicted the properties of some of those new elements.

Mendeleev's table has indeed changed over time, as scientists discovered new elements and learned more about atomic structure. We now know that the number of protons in an atom's nucleus, indicated by the atomic number, is related to the chemical properties of an element. Therefore, modern periodic tables are arranged in order of increasing atomic number instead of by increasing atomic mass.

**READING CHECK** **Explain** How is the modern periodic table different from Mendeleev's periodic table?

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.....  
.....  
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# Using the Periodic Table

The periodic table contains information about each of the known elements. It includes the name of each element, its atomic number, and its atomic mass. It also includes its **chemical symbol**. This symbol is a one- or two-letter abbreviation for the element. **Figure 3** shows the **representation** of the element phosphorus on the periodic table.

Look at the periodic table in **Figure 4** on the next two pages. Notice that the atomic numbers increase from left to right. Also notice that each color-coded region corresponds to a different class of elements—metals, nonmetals, and metalloids.

## Academic Vocabulary

How are a symbol and a model both examples of a representation?


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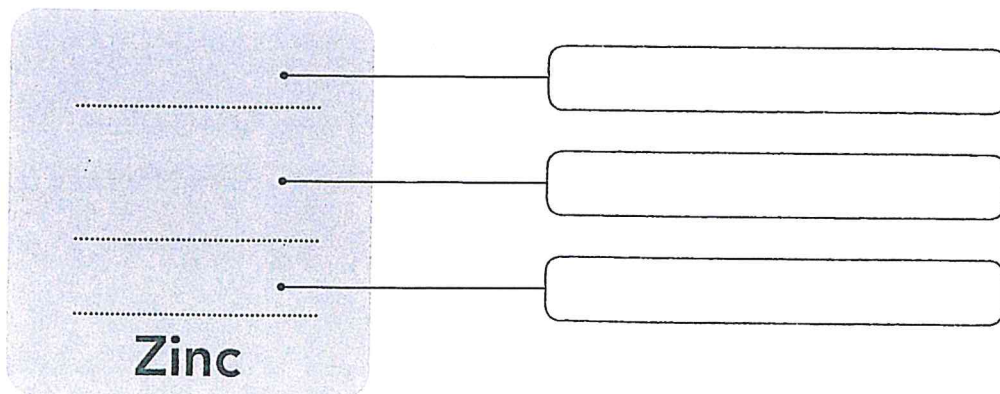
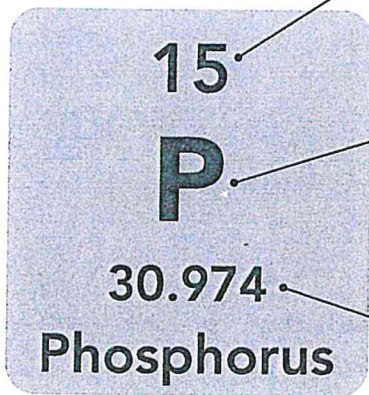
## Information in Each Cell

**Figure 3**  The periodic table contains one cell for each of the known elements. Each cell provides certain information about the element represented. Study the information shown for the element phosphorus. Then, using **Figure 4**, fill in the information for the element zinc on the cell shown, and label each piece of information.

**Atomic Number** One piece of information is the atomic number of the element, shown at the top of each cell. For phosphorus, that number is 15. Every phosphorus atom has 15 protons in its nucleus.

**Chemical Symbol** In the center of each cell is the chemical symbol for the element. A permanent chemical symbol contains either one or two letters. For phosphorus, that letter is "P." Chemical symbols with three letters are temporary and are used until permanent names are assigned to the elements.

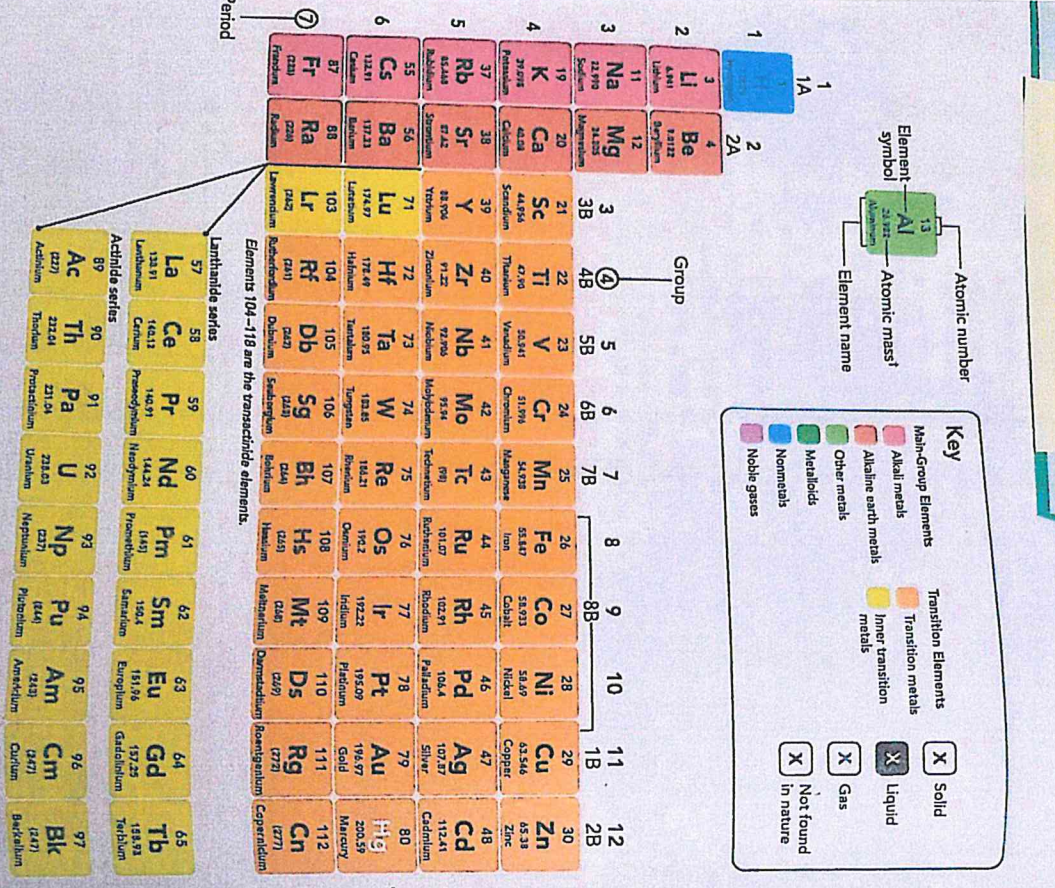
**Atomic Mass** At the bottom of each cell is the average atomic mass of the element. For phosphorus, this value is 30.974 amu (atomic mass units). The atomic mass is an average because most elements consist of a mixture of isotopes.



# Figure 4

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Figure 4 1  
tools: Find  
the period  
Name of  
Chemical  
Atomic m



The atomic masses in parentheses are the mass numbers of the longest-lived isotope of elements for which a standard atomic mass cannot be defined.

13	14	15	16	17	18
3A	4A	5A	6A	7A	8A
13	14	15	16	17	18
Al	Si	P	S	Cl	Ar
26.982	28.086	30.974	32.06	35.45	39.948
Aluminum	Silicon	Phosphorus	Sulfur	Chlorine	Argon
31	32	33	34	35	36
Ga	Ge	As	Se	Br	Kr
69.723	72.64	74.922	78.96	79.904	83.80
Gallium	Germanium	Arsenic	Selenium	Bromine	Krypton
49	50	51	52	53	54
In	Sn	Sb	Te	I	Xe
114.818	118.710	121.757	127.6	126.905	131.29
Indium	Tin	Antimony	Tellurium	Iodine	Xenon
81	82	83	84	85	86
Tl	Pb	Bi	Po	At	Rn
204.387	207.2	208.980	(209)	(210)	(222)
Thallium	Lead	Bismuth	Polonium	Astatine	Radon
113	114	115	116	117	118
Nh	Fl	Mc	Lv	Ts	Og
(113)	(114)	(115)	(116)	(117)	(118)
Nihonium	Flerovium	Moscovium	Livermorium	Tennessine	Oganesson

## Math Toolbox

### Applying the Periodic Table

The order of elements on the periodic table enables scientists to predict properties about the elements. Answer these questions about the periodic table?

- Use Tables** What is the difference of the atomic masses of the heaviest and lightest elements in the table?
- Sequence** Examine the periodic table. Which four pairs of elements would be reversed in order if the elements were listed by increasing atomic mass instead increasing atomic number?

**3. Predict** When Mendeleev developed periodic table, the element gallium had yet been discovered. Without looking at periodic table on this page, examine the elements surrounding gallium in the diagram below, and predict the atomic number, atomic mass for this element. How do prediction match the actual atomic number and atomic mass for gallium on the periodic table?

13	14	32
Al	Si	Ge
26.982	28.086	72.64
Aluminum	Silicon	Germanium
30	32	50
Zn	Ga	In
65.38	69.723	114.818
Zinc	Gallium	Indium
48	49	112.409
Cd	In	Tl
112.411	114.818	204.387
Cadmium	Indium	Thallium

Atoms and the Periodic Table




## INTERACTIVITY

Explore how atomic mass and other properties of elements determine the organization of the periodic table.

.....  
**La**  
.....

## Lanthanum

### Uses of Lanthanum

**Figure 5**  Lanthanum (La), like other lanthanides, is a soft, shiny metal. This lanthanide is a major component in batteries for hybrid cars and in permanent magnets. Label the lanthanum cell with the atomic number and atomic mass.



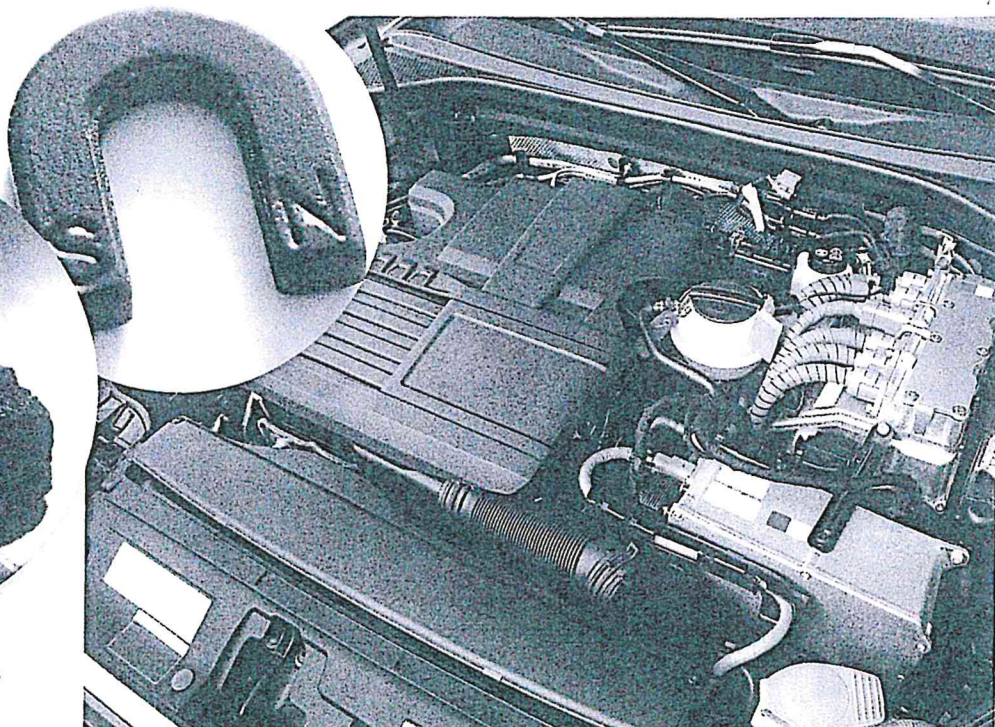
## Periods in the Periodic Table

The rows in the periodic table are known as periods. Each **period** contains a series of different elements. Look at the period numbers on the left side of the periodic table in **Figure 4**. As you look from left to right across a period, you will notice that the properties of the elements change in a pattern. Metals are shown on the left of the table, and nonmetals are located on the right. Metalloids are found between the metals and nonmetals. This pattern is repeated in each period. An element's properties can be predicted by its location in the periodic table. This predictability is one reason that the periodic table is so useful to chemists.

**Lanthanides and Actinides** Under the bottom row of the main part of the periodic table, you can see two additional rows standing alone. These rows are placed off the table to save space and to make the rest of the table easier to read. Follow the line on **Figure 4** to see how these rows fit in the table.

The elements in the top row are the lanthanides. These elements are all found in nature and are sometimes called the "rare earth metals." The most commonly known element in this series is lanthanum (La), for which the series is named. Some uses for lanthanum are shown in **Figure 5**.

Under the lanthanides are the actinides. Uranium and thorium are the only two actinides that are found in significant quantities in nature. Most other actinides are not found in nature, but are made artificially in laboratories. One characteristic that all actinides have in common is that they are radioactive.



**Transuranium Elements** The elements that come after uranium (U) in the periodic table are known as transuranium elements. None of these elements is stable, and each of them decays radioactively into other elements. With the exception of small traces of neptunium and plutonium, these elements are not found in nature. They are made in a laboratory when nuclear particles are forced to crash into one another.

Scientists use particle accelerators to make atomic nuclei move at extremely high speeds. If these nuclei crash into the nuclei of other elements with enough energy, the particles can combine into a single nucleus.

In general, the higher the atomic number, the more difficult it is to synthesize new elements. So, this process has taken place only as more powerful particle accelerators have been built. Some of these newly discovered elements do not yet have permanent names or symbols. In the future, scientists around the world will agree on permanent names and symbols for these elements.



**VIDEO**

See how art and science can come together in the work of an artist.

## Question It !

### Temporary Element Names

Until scientists assign permanent names to newly discovered elements, the elements are assigned temporary names based on their atomic number. Each digit in the atomic number is assigned the root name for that digit. Then the suffix *-ium* is added to the end of the name. For example, before element 116 got its permanent name, it was called ununhexium from the roots for the digits 1, 1, and 6, followed by the suffix *-ium*.

**SEP Interpret Data** Imagine that three new elements are discovered, and they need temporary names. Use the information in the table to name the yet-undiscovered elements with these atomic numbers. Then, write the three-letter chemical symbol for the element.

digit	root	symbol
0	nil	n
1	un	u
2	bi	b
3	tri	t
4	quad	q
5	pent	p
6	hex	h
7	sept	s
8	oct	o
9	en	e

**Element 119** .....

**Element 120** .....

**Element 121** .....

## HANDS-ON LAB



**Investigate** Practice arranging and classifying elements in the periodic table.

# Groups in the Periodic Table

The modern periodic table has seven periods, each of which follows a pattern. Because the pattern of properties repeats in each period, these patterns can be used to classify elements that have similar characteristics into a specific **group**, or family. There are 18 columns in the table, and so there are 18 groups.

**Groups Containing Metals** If you examine the periodic table, you can see that metals make up most of the elements. At least one metal is found in every group except Group 18. See **Figure 6** to examine some of the groups that contain metals.

## The Metal Groups

**Figure 6** The groups shaded on the periodic table below contain the alkali metals, the alkaline earth metals, and the transition metals. Next to each element's name and image, fill in its chemical symbol.

Lithium .....

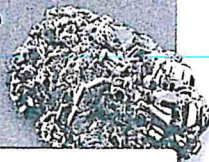
### Alkali Metals

The metals of Group 1, from lithium (Li) to francium (Fr), are called the alkali metals. Alkali metals are so reactive that they are never found as free elements in nature. They are found only in compounds. Some of the alkali metals are shiny and so soft you can cut them with a plastic knife.



### Alkaline Earth Metals

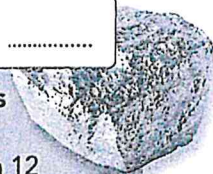
The metals of Group 2 are called the alkaline earth metals. These metals are harder and denser, and they melt at higher temperatures than the alkali metals. Alkaline earth metals are very reactive, though not as reactive as the alkali metals. These metals are also never found uncombined in nature.



Gold .....

### Transition Metals

The elements in Groups 3 through 12 are called the transition metals. They include iron, copper, nickel, gold, and silver. Most of these metals are hard and shiny solids with high melting points. Most are good conductors of heat and electric current. Some transition metals (like gold) can be found in their elemental forms in nature.



Magnesium .....

	1																18
1																	
2																	
3			3	4	5	6	7	8	9	10	11	12					
4																	
5																	
6																	
7																	



## Groups Containing Metalloids and Nonmetals

Look back at the periodic table. There are nonmetals in Group 1 and in Groups 14 through 18. Examine **Figure 7**, which shows some groups that contain nonmetals (groups 13 through 16). These groups also contain metalloids, which have some properties of metals and some properties of nonmetals.



### INTERACTIVITY

Analyze, identify, and classify elements based on their properties.

### Groups with Metalloids and Nonmetals

**Figure 7** ✎ The groups shaded on the periodic table below contain metals, metalloids, and nonmetals. Write the chemical symbols of the representative elements next to each photo.

Carbon .....



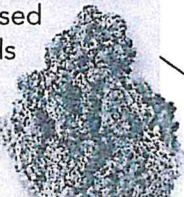
**The Carbon Family** In Group 14, only carbon is a nonmetal, and silicon and germanium are metalloids. Carbon plays an especially important role in the chemistry of life. Proteins, DNA, and fats all contain carbon.

Sulfur .....



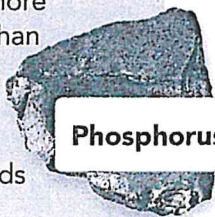
**The Oxygen Family** Group 16 contains three nonmetals—oxygen, sulfur, and selenium—and two metalloids—tellurium and polonium. Oxygen is a gas at room temperature, whereas sulfur and selenium are both solids.

**The Boron Family** Group 13 contains the metalloid boron, followed by post-transition metals. Boron is used in materials of high strength and light weight, such as fiberglass.



Boron .....

**The Nitrogen Family** Group 15 contains two nonmetals—nitrogen and phosphorus—and two metalloids—arsenic and antimony. Nitrogen makes up about 78 percent of Earth's atmosphere. Phosphorus, which is much more reactive than nitrogen, is always found in compounds in nature.



Phosphorus .....

	1																		18
1		2											13	14	15	16	17		
2																			
3			3	4	5	6	7	8	9	10	11	12							
4																			
5																			
6																			
7																			

**Reflect** How is the periodic table helpful to you? In your science notebook, describe one or two ways the periodic table might help you, and explain how.

**Halogens, Noble Gases, and Hydrogen** The shaded areas in **Figure 8** contain the halogens, the noble gases, and hydrogen. Halogens are the most reactive nonmetals, while noble gases are the least reactive nonmetals. Hydrogen is a nonmetal that does not fall into a family because its chemical properties are very different from other elements. It is the simplest element, containing only one proton and one electron.

**READING CHECK Determine Central Ideas** What do alkali metals and alkaline earth metals have in common? How are they different?

.....

.....

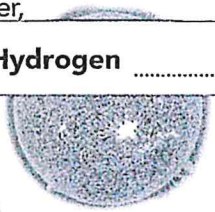
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### The Remaining Elements

**Figure 8** Next to each photo, write the appropriate symbol of the element representing each group.

**Hydrogen** Alone in the upper left corner of the periodic table is hydrogen—the element with the simplest atoms. Hydrogen is rarely found on Earth as a pure element, because most of it is combined with oxygen in water. However, much of the sun is composed of hydrogen.

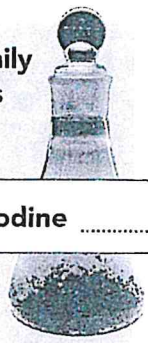
**Hydrogen** .....



### The Halogen Family

Group 17 contains the nonmetals fluorine, chlorine, bromine, and iodine. These elements are also known as the halogens, which means “salt-forming.” Most of the properties of astatine, another element in the group, are unknown because it is extremely rare.

**Iodine** .....



### The Noble Gases

The elements in Group 18 are known as the noble gases. They do not ordinarily form compounds. Even so, scientists have been able to synthesize some noble gas compounds in laboratories. One common element in this group, helium, is used to inflate balloons and make them float.

**Helium** .....

