Name: _____ Period: _____ Date: _____

Lab 5: The Periodic Table Game

HASPI Middle School/Medical Physical Science

Background

			Ti = 50	Zr = 90	? = 180		
			V = 51	Nb = 94	Ta = 182		
			Cr = 52	Mo = 96	W = 186		
			Mn = 55	Rh = 104,4	Pt = 197,4		
			Fe = 56	Ru = 104,4	Ir = 198		
		Ni =	Co = 59	Pd = 106,6	Os = 199		
H = 1			Cu = 63,4	Ag = 108	Hg = 200		
	Be = 9,4	Mg = 24	Zn = 65,2	Cd = 112			
	B = 11	Al = 27,4	? = 68	Ur = 116	Au = 197?		
	C = 12	Si = 28	? = 70	Sn = 118			
	N = 14	P = 31	As = 75	Sb = 122	Bi = 210?		
	O = 16	S = 32	Se = 79,4	Te = 128?			
	F = 19	Cl = 35,5	Br = 80	J = 127			
Li = 7	Na = 23	K = 39	Rb = 85,4	Cs = 133	Tl = 204		
		Ca = 40	Sr = 87,6	Ba = 137	Pb = 207		
		? = 45	Ce = 92				
		?Er = 56	La = 94				
		?Yt = 60	Di = 95				
		?In = 75,6	Th = 118?				

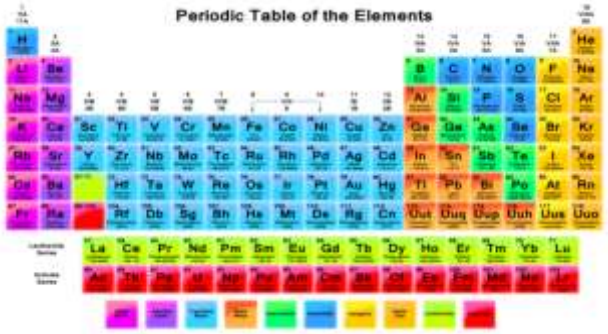
http://www.aip.org/history/curie/periodic.htm

Mendeleev's Periodic Table

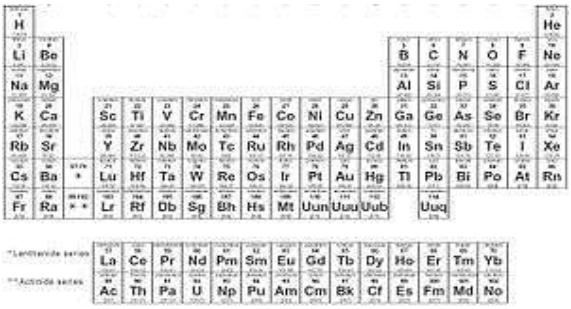
In 1869, Russian chemist Dimitri Mendeleev published a table that organized the 63 elements already discovered at the time. Although there were question marks and gaps in his table, Mendeleev knew that some elements had similar **chemical** and **physical properties**. Fluorine (F) and Chlorine (Cl), for example, were both gases that were known to form similar compounds and cause irritation in the lungs when inhaled. Mendeleev focused his observations of each element on the **melting point**, **density**, color, and **atomic mass**. Sure enough, patterns of these properties arose when the elements were arranged by increasing atomic mass, allowing Mendeleev to predict the properties of missing elements in his table.

The Modern Periodic Table

Today **The Periodic Table** consists of 118 known elements that make up all matter in the observable universe. Some scientists believe there are still undiscovered elements that could be added to the periodic table at some point in the future. The Periodic Table is organized into 18 vertical columns, called **groups**, and 7 horizontal rows, called **periods**. Although many periodic tables may look different, with some providing more information than others, they are all organized the same basic way: in order of increasing **atomic number**, or the number of protons in the nucleus.

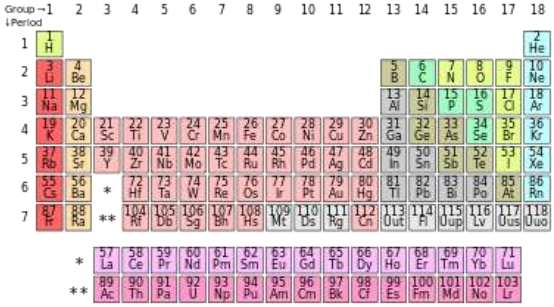


http://0.tqn.com/d/chemistry/1/0/8/d/1/PeriodicTableWallpaper.png



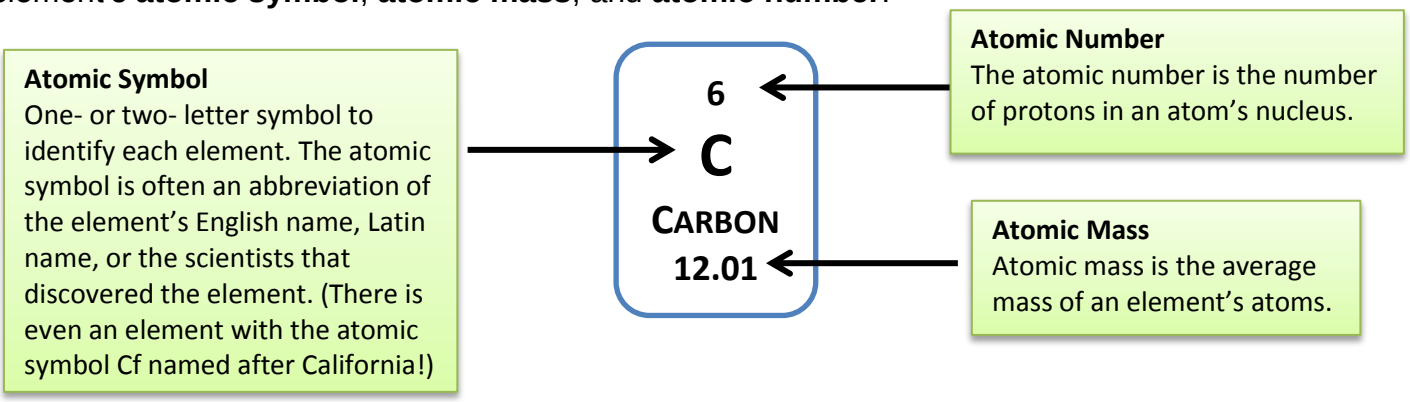
http://upload.wikimedia.org/wikipedia/commons/thumb/6/61/Periodic-table.jpg/300px-Periodic-table.jpg

http://element-collection.com/images/poster.jpg



http://upload.wikimedia.org/wikipedia/commons/thumb/9/98/Periodic_table_%28polyatomic%29.svg/375px-Periodic_table_%28polyatomic%29.svg.png

Each element is represented on the periodic table with a tile including, but not limited to, the element's **atomic symbol**, **atomic mass**, and **atomic number**.



Metals

The elements on the periodic table can be classified into three distinct groups with similar physical and chemical properties: Metals, Non-metals, and Semi-metals. **Metals** are located on the left side of the periodic table and are generally **lustrous** in appearance. Their **malleability** and **ductility** allow them to be hammered, shaped, or rolled into wires without breaking apart easily. Metals also have good **thermal** and **electrical** conductivity, allowing heat and electricity to travel through them. Chemically, metals react to other elements by losing electrons to other atoms.

Group 1 metals, known as **Alkali Metals**, are all shiny, soft, highly reactive metals at standard temperature and pressure and readily lose their outermost electron. They must be stored under oil as they all react violently with water and tarnish rapidly in air due to oxidation. The two most important Alkali Metals are found naturally only in salts like Sodium Chloride (NaCl) and Potassium Chloride (KCl). Sodium (Na) and Potassium (K), which can be found in many foods and are vital to many bodily functions like water regulation, muscle contraction and nervous system function

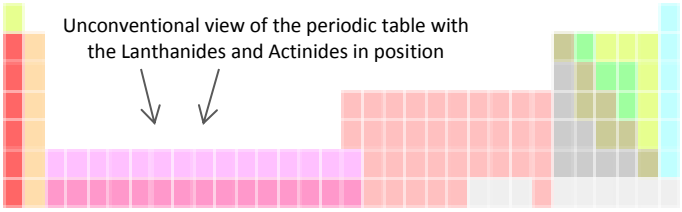
Alkaline Earth Metals in Group 2 of the periodic table are not as reactive as the neighboring Alkali Metals, but are more reactive than most other metals. Calcium (Ca) is a common Alkaline Earth Metal essential for strengthening teeth and bones. Magnesium (Mg) has many industrial uses as it is found in materials that make tools, automobiles, and airplanes. Magnesium is also an essential trace element that plays an important role in bone and muscle development.

The **Transition Metals** are the elements in Groups 3 through 12. Most of the Transition Metals are hard, shiny, and good conductors of heat and electricity. Many of these metals can be very colorful and are used to make pigments for paints. Unlike metals in Groups 1 and 2, Transition Metals have varying reactivity. Gold (Au) has long been used for currency, jewelry and even dental crowns and false teeth because of its un-reactivity (resists tarnishing, for example). On the other hand, Iron (Fe) reacts with Oxygen (O) to create rust. This reactivity is also essential for the oxygen-carrying molecule, hemoglobin, found in red blood cells.

Red blood cells contain hemoglobin, a large Iron (Fe) based molecule that is responsible for giving red blood cells its oxygen-carrying capabilities and its red color.
http://www.pbs.org/wgbh/nova/genes/fate-02.html

Only some of the elements in Groups 13 through 15 are metals and are referred to as **Mixed Group Metals**. The most familiar are Aluminum (Al), which is used for beverage cans and airplane parts because of its light weight, Tin (Sn), which is often used to plate (coat) materials to keep them from corroding, and Lead (Pb), which was once used in paint and water pipes for its durability and water-resistance, but has been found to have poisonous effects on the human body.

The **Lanthanides** and **Actinides** are the two rows of elements placed below the main part of the periodic table. This is to make the table more compact. Lanthanides are often mixed with more common metals to make **alloys**. Neodymium (Nd) is used in manufacturing headphone speakers and the magnetic properties of Gadolinium (Gd) make it an essential component in Magnetic Resonance Imaging (MRI) technology. The Actinides contain a few elements that occur naturally on Earth and others that are created artificially in laboratories. Many of these elements are highly unstable and are their radioactive properties are often targeted for uses in nuclear medicine.



The chemical and physical properties of the Lanthanides and Actinides would allow them to fit between the Alkaline Earth Metals and the Transition Metals in Periods 6 and 7. However, if they were placed within the body of the periodic table, the number of groups would increase to 32 instead of the official 18.

http://upload.wikimedia.org/wikipedia/commons/thumb/f/f3/Periodic_Table_overview_(wide).svg/244px-periodic_Table_overview_(wide).svg.png

Non-Metals

Non-metals are located on the right side of the periodic table and generally have characteristics opposite of metals. Most non-metals are poor conductors of heat and electricity. Unlike metals that are all solid at room temperature, with the exception of Mercury (Hg) that is a liquid at room temperature, non-metals are mostly gases at room temperature. Some are solids that are dull and brittle, and one, Bromine (Br), is a liquid at room temperature.

Non-metals tend to gain or share electrons when they react with other atoms. The **Halogens** in Group 17, which means "salt forming," are very reactive non-metals. Fluorine (F) is so reactive that it reacts with almost every other known substance! In small amounts, Fluorine is added to toothpastes and mouthwashes to prevent tooth decay by binding with the calcium found tooth enamel. Carbon (C) in Group 14 tends to share its four valence electrons, giving it the ability to bond with many atoms of other elements and itself. This property of Carbon is the reason why plays it forms the backbone of the four main biological macromolecules (carbohydrates, protein, fats, and nucleic acids) that all living organisms need to survive.

http://www.bianor.com/blog/wp-content/uploads/2010/08/Oxygen-Cylinder.jpg

Some non-metals form **diatomic molecules**, or molecules that consist of two atoms of the same element, in nature. Nitrogen (N) naturally exists as N_2 and makes up about 80 percent of the Earth's atmosphere. Oxygen (O) that we breathe in also exists as a diatomic molecule, O_2. The human body cannot survive without a consistent supply of Oxygen. Its ability to bond with nearly all other elements makes it the most abundant element in the Earth's crust, the second most abundant element in Earth's atmosphere, and the most abundant element by weight in the human body, mainly due to the large amount of water (H_2O) in the body.

Unlike all other elements on the periodic table, the **Inert Gases** in Group 18 are unreactive. Neon (Ne), Argon (Ar), and Xenon (Xe) are commonly used in glowing electric lights. Important documents like the Declaration of Independence and the Constitution of the United States are stored in Argon (Ar) containing glass cases to prevent further deterioration. Helium (He) is commonly used to fill balloons but is also being explored by surgeons to fill the abdomen during laparoscopic surgeries because it is better than the more commonly used carbon dioxide at preventing respiratory acidosis in some patients.

Semi-Metals

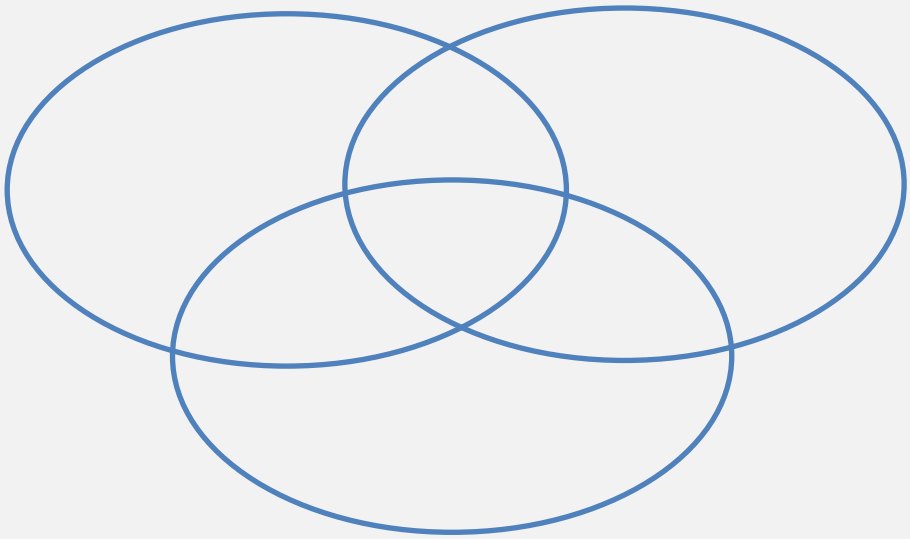
Semi-metals are positioned between the metals and non-metals. Many periodic tables will outline a **zig-zag line** on which they lie. Semi-metals can be distinguished by the properties they share with both metals and non-metals. All are solid at room temperature. Some can be hard and lustrous like metals, while some are brittle and dull like non-metals. Reactivity and conductivity depend on the individual element. Many of the semi-metals are examples of **semiconductors**, which are substances that conduct an electric current under some conditions but not under other conditions. Semiconductors are used to make lasers, transistors, and computer chips. Silicon (Si) is the most common and versatile semi-metal. It can bond with Oxygen atoms to form synthetic polymers known as silicones, which are known for their resistance to bacteria and biocompatibility, meaning they are non-toxic to living tissues. Silicones are very flexible and are often used in tubing found in many medical devices, compounds used to seal and protect wounds, and lubricants used to ease the insertion of needles and other objects into the body. Silicones have also been used in different ways for breast implants, including reconstructive surgeries after a mastectomy/breast cancer.

http://www.masterbond.com/sites/default/files/lpimages/shutterstock_79012027_300x200.gif

http://medtechinsider.com/wp-content/uploads/2008/12/wacker-silpuran.jpg

Review Questions

1. What are some differences between Dimitri Mendeleev's organization of the elements in 1869 and the modern periodic table?
2. What information can you find on each of the tiles on the periodic table?
3. Define malleability, ductility, thermal conductivity, electrical conductivity, density, melting point, and brittle.
4. Name a metal, non-metal, and semi-metal found in the human body, where it can be found, and its biological significance.
5. Complete the following Venn Diagram that compares and contrasts metals, non-metals, and semi-metals.



Name: _____ Period: _____ Date: _____

Lab 05 – The Periodic Table Game

HASPI Medical Middle School Physical Science

Materials

Game Board
Game Cards (118)
Game Pieces (4)
Die

Game Directions

This game will allow you to review the elements of The Periodic Table. Some of this information will be a review of what has been covered in class, and other information will be new. One game board is designed for 3 to 6 players.

STEP 1	Choose a game piece and place it on the periodic tile for Hydrogen (H), where the game board is labeled "START.
STEP 2	Shuffle the cards and place them face-down on the side of the game board.
STEP 3	Roll the die to see which player will move first. The highest roll wins.
STEP 4	The player who rolls the highest number will roll again and move the corresponding number of spaces "up" the periodic table. (*Remember: The periodic table progresses by increasing atomic number. When you reach the end of one period (row), you continue at the beginning of the next period.)*
STEP 5	The player who has just moved pulls the top Element Clue card and starts reading the clues one at a time, from top to bottom. The top clue is the most difficult and the clues decrease in difficulty as they go.
STEP 6	The other players can guess the answer at any time, but each player only gets <u>one</u> guess <u>per card</u>.
STEP 7	If a player guesses incorrectly, he/she is out for the remainder of those clues on the selected card.
STEP 8	The first player to guess <u>correctly</u> now rolls the die and moves.
STEP 9	This player will then draw a card and read the clues aloud.
STEP 10	If no one guesses correctly, the player reading the card rolls and moves again. Repeat Steps 5 through 9 until another player guesses correctly
STEP 11	Once a turn is over, the Element Clue card is returned to the bottom of the pile.
STEP 12	The first player to reach the periodic tile for Ununoctium (Uuo), where the game board is labeled "FINISH" wins the game. Note: a player does not need to get an exact roll to win the game.

ROLL AGAIN	If any player lands on a periodic tile designated "Roll Again," that player gets to roll the die one more time and move the corresponding number of spaces before reading the clues on the Element Clue card.
GO BACK (#) TILES	If any player lands on a periodic tile designated "Go Back (#) Tiles," that player must move back the corresponding number of spaces before reading the clues on the Element Clue card. (Follow the atomic numbers backward just as they had been advanced.)
SKIP (#) TILES	If any player lands on a periodic tile designated "Skip (#) Tiles," that player is allowed to move the corresponding number of spaces forward before reading the clues on the Element Clue card.
♦ **LANTHANIDES**	The periodic tile for the Lanthanides on the main game board counts as one space. If a player does not land on this tile while advancing, he/she will continue on with the main game board without having to move through Elements 57-70. The same rules apply when moving backward or skipping tiles. However, if any player lands on the Lanthanides tile, he/she must move his/her game piece to the periodic tile for element #57 (Lanthanum - La). On the player's next turn rolling the dice, he/she must progress through elements 57-70 before returning to element #71 (Lutetium - Lu) on the main game board.
♦ **ACTINIDES**	The same general principles apply when a player lands on or passes forward or backward across the Actinides tile: See Lanthanides above. In this case, the Actinides are Elements 89-102, beginning with element #89 (Actinum - Ac). Once returning to the main game board, the next tile will be element #103 (Lawrencium – Lr)

Resources & References

- http://www.medicalgasresearch.com/content/3/1/18
- http://www.nature.com/news/2004/040122/full/news040119-8.htm l
- http://apps.catalysts.basf.com/apps/eibprices/mp/
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Elements:

- http://en.wikipedia.org/wiki/Actinium
- http://en.wikipedia.org/wiki/Americium
- http://en.wikipedia.org/wiki/Antimony
- http://en.wikipedia.org/wiki/Argon
- http://en.wikipedia.org/wiki/Astatine
- http://en.wikipedia.org/wiki/Barium
- http://en.wikipedia.org/wiki/Berkelium
- http://en.wikipedia.org/wiki/Bismuth
- http://en.wikipedia.org/wiki/Bohrium
- http://en.wikipedia.org/wiki/Cadmium
- http://en.wikipedia.org/wiki/Californium
- http://en.wikipedia.org/wiki/Cerium
- http://en.wikipedia.org/wiki/Cesium
- http://en.wikipedia.org/wiki/Chromium
- http://en.wikipedia.org/wiki/Cisplatin
- http://en.wikipedia.org/wiki/Copernicium
- http://en.wikipedia.org/wiki/Curium
- http://en.wikipedia.org/wiki/Darmstadtium
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- http://en.wikipedia.org/wiki/Gadolinium
- http://en.wikipedia.org/wiki/Gallium
- http://en.wikipedia.org/wiki/Gold
- http://en.wikipedia.org/wiki/Hafnium
- http://en.wikipedia.org/wiki/Hassium
- http://en.wikipedia.org/wiki/Holmium
- http://en.wikipedia.org/wiki/Indium
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- http://en.wikipedia.org/wiki/Lanthanum
- http://en.wikipedia.org/wiki/Lawrencium
- http://en.wikipedia.org/wiki/Lead
- http://en.wikipedia.org/wiki/Livermorium
- http://en.wikipedia.org/wiki/Lutetium
- http://en.wikipedia.org/wiki/Meitnerium
- http://en.wikipedia.org/wiki/Mendelevium
- http://en.wikipedia.org/wiki/Mercury
- http://en.wikipedia.org/wiki/Neodymium
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- http://en.wikipedia.org/wiki/Nickel
- http://en.wikipedia.org/wiki/Niobium
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- http://en.wikipedia.org/wiki/Palladium
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- http://en.wikipedia.org/wiki/Radium
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- http://en.wikipedia.org/wiki/Ruthenium
- http://en.wikipedia.org/wiki/Rutherfordium
- http://en.wikipedia.org/wiki/Samarium
- http://en.wikipedia.org/wiki/Scandium
- http://en.wikipedia.org/wiki/Seaborgium
- http://en.wikipedia.org/wiki/Silicon
- http://en.wikipedia.org/wiki/Strontium
- http://en.wikipedia.org/wiki/Tantatum
- http://en.wikipedia.org/wiki/Technetium
- http://en.wikipedia.org/wiki/Tellurium
- http://en.wikipedia.org/wiki/Terbium
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