General Physical Science

IMPORTANT DETAILS!!!!!

1. Make sure you are on remind to get up to date details and to be able to contact me
    a. Sign up by texting @genphysci1 to the number 81010
2. Make sure you are on classroom and know how to log in on at home (if applicable)
    a. If parents wish to be added to google classroom please send me an email with the email they want added
3. Make sure you know how to get to your email and how to send emails.
4. How to contact me:
    a. Through remind via text message or the app
    b. Through gmail account : kayla.gauche@elsd.us
    c. Through google hangouts. Google hangout is an online chatting/video system. I will be on to answer any questions Wednesdays at 2pm while we are gone. Or by appointment made with me with a 24 hour advance notice.

Disclaimer please contact me within a reasonable time frame, 7am - 7pm. Also, give me at least 24 hours to respond to email. I will do my very best to get back to you asap.

Lesson #1 - #2

1. Watch the Crash Course on Classroom and answer the questions on the worksheet: **The Creation of Chemistry - The ...Laws Crash Course #3**
    a. If you do not have a computer at home to watch this read pages 488-497. Write 15 facts about the reading.
2. Use your Atomic theory notes, this video, and the book to help answer the question in the **Atomic Theory Review w.s.**

Lesson #3 - #4

1. Watch the Crash Course on Classroom and answer the questions on the worksheet: **The Nucleus: Crash Course Chemistry #1**
    a. If you do not have a computer at home to watch this answer questions on page 493 #1-5, pg. 497 #6-11.
2. Do the **Lewis Dot Diagram Worksheet** you do not have to do the column that says lewis dot unless you want to try

Lesson #5

1. Watch the Crash Course on Classroom and answer the questions on the worksheet: **The Electron: Crash Course Chemistry #5**
    a. If you do not have a computer at home to watch this read and answer the questions on the **What's the Charge? Remaining Neutral w.s.**
2. Do the second page (front and back) in the packet: **Periodic Table Packet #1**

Lesson #6-#7

1. Work on and complete your **<u>Atom Project</u>**
    a. You were given note cards to used as your key and a paper / paper plate to create your project. You may use any material you want or be as simple as drawing it on a plate like the bohr model drawings we did in class. **But you actually need to draw out the circles for the protons and electrons.**
    b. Make sure the protons, neutrons, and electrons are set to the correct number and in the correct location

Lesson #8

1. **Atom Quiz** - Please use your binders, worksheets, notes, and books to answer this quiz

Lesson #9

1. Watch the Crash Course on Classroom and answer the questions on the worksheet: **<u>The Periodic Table: Crash Course Chemistry #4</u>**
    a. If you do not have a computer at home to watch this read pages 498-506. Write 10 facts about the reading.
2. Read and answer the questions on the worksheet : **A Look at the Past: The History of the Periodic Table**

Lesson #10

1. Using the notes posted on classroom: **The Periodic Table Notes,** The Periodic Table reference sheet, and your book pages 498-539
2. Do the first page (front and back) in the packet: **Periodic Table Packet #1**

The Creation of Chemistry - The ... Laws: Crash Course Chemistry #3

1. So in today's episode of Crash Course Chemistry we're going to taking a bit of a historical perspective on the creation of the science of _____.
2. Antoine Lavoisier, was pretty fantastic. He was a geologist, a botanist, a biologist, and a physicist, he helped define the_____ system, creating an international language of chemistry, named hydrogen and oxygen, predicted the existence of silicon, outlined what elements were, figured out how animals extracted energy from food, determined that an element can take different forms on discovering that both ash and diamond contained pure carbon, published the very first chemistry textbook ever, and there's a reason why the Law of Conservation of _____used to be called Lavoisier's Law.
3. Lavoisier's chief contributions and ultimately his discovery of the Law of Conservation of Mass relied on careful _____ and careful thinking. And as you'll see, both of those things are key to success in chemistry to this day.
4. What happened to Lavoisier on May 8th, 1794?
5. Lavoisier's work was, for a full century, the basis of all _____.
6. Of course what was happening is obvious to us, carbon and oxygen were reacting to form two different compounds: carbon dioxide and carbon _____.
7. And so while in our first episode we showed you how Einstein actually proved that atoms exist with super fancy math, Dalton had used multiplication to become the first person to actually have real data supporting the idea of _____.
8. Avogadro proposed, correctly, that any gas in a container of the same size, with the same temperature and pressure, would have roughly the same number of _____ in it, no matter what the gas was.
9. To support his hypothesis, which was certainly good enough to support, he suggested that, in forming water, oxygen gas would actually split into two oxygen atoms, what he called "_____ molecules" that could not be broken down any further. For some fifty years, Avogadro's idea of fundamental molecules were ignored.
10. List and explain 2 things you learned from this episode?

Atomic Theory Review Worksheet

1. Doe ideas or theories in Science stay the same?

2. Who was Democritus?

3. What did Democritus conclude when he thought about cutting a piece of matter in half over and over?

4. What does the Greek word "atomos" mean?

5. What three ideas did John Dalton's propose for the theory?

6. What particle did Thomson discover? What electrical charge does it have?

7. Draw the model of JJ Thomson.

8. What experiment did Rutherford use in relation to the atom?

9. What did Rutherford find out about the atom with this experiment?

10. What did Niels Bohr learn that electrons can do?

11. In the Current Model are the electrons on rings or in clouds?

12. Do we know the exact location of electrons?

The Nucleus: Crash Course Chemistry #1

1. Chemistry is the science of how three tiny particles, come together to form EVERYTHING! What are the three tiny particles?

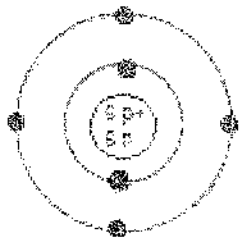
2. What is the definition of "theory?"

3. Here's how it happened. In 1827, a botanist named _____ was looking at pollen grains in water through a microscope and he noticed that they jiggled randomly even when there was no movement to cause the jiggling.
4. The word "atom", indeed, is from the Greek for "_____", though, of course, as we learned in World War II, atoms can be broken as well.
5. Protons and neutrons hang out in the nucleus, and thus are the nuclear components or nucleons; electrons hang out around the _____ and are the parts of the atom that do all the interesting chemical stuff.
6. Silver, of course, because we've known about it for a long time, is one of the first elements added to the periodic table, and back then it was called "argentum", Latin for "shiny gray stuff", also, the root of the word "_____", where Spanish explorers heard rumors of mountains made of silver, which of course did not exist.
7. Nuclei, which is the plural of nucleus, are boring. They're thousands of times _____than the atom as a whole and they mostly just sit around being exactly the same as they were when they were first created billions of years ago, held together by the strongest of the four fundamental forces of physics, the strong _____ force.
8. The atomic number of silver doesn't change as the number of neutrons changes because the number of _____ stays the same. But the relative atomic mass does change.
9. You'll note that I said these two different sorts of silver are called_____, they have different masses but the same chemical properties, and are the same element and so belong on the same place on the periodic table. In fact, the word "isotope" means "_____".
10. The chemical symbol, with the atomic number or number of protons here, the mass number, or number of protons and neutrons here, and the charge out here, which tells you by simple addition or subtraction how many _____ there are.

11. List and explain 2 things you learned or found interesting in the video:

Lewis Dot Diagram Worksheet

Use the Bohr models to determine the number of valance electrons. Once you have found the number of valance electrons, place them around the elements symbol.

Element	Atomic #	Atomic Mass	Protons	Neutrons	Electrons	Valance Electrons	Number of energy levels	Bohr Model	Lewis Dot
Carbon	6	12	6	6	6	4 (group 14, 4 in the ones palace)	2 (2nd period)		·C·
Hydrogen	1	1	1	0					H
Lithium	3	7	3		3				Li

Element	Atomic #	Atomic Mass	Protons	Neutrons	Electrons	Valance Electrons	Number of energy levels	Bohr Model	Lewis Dot
Magnesium	12	24	12	12					Mg
Boron	5	11	5		5				B
Helium	2	4		2	2				He
Oxygen	8	16	8		8				O

The Electron: Crash Course Chemistry #5

▼ Great Dane/Bohr Model

1. Before quantum mechanics, scientists envisioned the atomic world as just a miniature macroscopic world. Electrons seemed to just be particles orbiting around a _____.
2. In 1913, who came up with a simple model for describing these energy levels for a single electron in hydrogen merely assuming circular orbits? Niels _____
3. An Austrian physicist, Erwin Schrodinger, who you may have heard of because of his cat, is the first guy who developed a mathematical model where the electron was assumed to be a standing _____.

▼ Electron Shells and Orbitals

4. Electrons exist in orbitals a bit like the individual notes on a keyboard. But the orbitals tone isn't complete until it has ____ electrons in it, and orbitals exist in shells.
5. This is often described in terms of fullness or satiation, as if the _____are devouring electrons, but I prefer to think of an incomplete electron configuration as a cacophonous symphony playing in different keys and at different tempos.

▼ Electron Configurations

6. Iron, number twenty-six, would be 1s2 2s2 2p6 3p6 4s2 3d6. Now there are a couple of elements that have weird electron _____, but you can just look it up on Google.

▼ Ionization and Electron Affinities

7. So why are orbitals useful when it comes to understanding how an atom is likely to react? Well first, it really matters how much energy is required to remove an electron from an atom to form a positively charged ion. This energy is called "_____ energy"
8. Just like with the ionization energy there's a discrete energy jump involved with the adding of an electron. That energy is called "electron _____."

▼ Periodic Table

9. That's why this thing is so beautiful to me, because when you get to know it, you see all those flawed, competing harmonies and the actions and reactions that occur because of them, changing their song into something more stable and powerful and eternal together, making _____.

Big Picture

10. There are, a number of everywhere-permeating fields in our universe. One of those, is the _____. In order for an electron to exist, there has to be an excitation of the electron field and we can describe those excitations as waves, just as a wave in the ocean is an excitation of the water.
11. What are the root and the key and the nexus and the crux and the keystone and every other metaphor of not just chemistry but existence?
12. List and explain 2 things you learned from this video:

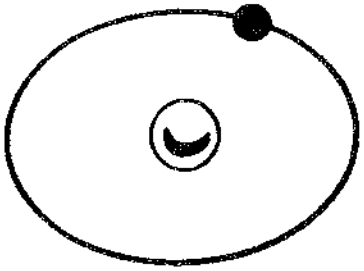
What's the Charge? Remaining Neutral

We have defined matter and decided that the smallest part of all matter is an atom. Each atom has the same basic parts: protons, neutrons, and electrons. Let's take another look at atoms and why they are said to be neutral.

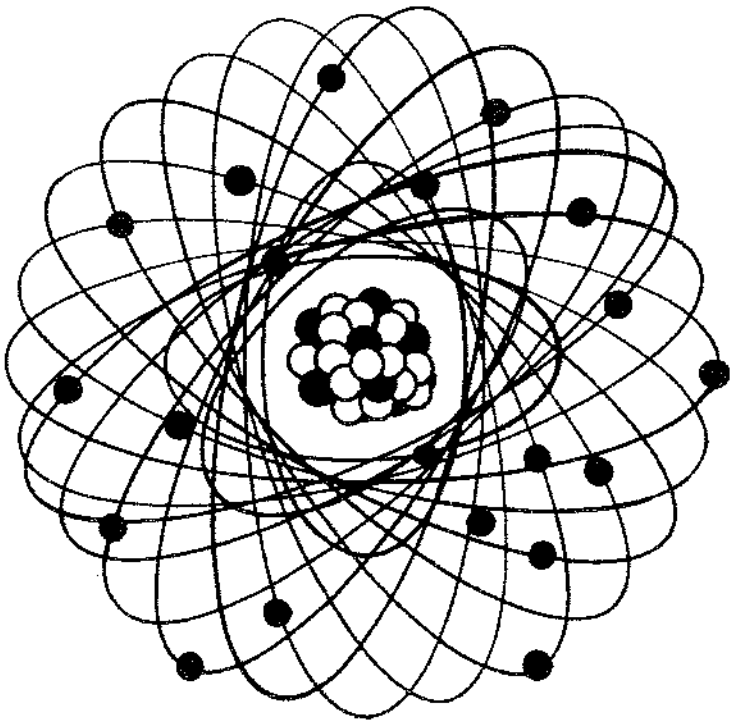
All atoms of the same kind of matter have the same number of protons in their nuclei. For example, every hydrogen atom has one proton in its nucleus and every helium atom has two protons in it nucleus. The number of protons in an atom is called the atomic number of an atom.

A normal atom has the same number of protons and electrons. So, while the atomic number is defined as the number of protons in an atom, it is also the number of electrons in a normal atom. Remember that protons are positively charged and electrons are negatively charged. Since the number of positive particles and the number of negative particles are the same, an atom does not normally have any electrical charge. An atom is said to be electrically neutral.

Hydrogen Atom:
1 proton; 1 electron



Calcium Atom:
20 protons; 20 electrons



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Name _____ Date _____

For the student:

1. How are all atoms of the same kind of matter similar?

_____

_____

2. What is the atomic number of an atom?

_____

_____

3. How do the number of protons and electrons compare in a normal atom?

_____

_____

4. How many electrons do each of the following kinds of matter have in each atom?

a. silver: 47 protons _____ electrons

b. carbon: 6 protons _____ electrons

c. sodium: 11 protons _____ electrons

d. neon: 10 protons _____ electrons

e. iodine: 53 protons _____ electrons

5. Why are atoms said to be electrically neutral?

_____

_____

6. Which element has the atomic number 2?

_____

_____

7. Which element has the atomic number 20?

_____

_____

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Periodic Table Packet #1

Name_____ Period_____

6.4 c Periodic Table of Elements

Directions: Use the periodic table to fill in the below chart.

	Element	Symbol	Atomic Number	# of protons	# of electrons	Atomic Mass	Rounded Atomic Mass	(show work) # of Neutrons	Period
1	Oxygen	O	8	8	8	15.999	16	16 - 8 = 8	2
2	Helium								
3	Carbon								
4	Aluminum								
5	Calcium								
6	Sodium								
7	Potassium								
8	Nitrogen								
9	Silicon								
10	Iron								
11	Hydrogen								

Periodic Table Packet #1

Name_____ Period_____

Directions: Use a Periodic table to find the information asked for below:

1. What is the atomic number of:
   - Calcium____
   - Iron _____
   - Gold_____
   - Uranium_____

2. What is the Atomic mass of:
   - Calcium___
   - Iron_____
   - Uranium_____
   - Copper_____

3. How many protons do the following have?
   - Calcium____
   - Gold_____
   - Copper_____
   - Iron_____

4. How many electrons do the following have?
   - Gold____
   - Iron_____
   - Copper_____
   - Uranium_____

5. Does mercury have more protons and electrons than tin?

6. Is mercury a heavier element than tin?

7. Does potassium have more electrons than neon?

8. Does hydrogen have more electrons than Uranium?

9. Which has more protons, sulfur or iodine?

10. Write the symbols or the names for each of these elements:
    - Chlorine _____
    - Copper _____
    - Potassium _____
    - Silver _____
    - Na _____
    - Sn _____
    - Zn _____
    - Helium _____
    - Iron _____
    - P _____
    - Ne _____
    - Mercury _____

Name: _____ Due:

Element: _____

Here's your chance to let your creative juices flow! In order to put everything together you have learned from this chapter, you will make an atom model for one element on the periodic table. You will be required to use common household and/or craft materials to create atom parts such as protons, neutrons, and electrons.

Use any material you want as long as it's safe and within reason! There is no need to buy materials – just use things you find around the house (styrofoam, light clay, paper mache, paperclips, foil, paper, etc.). Please avoid food items that will cause odor and rot later in time. Because there are several elements with extremely high atomic numbers, you will be required to choose one of the elements listed below for your model:

Lithium	Boron	Argon	Sodium	Aluminum	Helium
Carbon	Neon	Magnesium	Nitrogen	Calcium	Phosphorus
Chlorine	Potassium	Oxygen	Sulfur	Fluorine	Silicon

Basic Guidelines & Expectations:

1) Your model should be about the size of a sheet of printer paper. Make sure that your final product has the ability to be hung from the ceiling (paperclips and fishing line can be made available upon request). Size and weight should be considered – nothing too big or heavy!

2) Your model should use different colors and/or types of materials to represent each of the 3 major subatomic particles (protons, neutrons, and electrons). If you use beads to represent the protons, you should use a different material/color to represent the neutrons, and a third to represent the electrons.

3) Your model should have the correct number of electrons, protons, and neutrons present. Use your periodic table and ask me if you have questions.

4) Your model must also include an attached information tag that clearly identifies the following (as shown below):

Side 1

Atomic #

Atomic Symbol

Element Name
Atomic Mass

Your Name

Side 2

Key:

Protons:
Neutrons:
Electrons:

Note: Notice Side 1 resembles an element square on the Periodic Table. On Side 2, you should provide a key that will help distinguish between each subatomic particle.

5) You will need to do research either on the internet or in a book to determine the positions of electrons for your element (all electrons are orbiting outside of the nucleus, but amount of electrons in each "orbital" is different).

6) Be creative in your use of materials and construction. It is very easy to tell when students put forth great effort to create their models; likewise, it's very easy to tell when someone threw their model together at the last minute. DON'T PROCRASTINATE! Be sure to ask questions if you have them.

Names _____ Element _____

ATOM MODEL SCORING RUBRIC

This rubric will be used to assess your atom model and information card. This rubric is required to be handed in with your project or your grade will be held until it is submitted to me.

MODEL ACCURACY	MODEL CREATIVITY	DESIGN/MATERIALS	INFO CARD ACCURACY	INFO CARD DESIGN	POINTS
6: The number of protons, neutrons and electrons are correct.	6: The model includes at least 3 different materials and is very neatly crafted and organized.	6: Well constructed, demonstrates creative use of materials, and is a reasonable size. Can hang from ceiling.	6: All required information is present and correct.	6: The information on the card is very organized, easy to read and clearly identified/labeled	
4: There is an error in ONE of the atom particle totals.	4: The model includes at least 2 different materials and is neatly crafted and organized.	4: Generally well constructed, creative use of materials, and is reasonable size. Can't hang from ceiling as is.	4: There are 1-2 errors in the required information.	4: The information on the card is generally organized, readable and labeled	
2: There is an error in TWO of the atom particle totals.	2: The model includes at least 1 different material but lacks creativity or organization.	2: Construction, OR use of materials, OR size does not meet expectations.	2: There are 3-4 errors in the required information.	2: The information card is lacking in one of the above areas	
0: All three atom particle totals are incorrect.	0: Serious lack of creativity or organization. Model does not use any materials.	0: Overall failure to meet expectations; haphazard material use and lack of effort is evident	0: There are 5 or more information errors.	0: The information card is not organized, not easy to read and not clearly labeled.	

TOTAL POINTS = _____/30

Comments:

Name _____

Atomic Quiz

1. Who was it that founded the nucleus?
   A. Rutherford C. Bohr
   B. Chadwick
2. What are the charges of the particles in an atom?

   Protons ____ Electrons ____ Neutrons ____

3. How many protons, neutrons, and electrons are in a neutral atom of Neon?

   P: N: E:

4. Who founded the neutron in the nucleus?
   A. Rutherford B. Chadwick C. Bohr
5. Draw a neutral atom of Boron.

6. ~~What is the difference between a neutral atom, an ion, and an isotope?~~

7. What are the protons, neutrons, and electrons in the element below?

   $^{23}_{11}Na^{+}$

8. What are the protons, neutrons, and electrons in the element below?

   $^{14}_{6}C$

9. Draw a neutral atom of Magnesium.

10. What particle determines what type of element it is and what particle determines the charge? (be specific)

The Periodic Table: Crash Course Chemistry #4

1. Mendeleev spent a great deal of time in laboratories as a student, studying the burgeoning new field of _____. He worked with all the elements that you could work with at the time, and his knowledge gave him unique insights into their properties.
2. Lithium, sodium, potassium, and rubidium were all extremely prone to reacting with chlorine, fluorine, iodine, and bromine; beryllium, magnesium, calcium, and strontium were all similar, but _____ reactive.
3. But with a quick inspection, you, and to be fair, a number of other chemists, realize that there was a relationship between atomic weights, but it's periodic. At the beginning of the list of elements, characteristics repeat every _____ elements.
4. You, never having examined the element he discovered, knew more about it than he did, because you are Mendeleev, Master of the _____.
5. Next, you have the alkaline earth metals - reactive metals, but not as reactive as the alkali metals, for cations with _____positive charges instead of just one. Calcium, shown here, undergoes a very similar reaction to sodium with water, just a little more slowly, producing a little less _____.
6. On the far right, just over from the noble gases, the halogens make up a set of extremely reactive gases that form negative ions, or anions, with one negative charge, and love to react with the alkali and alkaline earth _____.
7. And as we now know, the periodicity of elements is a physical phenomenon. It's a function of _____, which are in some ways pretty dang peculiar, but certainly not at all mystical.
8. And really, it would be best if it wrapped around into a circle, so that fluorine, and neon, and sodium were all next to each other, instead of being on opposite sides of the map, because they're just one _____ away!
9. Mendeleev's contribution, nonetheless, is more powerful than at first it seemed. He ended up forming a guide to help future chemists understand things that wouldn't be discovered for 25, 50, even _____ years.
10. List and explain two things you learned from the video:

A Look at the Past: The History of the Periodic Table

As you know, scientists love to organize and classify things. As they learned more and more about elements, they needed to find a good way to classify them. They could have used an alphabetical system, listing all of the elements whose names began with A first, followed by the B's, and so forth. This might have been an easy way to find the names; however, this would not have given the scientists any other information in an organized way.

Another option might have been to classify the elements according to the amount of them found on Earth and in its atmosphere. The most commonly found elements would be first and the more unusual ones would be found further down the list. This system might be EXTREMELY difficult. One element might be fairly common in one area of the Earth, but rare in another. How could it be classified? Would the system have to be revised from time to time as new discoveries were made and certain elements were found in greater quantities?

In 1864 John Newlands, an English scientist, tried organizing the elements in a different way. He listed all of the known elements by their relative masses. The elements with the least amount of mass were listed first, followed by the elements with greater masses. This system started to bring some organization into the study of elements.

In 1869 a Russian scientist by the name of Dmitri Mendeleyev developed a system that gave scientists more useful information about the elements in the form of a fairly simple table. Mendeleyev organized elements according to their properties and their atomic mass. He developed a chart with eight columns and several rows. Each column is referred to as a family or group. The families contained elements with similar properties. Each row was referred to as a period. When moving from left to right across a period, the elements increased in atomic mass. Mendeleyev's system was similar to Newlands' system, but Mendeleyev believed there were other elements that would be added to the chart. He predicted the properties of these elements and left places for them in his chart. Eventually, the missing elements were discovered!

Since Mendeleyev's time, chemists have found an even better way to organize and classify the elements. Instead of listing them in order by atomic mass, modern scientists list the elements according to their atomic numbers. The modern Periodic Table of the Elements still uses rows and columns. The columns, still called families, consist of elements with similar properties. The rows, still called periods, list the elements by atomic number, increasing by 1 as you move from the left to the right.

At the present time, the Periodic Table of the Elements lists 118 elements. Scientists are continuing their research and their experiments to find or make new elements. The chart may need to be revised as new elements are discovered, named, and classified according to their properties.

Dmitri Mendeleyev

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Name _____ Date _____

For the Student:

1. Why do scientists need to classify elements?

2. Who was the first person to develop the idea of listing elements according to their mass?

3. How did Mendeleyev improve Newlands' method?

4. Why did Mendeleyev leave spaces in his chart?

5. Were the spaces Mendeleyev left ever of any use? Why or why not?

6. What are the columns and rows of the Periodic Table of the Elements called? What do they group together, if anything?

7. How does the modern Periodic Table of the Elements differ from Mendeleyev's chart?

8. Is the Periodic Table we have today complete?

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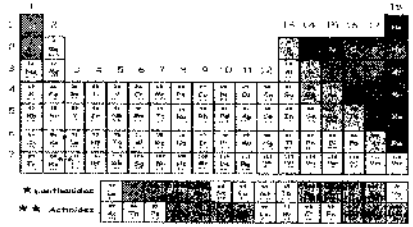
The Periodic Table of Elements



Periodic Table

- Something "periodic" occurs at regular or generally predictable intervals
- Periodic law - physical and chemical properties of the elements are periodic functions of their atomic numbers
- Periodic Table of Elements - a table of the elements, arranged by atomic number, that shows the patterns in their properties; based on the periodic law

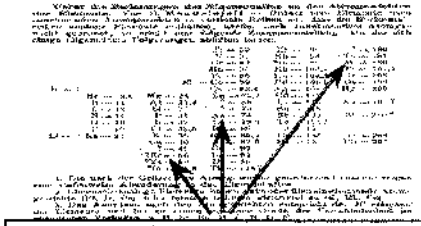
Element

- A pure substance made up of one kind of atom that cannot be broken down into simpler substances by physical or chemical means
- 90 occur naturally on earth
- 28 were synthesized (made) by scientists
- https://www.youtube.com/watch?v=VgVQKCcfwnU

Dmitri Mendeleev

- In the 1860's he devised a periodic table where the elements were ordered by their atomic masses
- He did this by grouping elements together according to their similarities
- Draft of Mendeleev's Periodic Table

Mendeleev's Published Periodic Table of Elements



Why do you think there are question marks here?

Mendeleev's Predictions

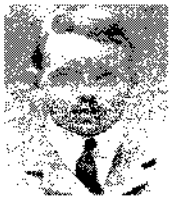
- Although Mendeleev's Periodic Table of Elements had missing elements or "gaps," he was able to predict the characteristics of these missing elements because of Periodic Law.

	"Ekasilicon"	Germanium
Discovered	1871	1886
Atomic Mass	72	72.6
Density	5.5 g/cm³	5.47 g/cm³
Melting Point	High	High
Color	Dark Gray	Gray

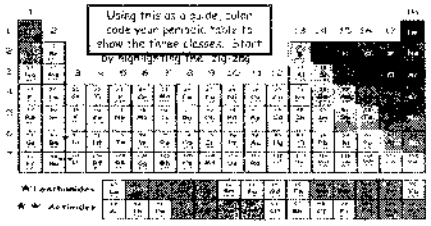
Notice how Mendeleev's predictions (ekasilicon) were very accurate when compared to Germanium's actual characteristics.

Henry Moseley

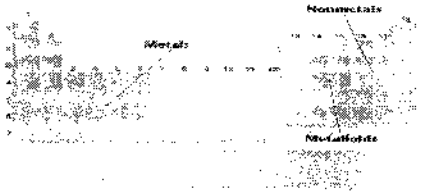
- In 1914, his work led to a revision of the periodic table by rearranging the elements by their atomic numbers
- He concluded that the number of protons in an atom is its atomic number



3 Classes of Elements



3 Classes of Elements

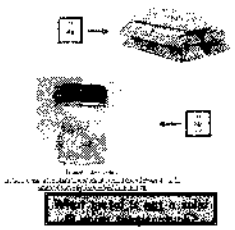


Metals

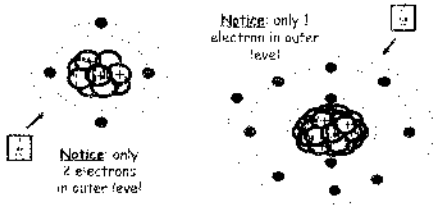
Location: Found on the left of the zigzag line/staircase on the periodic table (exception → Hydrogen)

Chemical Properties: Have few electrons in their outer energy level, thus lose electrons easily

Physical Properties: Ductile, good conductors, malleable, shiny, most are solid @ room temperature

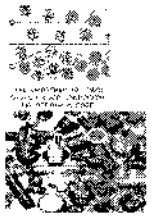


Metals' Chemical Properties



Metals' Physical Properties

- Good conductor: electrons (electricity) flow easily through the substance
- Malleable- able to be hammered or pressed out of shape without breaking

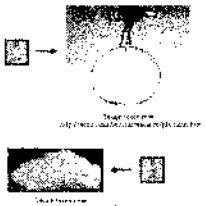


Non-Metals

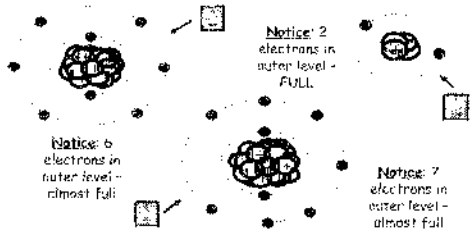
Location: Most found to the right of the zigzag line/staircase on the periodic table

Chemical Properties: Most have almost full outer energy levels, thus they tend to gain electrons; some have completely full outer level

Physical Properties: Not ductile or malleable, not shiny, poor conductors, most are solid, but some are gas at room temperature



Non-metals' Chemical Properties



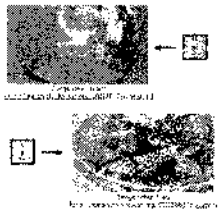
Metalloids

Location: Border the zigzag line/staircase on the periodic table

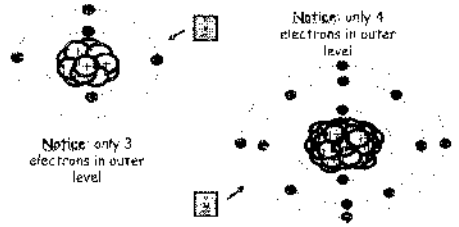
Chemical Properties: Most atoms have ½ (≈) complete set of electrons in outer level

Physical Properties

- have properties of both metals and non-metals

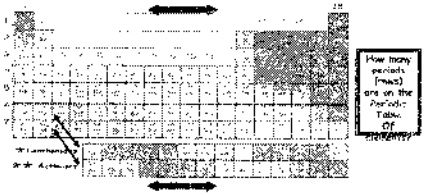


Metalloids' Chemical Properties



Important Features of the Periodic Table

- Period- each horizontal row of elements on the periodic table



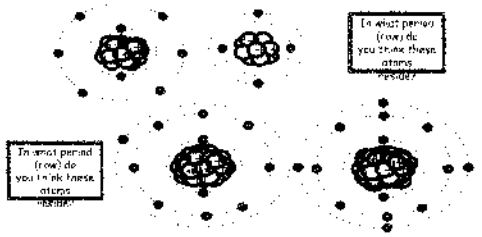
FROM LEFT TO RIGHT OR RIGHT TO LEFT

Period (Row) Properties

- Seven periods on a periodic table (numbered from the top down)
- Atomic numbers and atomic masses increase as you move from the left to the right in a period
- All atoms of the elements in the same period have the same number of orbitals/levels
- All atoms of the elements in a specific period have that respective number of orbitals/levels
  - Example

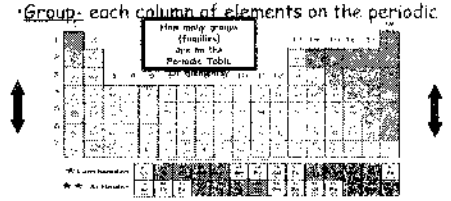
Period 1 = 1 orbital Period 2 = 2 orbitals Period 3 = 3 orbitals + Etc

Examples of Period (Row) elements having the same number of orbitals/levels in their atoms



Important Features of the Periodic Table

- Group- each column of elements on the periodic



FROM TOP TO BOTTOM OR BOTTOM TO THE TOP

Group (Family) Properties

- Eighteen groups on the periodic table (numbered from left to right)
- Atomic numbers and atomic masses increase as you move from the top down in a group (family)
- Atoms of elements in the same group have the same number of electrons in the outer orbitals of their atoms (known as valence electrons)
  - **Exceptions**:
    - Transition elements (3-12)
    - Helium (actually has 2 valence electrons)
- Elements in groups usually have similar physical and chemical properties

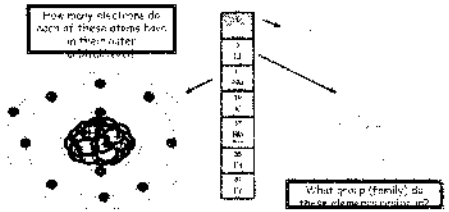
Determining the Number of Valence Electrons by Using the Periodic Table

*Atoms of elements in Groups 1 and 2 have the same number of valence electrons as their group number.

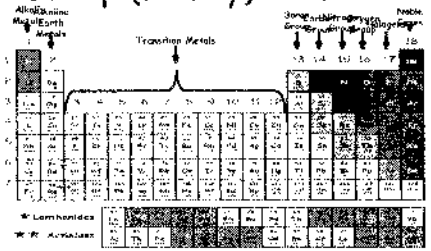
*Atoms of elements in Group 3-12 do not have a general rule relating their valence electrons to their group number. However, they typically have between 1 or 2 valence electrons.

*Atoms of elements in Groups 13-18 have 10 fewer valence electrons than their group number. (*Exception - helium atoms have only 2 valence electrons, even though they are in group 18*)

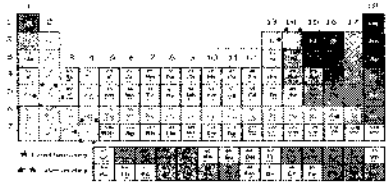
Examples of Group Elements with the same # of valence electrons



Group (Family) Names



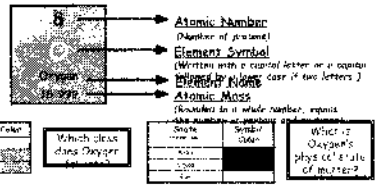
Identify the Element

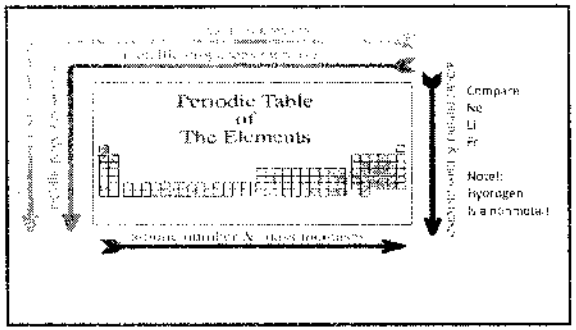


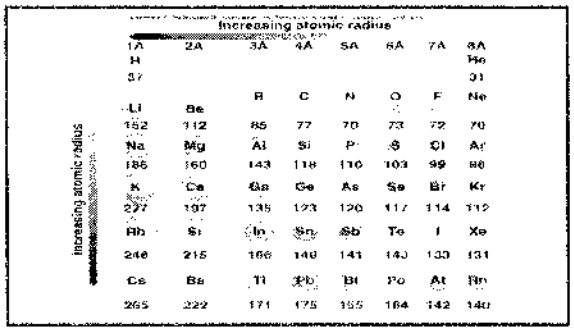
Rutherfordium - Rf

Using the Periodic Table

- The boxes that make up the periodic table contain a significant amount of information. To understand this information, it is necessary to refer to the periodic table's key(s)







Check for Understanding

- What is the smallest atom in regards to mass in the periodic table? Circle it.
- What is the largest atom (in size in atomic radius) in the periodic table? Put a dot by it.
- What is the most metallic element? Put a box around it.

Lewis Structure (Electron Dot Diagram)

- Valence electrons- the electrons in the outermost shell that are responsible for how an atom will behave chemically
- Lewis Dot Structure- way of drawing ONLY the valence electrons of an atom
- Element symbol surrounded by as many dots as there are valence electrons
- Examples

Counting Valence Electrons

Carbon
4 valence electrons

Oxygen
6 valence electrons

Beryllium
2 valence electrons

Check for Understanding How Many Valence Electrons?

- Hydrogen → 1 Valence Electron
- Potassium → [redacted]
- Neon → 8 Valence Electrons
- Sulfur → 6 Valence Electrons

Strong Force

- The force that holds the atomic nucleus together
- The force that counteracts the electromagnetic force
- This force is only strong if the protons and neutrons are close together

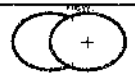
Notice how the electromagnetic force causes the protons to repel each other but the strong force holds them together

Would an atom have a nucleus if the strong force did not exist?

Weak Force

- Plays a key role in the possible change of sub-atomic particles.
  - For example, a neutron can change into a proton(+) and an electron(-)
- The force responsible for radioactive decay.
  - Radioactive decay- process in which the nucleus of a radioactive (unstable) atom releases nuclear radiation.

Notice how the original particle changes to something new



If you need help remembering weak force, just think of...

The Periodic Table of the Elements

1 **H** Hydrogen 1.00794																	2 **He** Helium 4.003
3 **Li** Lithium 6.941	4 **Be** Beryllium 9.012182											5 **B** Boron 10.811	6 **C** Carbon 12.0107	7 **N** Nitrogen 14.00674	8 **O** Oxygen 15.9994	9 **F** Fluorine 18.9984032	10 **Ne** Neon 20.1797
11 **Na** Sodium 22.989770	12 **Mg** Magnesium 24.3050											13 **Al** Aluminum 26.981538	14 **Si** Silicon 28.0855	15 **P** Phosphorus 30.973761	16 **S** Sulfur 32.066	17 **Cl** Chlorine 35.4527	18 **Ar** Argon 39.948
19 **K** Potassium 39.0983	20 **Ca** Calcium 40.078	21 **Sc** Scandium 44.955910	22 **Ti** Titanium 47.867	23 **V** Vanadium 50.9415	24 **Cr** Chromium 51.9961	25 **Mn** Manganese 54.938049	26 **Fe** Iron 55.845	27 **Co** Cobalt 58.933200	28 **Ni** Nickel 58.6934	29 **Cu** Copper 63.546	30 **Zn** Zinc 65.39	31 **Ga** Gallium 69.723	32 **Ge** Germanium 72.61	33 **As** Arsenic 74.92160	34 **Se** Selenium 78.96	35 **Br** Bromine 79.904	36 **Kr** Krypton 83.80
37 **Rb** Rubidium 85.4678	38 **Sr** Strontium 87.62	39 **Y** Yttrium 88.90585	40 **Zr** Zirconium 91.224	41 **Nb** Niobium 92.90638	42 **Mo** Molybdenum 95.94	43 **Tc** Technetium (98)	44 **Ru** Ruthenium 101.07	45 **Rh** Rhodium 102.90550	46 **Pd** Palladium 106.42	47 **Ag** Silver 107.8682	48 **Cd** Cadmium 112.411	49 **In** Indium 114.818	50 **Sn** Tin 118.710	51 **Sb** Antimony 121.760	52 **Te** Tellurium 127.60	53 **I** Iodine 126.90447	54 **Xe** Xenon 131.29
55 **Cs** Cesium 132.90545	56 **Ba** Barium 137.327	57 **La** Lanthanum 138.9055	72 **Hf** Hafnium 178.49	73 **Ta** Tantalum 180.9479	74 **W** Tungsten 183.84	75 **Re** Rhenium 186.207	76 **Os** Osmium 190.23	77 **Ir** Iridium 192.217	78 **Pt** Platinum 195.078	79 **Au** Gold 196.96655	80 **Hg** Mercury 200.59	81 **Tl** Thallium 204.3833	82 **Pb** Lead 207.2	83 **Bi** Bismuth 208.98038	84 **Po** Polonium (209)	85 **At** Astatine (210)	86 **Rn** Radon (222)
87 **Fr** Francium (223)	88 **Ra** Radium (226)	89 **Ac** Actinium (227)	104 **Rf** Rutherfordium (261)	105 **Db** Dubnium (262)	106 **Sg** Seaborgium (263)	107 **Bh** Bohrium (262)	108 **Hs** Hassium (265)	109 **Mt** Meitnerium (266)	110 (269)	111 (272)	112 (277)	113	114				

58 **Ce** Cerium 140.116	59 **Pr** Praseodymium 140.90765	60 **Nd** Neodymium 144.24	61 **Pm** Promethium (145)	62 **Sm** Samarium 150.36	63 **Eu** Europium 151.964	64 **Gd** Gadolinium 157.25	65 **Tb** Terbium 158.92534	66 **Dy** Dysprosium 162.50	67 **Ho** Holmium 164.93032	68 **Er** Erbium 167.26	69 **Tm** Thulium 168.93421	70 **Yb** Ytterbium 173.04	71 **Lu** Lutetium 174.967
90 **Th** Thorium 232.0381	91 **Pa** Protactinium 231.03588	92 **U** Uranium 238.0289	93 **Np** Neptunium (237)	94 **Pu** Plutonium (244)	95 **Am** Americium (243)	96 **Cm** Curium (247)	97 **Bk** Berkelium (247)	98 **Cf** Californium (251)	99 **Es** Einsteinium (252)	100 **Fm** Fermium (257)	101 **Md** Mendelevium (258)	102 **No** Nobelium (259)	103 **Lr** Lawrencium (262)

1995 IUPAC masses and Approved Names from http://www.chem.qmw.ac.uk/iupac/AtWt/
masses for 107-111 from C&EN, March 13, 1995, p. 35
112 from http://www.gsi.de/z112e.html

Periodic Table Packet #1

Name_____ Period_____

Directions: Answer the questions with the proper information using your notes, book, and the periodic table.

1. Define a family. _____

2. What is a period? _____

3. What is the symbol for the following elements.

   a. Magnesium _____ b. Potassium _____

   c. Iron _____ d. Copper _____

4. What are the names of the following elements.

   a. C _____ b. Cl _____

   c. Au _____ d. Sr _____

5. What period are the following elements in?

   a. He _____ b. Ge _____

   c. Rb _____ d. I _____

6. What group are the following elements?

   a. Sulfur _____ b. Ca _____

   c. Iodine _____ d. Fe _____

7. Give me an atom with the following characteristics.

   a. Halogen _____ b. halogen _____

   c. Alkali metal _____ d. Boron _____

   e. Lanthanide series _____ f. Alkaline Earth metal _____

   g. Transition metal _____ h. Nobel gas _____

Periodic Table Packet #1

Name_____ Period_____

Directions: Use your Periodic table to complete the worksheet.

1. What is the atomic symbol for silver?

2. What is the atomic mass of mercury?

3. Ni is the symbol for what element?

4. The element that has the atomic number 17 is?

5. List the symbols for two transition metals.

6. Cu, Ag, and Au are all in what group #

7. Name two noble gases

8. Give the symbol for two halogens.

9. What is the symbol for element with atomic number 74?

10. What is the atomic mass of copper?

11. What is the last element in period 4?

For questions 12 - 15, label the following Key box as it should appear on your periodic table

12. _____

13. _____

14. _____

15. _____