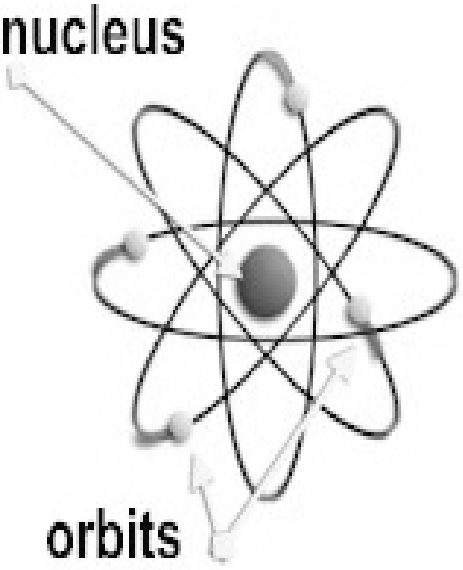
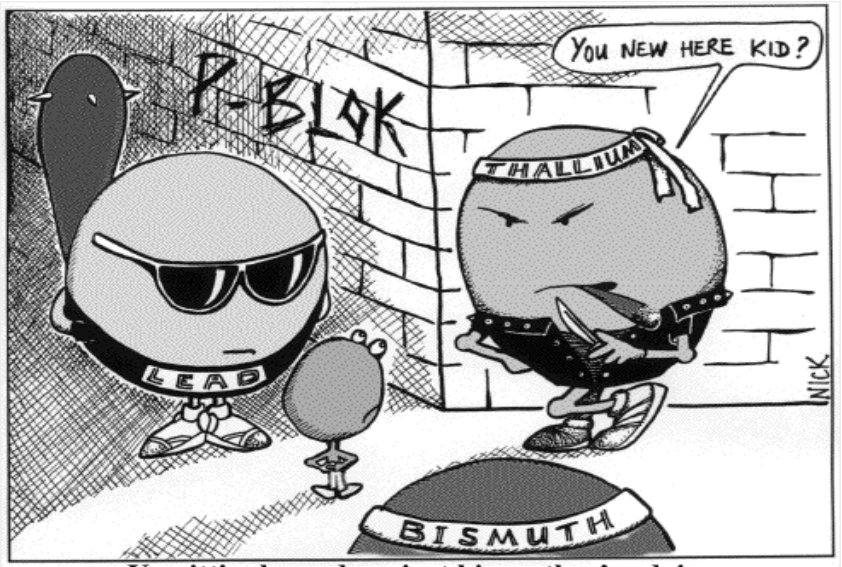
Physical Science Unit 4



The Atom & Periodic Table



Unwittingly, and against his mother's advice, Vince the first-row transition metal had been lured far away from home, and now found himself surrounded by heavier elements of the P-block.

Unit 4 Overall Goals:

Understand and apply knowledge of the structure of atoms.
Understand and apply knowledge of the structure and properties of matter.

After completing this unit, you should be able to understand and explain the following.

1. Know the basic structure of the atom and terms related: proton, neutron, electron, nucleus, electron level (cloud), etc.

2. Identify atoms and ions by mass number, atomic number, charge, number of electrons, protons, and neutrons.

3. Define isotope.

4. Define periodicity and be able to explain how it relates to the periodic table.

5. Understand the principles used to structure the periodic table.

6. Know the name of the scientist who is accredited with creating the periodic table.

7. Understand and know the common names and terms related to the periodic table of elements (ex: family, group, period, metalloid, etc).

8. Know the terms and properties related to metals, non-metals, and metalloids.

9. Know the term valence electrons and determine the number of valence electrons by using the periodic table.

10. Be able to write the Lewis dot structure for the elements based on their location on the periodic table.

11. Know the major families on the periodic table and the trends they follow.

Chapter 4 Section 1 Reading Guide

Use pages 102-108 to help you answer the following questions.

1. What is an atom?

2. What are the three parts of the atom?

3. Complete the following table regarding the 3 parts that you named above.

Name of Part	**Charge**	**Mass**	**Location**

4. What is always the same as the number of protons in the nucleus of an atom?

5. What is an isotope? How are these different from other atoms of the same element?

6. Why do atoms have no electric charge even though most of the individual particles have a charge?

Chapter 4 Section 2 Reading Guide

Use pages 109-117 to help you answer the following questions.

1. What is the tool that is used to organize the different elements?

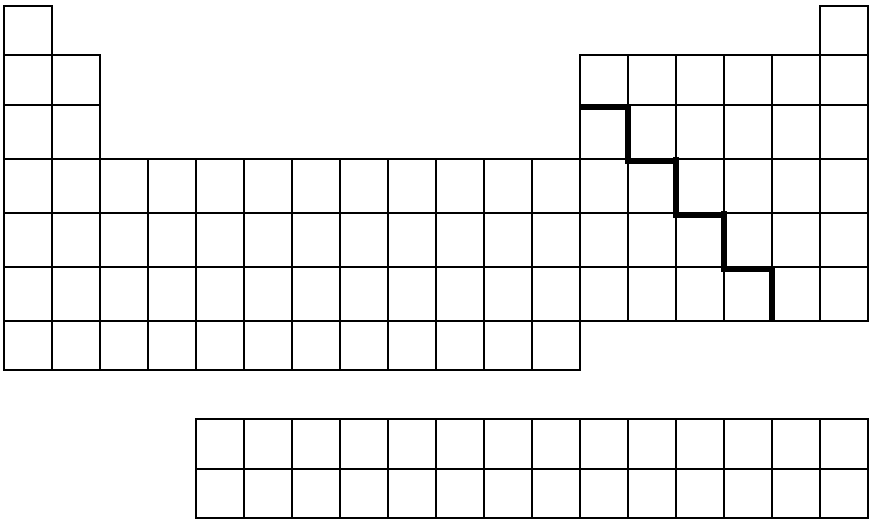
2. Who invented the original periodic table? How was his table different from the 'modern' or current Periodic Table?

3. What is 'atomic mass'?

4. How is atomic mass related to how the elements are arranged on the Periodic Table?

5. What are 3 things that you can find out about an element by looking in a square on the Periodic Table?

6. Label the Periodic Table below by drawing two arrows to represent the terms 'period' and 'group'. Then, color the metals blue, the nonmetals green, and the metalloids yellow.



Chapter 4 Section 3 Reading Guide

Use pages 118-125 to help you answer the following questions.

1. What is a metal?

2. What are the physical properties of a metal?

3. What are the chemical properties of a metal?

4. Complete the following table for each of the specific groups of metals:

Name of Group	**Group #**	**Example #1**	**Example #2**	**One Interesting Fact**

Chapter 4 Section 4 Reading Guide

Use pages 128-135 to help you answer the following questions.

1. What is a nonmetal?

2. What are three physical properties of most nonmetals?

3. What are two chemical properties of most nonmetals?

4. Complete the following table for each of the specific groups of metals:

Name of Group	**Group #**	**Example #1**	**Example #2**	**One Interesting Fact**

5. What is a metalloid? Where are they located on the Periodic Table?

Bill Nye "Atoms" Video

1. What are things made of?

_____

2. What pieces are "unbreakapartable"?

_____

3. Where are the heavy particles of an atom located?

_____

4. What two particles are in the nucleus of an atom?

_____

5. How far are the electrons from the nucleus of the 'properly proportioned model of science'?

_____

6. If atoms are like letters, what are like words?

_____

7. How many hydrogens are in water? How many oxygens?

_____

8. What elements are in dynamite?

_____

9. What are inside of protons and neutrons?

_____

10. What is the big pile of Carbon by Bill's feet?

_____

11. What are 3 interesting things that you learned/heard about during the video?

1. _____

_____

2. _____

_____

3. _____

_____

Parts of An Atom Computer Simulation

Directions: go to the website http://www.colorado.edu/physics/2000/applets/a2.html

*a. Make sure that you are on **David's Whizzy Periodic Table**.*
*b. Once there, click on **Hydrogen (H).***
*c. Choose the **Nuclear View***

You will be completing the follow chart as you search this website.

Color Particle	Name	Charge
Red		
Black		
Yellow & Pink		

1. What does the red particle represent? Fill in the red particle row in the chart above.

2. What charge does the red particle have? _____

3. How many are there in Hydrogen? _____

*Now click on the **Shell View**.*

1. What does the pink particle represent? Fill in the pink particle row in the chart above.

2. What charge does it have? _____

3. How many are there? _____

*Now choose **Neon**, and choose the **Nucleus View.***

4. What do the black particles represent? Fill in the black particle row in the chart above.
5. How many red particle are there in Neon? _____

6. What is Neon's atomic number? _____

*Now choose **Shell View.***

7. How many pink and yellow particles are there in Neon? _____

8. How many pink particles are in the first shell of Neon? _____

9. How many yellow particles are in the second shell of Neon? _____

10. How much Neon would $100.00 get you? _____

11. What is Neon used for? _____

*Now choose **Beryllium**, and choose the **Nucleus View.***

12. How many black particles are there in Beryllium? _____

13. How many red particles are there in Beryllium? _____

*Now chose the **Shell View**.*

14. How many pink and yellow particles are there in Beryllium? _____

15. What is Beryllium's atomic number? _____

16. How many protons does Beryllium have in its nucleus? _____

17. How many electrons does Beryllium have in its shell? _____

18. How many electrons are in the first energy level in Beryllium? _____

19. How many electrons are in the second energy level in Beryllium? _____

20. How much Beryllium could you buy with $100? _____

21. What is Beryllium used to make? _____

Atomic Numbers Practice #1

There are three subatomic particles. Protons, neutrons, and electrons.

1. Which of these have substantial mass? _____

2. Which of these have electromagnetic charge? _____

For this page, ASSUME CHARGE IS ZERO.

Name	Symbol	Atomic #	Mass #	Protons	Neutrons	Electrons	Charge
Lithium-7							0
Lithium-9							0
Phosphorus-31							0
Oxygen-16							0
Boron-11							0
Sodium-23							0
Nitrogen-14							0
Aluminum-27							0
Argon-40							0
Argon-39							0
Argon-38							0
Magnesium-24							0
Sulfur-33							0
Phosphorus-34							0
Carbon-14							0
Beryllium-9							0
	Ba		136				0
		22	41				0
		26			50		0
					44	32	0
	Al				14		0
		15	30				0

Cooperative Review

Alternate turns with you partners using different colored pencils. Work left to right, filling in the missing information. While your partners work, coach them to ensure the right answer.

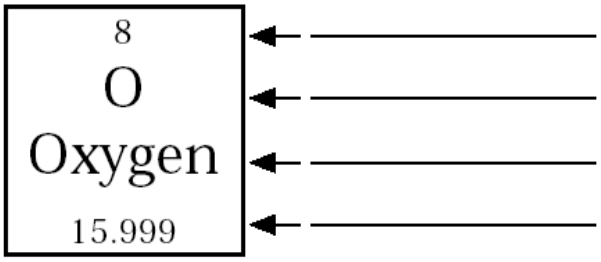
Name	Protons	Electrons	Neutrons	Mass
Hydrogen				**2**
	7		**9**	
		6		**14**
Phosphorus			**16**	
	28			**59**
		12	**12**	
Iron				**56**
	26		**29**	
		17		**35**
Lithium			**4**	
	82			**207**
		79	**120**	

Elements Pairs Check

Directions: For each element, find the requested information using your periodic table. After you have answered the question, your partner is to check your answer and either praise or correct the answer. Then, exchange roles.

Partner A: _____ __Partner: B: _____

1. How many protons are in the element aluminum? _____	2. How many protons are in the element zinc? _____
3. How many electrons are in the element calcium? _____	4. How many electrons are in the element lead? _____
5. What is the atomic mass of the element silver? _____	6. What is the atomic mass of the element fluorine? _____
7. How many neutrons are in an atom of sodium? _____	8. How many neutrons are in an atom of sulphur? _____
9. Using the following information, how many neutrons are in this atom? Is it an isotope? *Aluminum-27* _____	10. Using the following information, how many neutrons are in this atom? Is it an isotope? *Carbon-24* _____

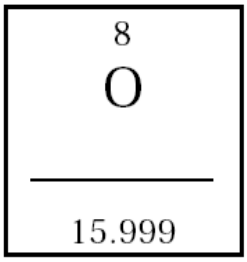


Atomic number equals the number of

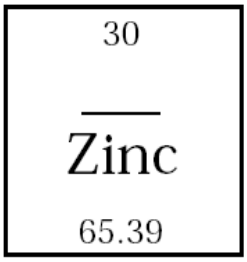
_____ **or** _____

Atomic mass equals the number of

_____ + _____



Atomic # = _____
Atomic Mass = _____
# of Protons = _____
# of Neutrons = _____
# of Electrons = _____



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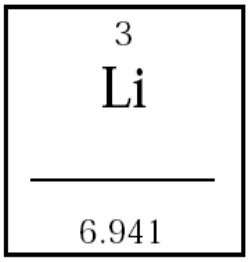
Atomic Mass = _____
# of Protons = _____
# of Neutrons = _____
# of Electrons = _____



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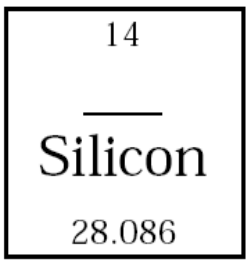
Atomic Mass = _____
# of Protons = _____
# of Neutrons = _____
# of Electrons = _____



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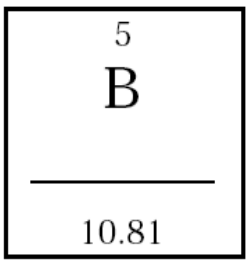
Atomic Mass = _____
# of Protons = _____
# of Neutrons = _____
# of Electrons = _____



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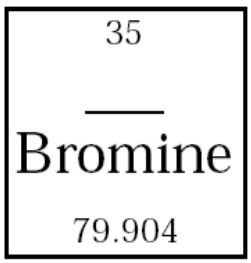
# of Neutrons = _____
# of Electrons = _____



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Atomic Mass = _____
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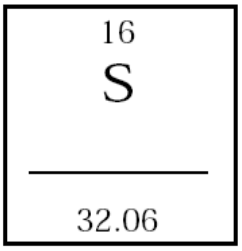
# of Neutrons = _____
# of Electrons = _____



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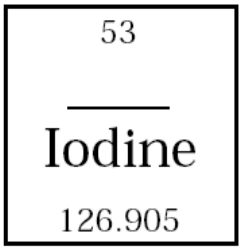
Atomic Mass = _____
# of Protons = _____
# of Neutrons = _____
# of Electrons = _____



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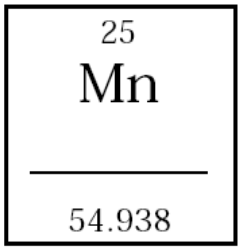
Atomic Mass = _____
# of Protons = _____
# of Neutrons = _____
# of Electrons = _____



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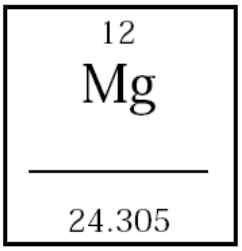
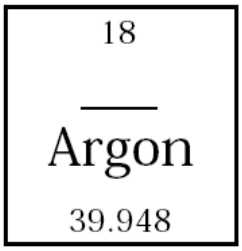
Atomic Mass = _____
# of Protons = _____
# of Neutrons = _____
# of Electrons = _____



Atomic # = _____
Atomic Mass = _____
# of Protons = _____
# of Neutrons = _____
# of Electrons = _____



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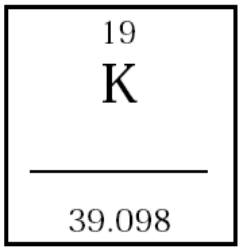

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# of Neutrons = _____
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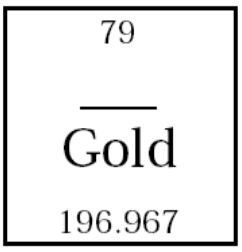

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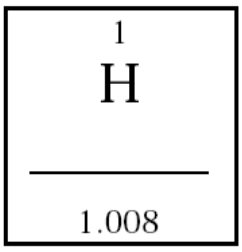

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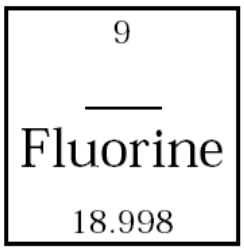

Atomic # = _____
Atomic Mass = _____
# of Protons = _____
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# of Electrons = _____

The Organization of the Periodic Table

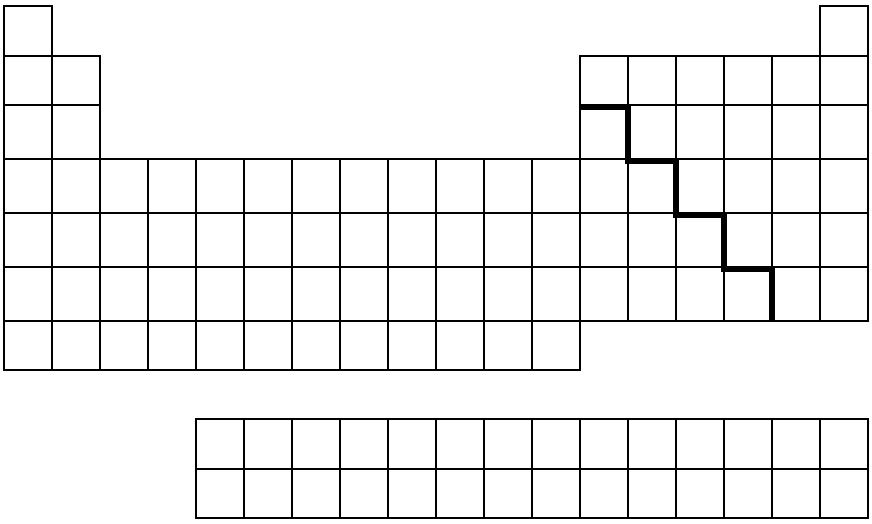
The Periodic Table is organized in several different ways. Consider the meaning of the word periodic. It literally means (according to Webster) "occurring at repeating regular intervals." This is an important definition. Many characteristics of the elements in the table are periodic. They have noticeable trends that repeat at regular intervals. After today you will begin to understand some of the intricacies of the Periodic Table and the valuable information it shows.

DIRECTIONS: Read each of the following sections. The information contained within them is very important. Then follow the directions for coloring and labeling a periodic table. You should do all colors and labels on the same sheet. Make a key on your table also.

I. Division of the Periodic Table into Metals, Non-metals, and Metalloids

The dark stair-step line you see on most periodic tables is what separates the metals and non-metals. All elements to the left of the line are considered metals (with the exception of Hydrogen) and all elements to the right are non-metals. The elements whose boxes actually touch the line are called metalloids. These elements can behave as a metal or a non-metal in certain compounds. The metalloids typically obey the stair-step rule however. For example, Aluminum is technically a metalloid, but in almost all cases it reacts chemically like a metal would. The elements at the bottom that are not connected to the periodic table are also considered to be metals.

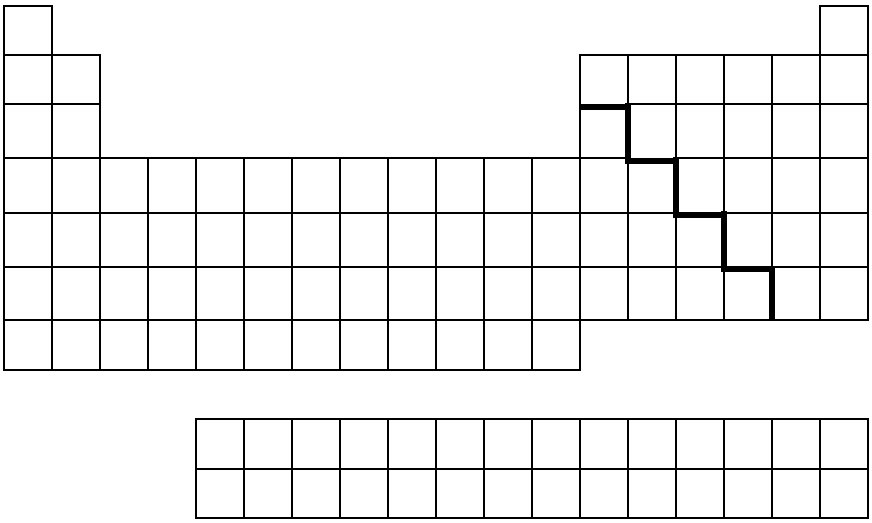
COLOR: *Shade the metalloids yellow. Shade the non-metals blue. Put blue stripes in metalloids that act more like non-metals.*



II. Division of the Periodic Table into Representative Metals, Transition Metals and Rare Earth Metals

At the left of the periodic table, two columns are taller than the others. These metals are very important because they show the trends of how almost all metals react chemically. For this reason, they are called the representative metals because they "represent" the major characteristics of all metals. The center of the periodic table (the short columns) also consists of metals. These are called the transition metals: they make the transition between the metals and non-metals. The metals in columns 13, 14, 15, and 16 below the stair-step line can also be considered transition metals. Finally at the bottom of the table there are two rows which are disconnected. These elements are referred to as the Rare Earth Metals. The elements in this group are found in very low numbers on earth. Some do not even occur naturally. These elements behave differently than the representative metals and the transition metals. You will notice that the numbers do fit into the regular table in two spots, but with this modification, the table is too large to fit on a page. The top row of the rare earth metals is called the Lanthanide Series because the first element in the row is Lanthanum. The lower row of the rare earth metals is called the Actinide Series because the first element in the row is Actinium.

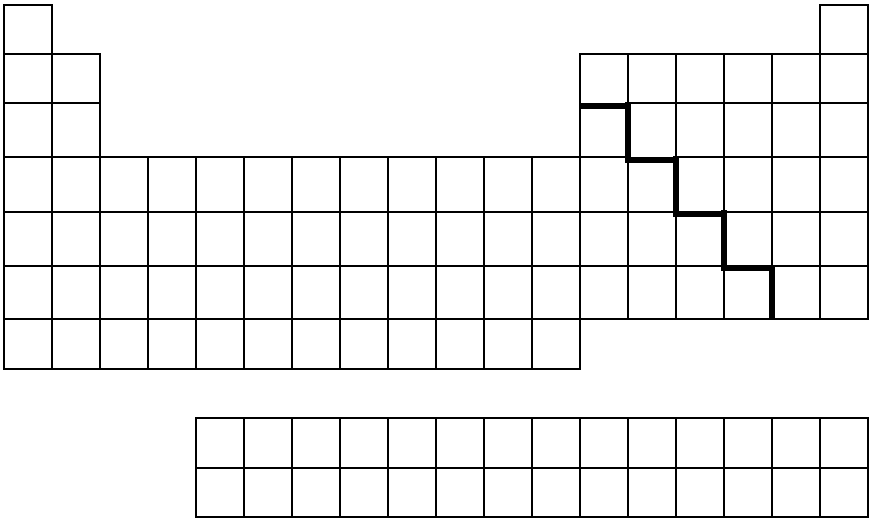
COLOR: *Shade the representative metals red. Shade the transition metals orange. Shade the Rare Earth Metals blue. Shade the metalloids yellow, but draw orange stripes in the metalloids that act more like metals (those BELOW the staircase line).*



III. Division of the Periodic Table into Periods

This is a very important way to think about the arrangement of the elements. Remember Bohr's discovery that the electrons in the atom have various energy levels that they can be found on? Well, the rows of the periodic table, called the periods, show the different energy levels for the elements. ROWS (PERIODS) GO ACROSS. Energy level 1 can only have 2 electrons, right? Well there are only two elements in this row, H and He. The second energy level can have 8 electrons, and so eight more elements will fit in the period. The third energy level and beyond have some less intuitive patterns that we will not discuss in this class, but the periodic table helps us understand them. The periods in the periodic table are an important organizational tool for helping people understand the energy levels of the electrons.

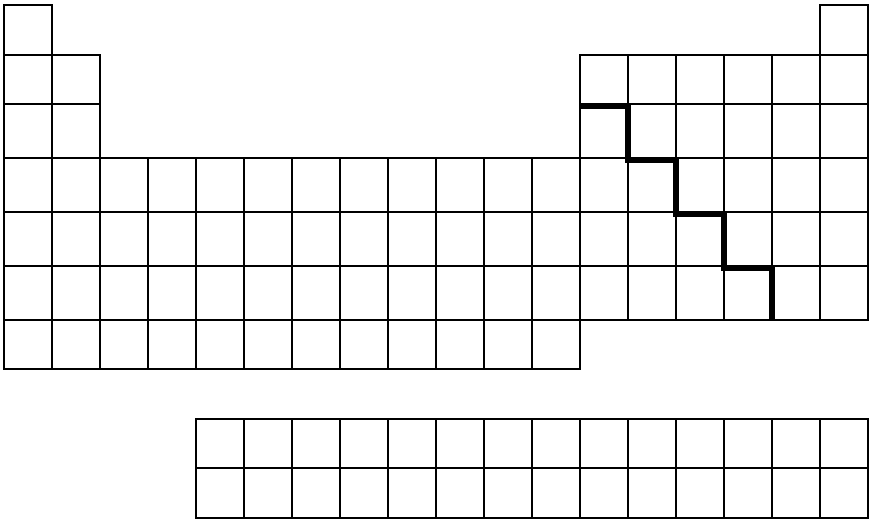
LABEL: *First, number the rows on the periodic table 1-7 on the left side of the table. Do not number the rare earth metals. Then color each row of the table a different color. For the rare earth metals, color those the same as the rows 6 and 7 since that is where the elements would fit.*



IV. Division of the Periodic Table into Groups (Families)

The groups of the periodic table are the different vertical columns (COLUMNS GO UP AND DOWN). The groups are sometimes also called families. These groups are extremely valuable to scientists in predicting how elements will react chemically. The groups are also arranged by the electrons. Each element from the same group has the same number of valence electrons. *Valence electrons are the outermost electrons in an atom (at the highest energy level).* The valence electrons are responsible for all of the chemical bonding that an atom can do. Because this is such an important way to organize the table, many of the groups even have their own names. The first column on the left, Group 1 is known as the alkali metals. The second tall column, Group 2 is known as the alkaline earth metals. Group 17 is a very important group known as the Halogens. The last column on the periodic table is called the Noble Gases. The noble gases are the least reactive elements on the table. Sometimes the Noble Gases will be labeled Group 0 or Group 18.

LABEL: *Number the columns of the periodic table 1-18. Then color column 1 red, column 2 orange, column 17 green, and column 18 blue. Finally, label the correct columns as the alkali metals, the alkaline earth metals, the halogens, and the noble gases.*



Alien Periodic Table

Introduction:

Imagine that scientists have made radio contact with life on a distant planet. The planet is composed of many of the same elements as are found on Earth. However, the inhabitants of the planet have different names and symbols for the elements. The radio transmission gave data on the known chemical and physical properties of 30 elements that belong to Groups 1, 2, 13, 14, 15, 16, 17, and 18. You need to place the elements into a blank periodic table based on these properties.

Problem: Where do the alien elements fit in the periodic table?

Procedure:

1. Listed below are data on the chemical and physical properties of the 30 elements. Write the elements in their proper position in the blank periodic table.
2. Once you have determined the proper position for each element, then write the symbol in the correct place.
   - The noble gases are bombal (Bo), wobble (Wo), jeptum (J), and logon (L). Among these gases, wobble has the greatest atomic mass and bombal the least. Logon is lighter than jeptum.
   - The most reactive group of metals are xtalt (X), byyou (By), chow (Ch), and quackzil (Q). Of these metals, chow has the lowest atomic mass. Quackzil is in the same period as wobble.
   - Apstrom (A), vulcania (V), and kratt (Kt) are nonmetals whose atoms typically gain or share one electron. Vulcania is in the same period as quackzil and wobble.
   - The metalloids are ernst (E), highho (Hi), terriblum (T), and sississ (Ss). Sississ is the metalloid with the greatest atomic mass. Ernst is the metalloid with the lowest atomic mass. Highho and terriblum are in Group 14. Terriblum has more protons than highho. Yazzer (Yz) touches the zigzag line, but it's a metal, not a metalloid.
   - The lightest element of all is called pfsst (Pf). The heaviest element in the group of 30 is eldorado (El). The most chemically active nonmetal is apstrom. Kratt reacts with byyou to form table salt.
   - The element doggone (D) has only 4 protons in its atom.
   - Floxxit (Fx) is important in the chemistry of life. It forms compounds of long chains of atoms. Rhaatrap (R) and doadeer (Do) are metals in the fourth period, but rhaatrap is less reactive than doadeer.

****There are a few more on the next page!!****

- Magnificon (M), goldy (G), and sississ are all members of Group 15. Goldy has fewer total electrons than magnificon.

- Urrp (Up), oz (Oz), and nuutye (Nu) all gain 2 electrons when they react. Nuutye is found as a diatomic molecule and has the same properties as a gas found here in Earth's atmosphere. Oz has a lower atomic number than urrp.

- The element anatom (An) has atoms with a total of 49 electrons. Zapper (Z) and pie (Pi) lose two electrons when they react. Zapper is used in flashbulbs.

Analysis Questions:

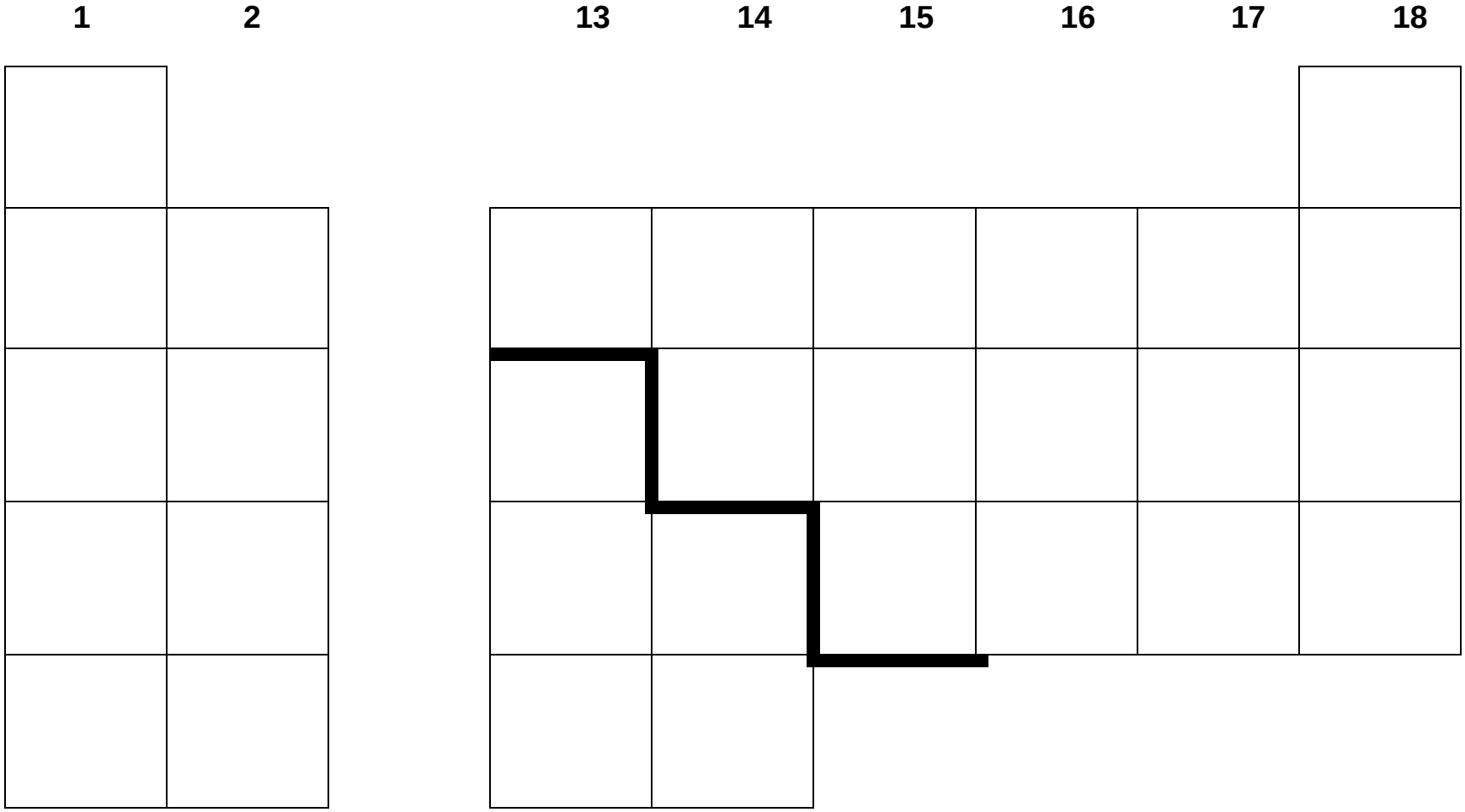
1. List the name of each alien element and the Earth element that it represents. Do this for all 30 elements used in this activity. (write small)

2. Were you able to place some elements within the periodic table with just a single clue? Explain your answer using two examples from the activity.

3. Why did you need two or more clues to place other elements? Explain your answer using one specific example from the activity.

4. Why could you use clues about atomic mass to place elements, even though the periodic table is based on atomic number?

Alien Periodic Table



History of the Periodic Table reading

In 1869 Mendeleev, a Russian chemist, showed the first version of his periodic table. This table was the first coherent presentation of the similarities between elements. He noticed that classifying the elements by their atomic mass a periodicity in certain properties could be seen. The first table consisted of 63 elements.

This table was designed in such a way that the elements periodicity showed up. In this way the elements are classified vertically. The resulting vertical groupings represent the elements of the same "family".

In order to apply the law in which he believed, Mendeleev has to leave some hollow spaces.

Mendeleev lays out his table so the periodicity of the elements clearly appears. In this table, the elements are classified vertically (in the current classification they are arranged horizontally). The horizontal arrangements occur regularly as certain chemical and physical properties are repeated. In the vertical arrangements, we find that the elements have almost the same chemical properties and similarities in their physical properties.

To follow the periodic law in which Mendeleev firmly believed, he should sometimes modify the order determined by the atomic mass progression and leave certain places "hollow".

He was sure that we would finally discover the missing elements, (those elements correspondent to the question marks before the relative atomic masses 45, 68, 70 and 180), which would confirm how well based his theory was. More than that, he predicted the properties of the three missing elements by looking at the properties of the four neighbour elements. Between 1875 and 1886, these three elements (gallium, scandium and germanium) were discovered. Each one of them had the properties predicted by the Russian chemist. Until then, very few scientists had accepted the ideas of Mendeleev. But as soon as these predicted elements where discovered, presenting moreover very similar properties to the predicted ones, the scientists recognized the utility of his periodic table.

Even though it is true that Mendeleev's classification marks a clear progress over all the other previous attempts of classification, it still had certain anomalies owing to the atomic masses still badly determined at that time.

1. Why did Mendeleev's periodic table only have 63 elements on it?

_____

_____

2. How was Mendeleev's first periodic table arranged?

_____

_____

_____

3. Why did Mendeleev's periodic table finally gain acceptance?

_____

_____

_____

4. In the vertical arrangements, what do we see among the elements?

_____

_____

_____

5. What does the term *hollow* refer to in the 3rd paragraph?

_____

_____

_____

Atom Basics

Answer the following questions using your notes.

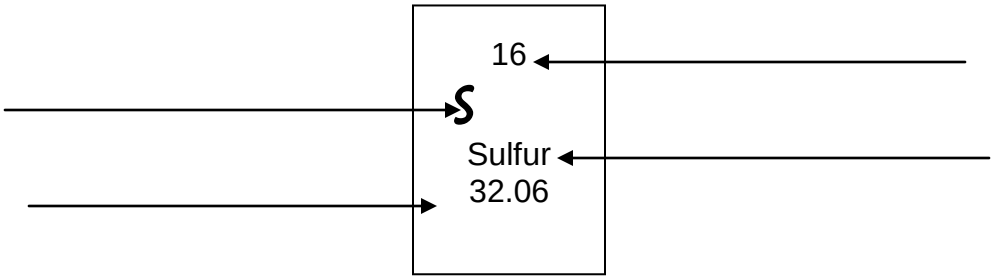
1. State the three subatomic particles of an atom. Provide their location within the atom. Be specific.

   a. _____ Location: _____

   b. _____ Location: _____

   c. _____ Location: _____

2. Label the four parts within the box.



3. What does the atomic number represent? And state three "things" you know about the atomic number.

_____

_____

4. What does the atomic mass number represent?

_____

5. When reading the periodic table of elements, how can you determine which number represents the atomic number and which number represents the atomic mass number?

_____

_____

6. Where is the majority of the mass located in the atom? Why is it there?

_____

_____

7. State if the number of each of the following can or cannot change within an atom:

   a. proton _____

   b. electron _____

   c. neutron _____

8. Why can the atomic mass number vary for a specific element?

_____

_____

Atomic Structure

1. An atom has a mass number of 43 and it also has 21 electrons.
   a) How many protons does this atom have?

   b) What is the identity of this atom?

   c) How many neutrons does this atom have?

2. What is an isotope? Give an example.

3. A certain *ion* has an atomic number of 16, a mass number of 33, and 18 electrons.
   a) What is the charge on the ion?

   b) What is the identity of this ion?

   c) How many neutrons does the nucleus of this ion have?

4. Tritium (an isotope of hydrogen) has 2 neutrons. How many protons does it have? What is its mass number?

5. What is the charge on a magnesium ion that has 10 electrons?

6. How many neutrons are there in a chromium atom with a mass number of 54?

7. Substance E has 29 protons, 28 electrons, and 34 neutrons. Substance F has 29 protons, 27 electrons, and 34 neutrons. Substances E and F can be categorized as…
   A) different elements B) ions C) isotopes D) nuclides
   E) nucleons

8. The element with 38 protons and 45 neutrons could correctly be identified as which element?

9. Complete the following table:

Symbol	# of neutrons	# of protons	# of electrons	Atomic #	Mass #
$^{56}_{136}Ba^{+2}$					
		25	25		56
	120		79	79	
	21	20	18		

The Mystery Element

Study the mystery element in Figure 1. Use Figure 1 and the periodic table to answer these questions and identify the element.

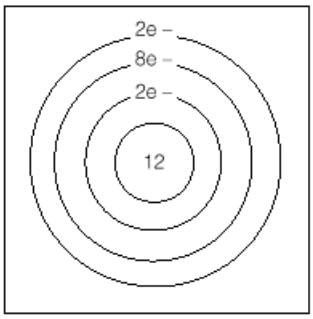


Figure 1 Mystery Element

1. The number in the nucleus tells how many protons are in the nucleus. What else does it tell you about the element?

_____

2. The three largest rings represent electron energy levels. How many electrons travel are in the second energy level?

_____

3. Do the elements above and below this one in the periodic table have similar properties? Explain your answer.

_____

4. To which period does the element belong? _____
5. To which group does the element belong? _____
6. Name two other elements with similar properties. _____
   _____
7. Give the symbol and name of the element in Figure 1.

   symbol = _____ name = _____

8. Is this element a metal, a metalloid, or a nonmetal? How do you know?

_____

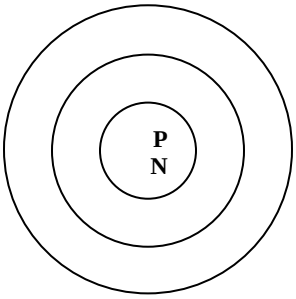
9. What is the atomic number of the element just to the left of the element in Figure 1?
   _____
10. How many electrons does the element just to the right of this one have?
    _____

Is the element to the right of this one a metal, a metalloid, or a nonmetal?
_____

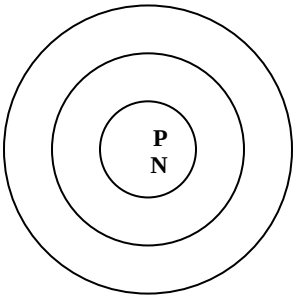
Electron Clouds

Use the information provided for each element to complete the diagram. Draw the electrons in their proper levels, and place the correct numbers in the nucleus to indicate the number of protons and the number of neutrons.

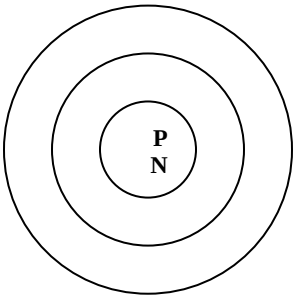
1. Sulfur: atomic number 16
   mass number 32



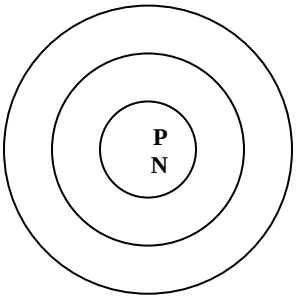
2. Beryllium: atomic number 4
   mass number 9



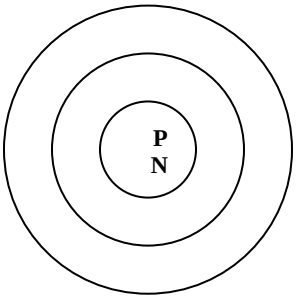
3. Nitrogen: atomic number 7
   mass number 14



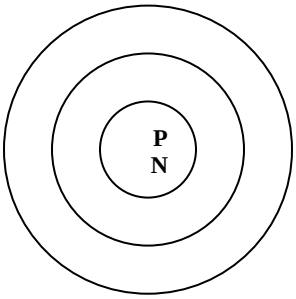
4. Sodium: atomic number 11
   mass number 23



5. Potassium: atomic number 19
   mass number 39



6. Argon: atomic number 18
   mass number 40



Valence Electrons (Lewis Dot)

Definition: Valence electrons are any electrons in an atom's highest energy level. They are sometimes described as the "outermost electrons" because they are literally the electrons we would expect to find the farthest away from the nucleus of the atom.

Valence electrons are believed to be the reason that all bonding occurs between atoms. First you are going to practice identifying valence electrons. Then you will look for patterns in the valence electrons which might explain the different chemical properties of elements.

DIRECTIONS: For each element, draw a Lewis Dot model of the atom within the box.

1 **H**							**2** **He**
3 **Li**	**4** **Be**	**5** **B**	**6** **C**	**7** **N**	**8** **O**	**9** **F**	**10** **Ne**
11 **Na**	**12** **Mg**	**13** **Al**	**14** **Si**	**15** **P**	**16** **S**	**17** **Cl**	**18** **Ar**

1. All elements in Group 1A have _____ valence electrons.

2. All elements in Group 2A have _____ valence electrons.

3. All elements in Group 3A have _____ valence electrons.
4. All elements in Group 4A have _____ valence electrons.
5. All elements in Group 5A have _____ valence electrons.
6. All elements in Group 6A have _____ valence electrons.
7. All elements in Group 7A have _____ valence electrons.
8. All elements in Group 8A have _____ valence electrons.
9. A shorthand way of showing valence electrons for atoms is to draw a

_____ .

Lewis Dot Give One/Get One

Directions: In the "Give one" column below, draw a Lewis Dot structure for ONE of the atoms listed. Then, meet with your partner, and teach them your atom. Your partner will then teach you their atom. You should write this in your "Get one" column.

Elements	Give One	Get one
Lithium, Sodium, or Potassium		
Beryllium, Magnesium, or Calcium		
Boron, Aluminum, or Galium		
Carbon, Silicon, or Tin		
Nitrogen, Phosphorus, or Bismuth		
Oxygen, Sulfur, or Selenium		
Fluorine, Chlorine, or Bromine		
Helium, Neon, or Krypton		

ATOMIC PRACTICE #2

For this page, do NOT assume the charge is zero.

Name	Symbol	Atomic #	Mass #	Protons	Neutron	Electrons	Charge
Lead-207							+4
Calcium-40						18	
	O^{2-}		18				-2
Silver-109						46	
	Sn^{+4}				68		
			37	17		18	
				19	21		+1
				24	24	21	
	Al^{+3}		26				
			107		60		+1
		15			16	18	
Bromine-81							-1
Bromine-82							0
		56		56			+2
			32			18	-3
			44	21			+3
Iron-55							+3
Iron-54						24	
	Ag^{+}			51	53		
		27	57			24	
		80	120				+1
	V^{5+}		49				
Tellurium-127							-2
				52	42		+6