8th Grade Science:

Chemistry

37 Lessons

Companion printouts

Date: _____

⇋Exper→*i*m°en[t]s+

Topic: _____

- What do we think will happen (Hypothesis):

- Materials:

- What did we do (Procedure):

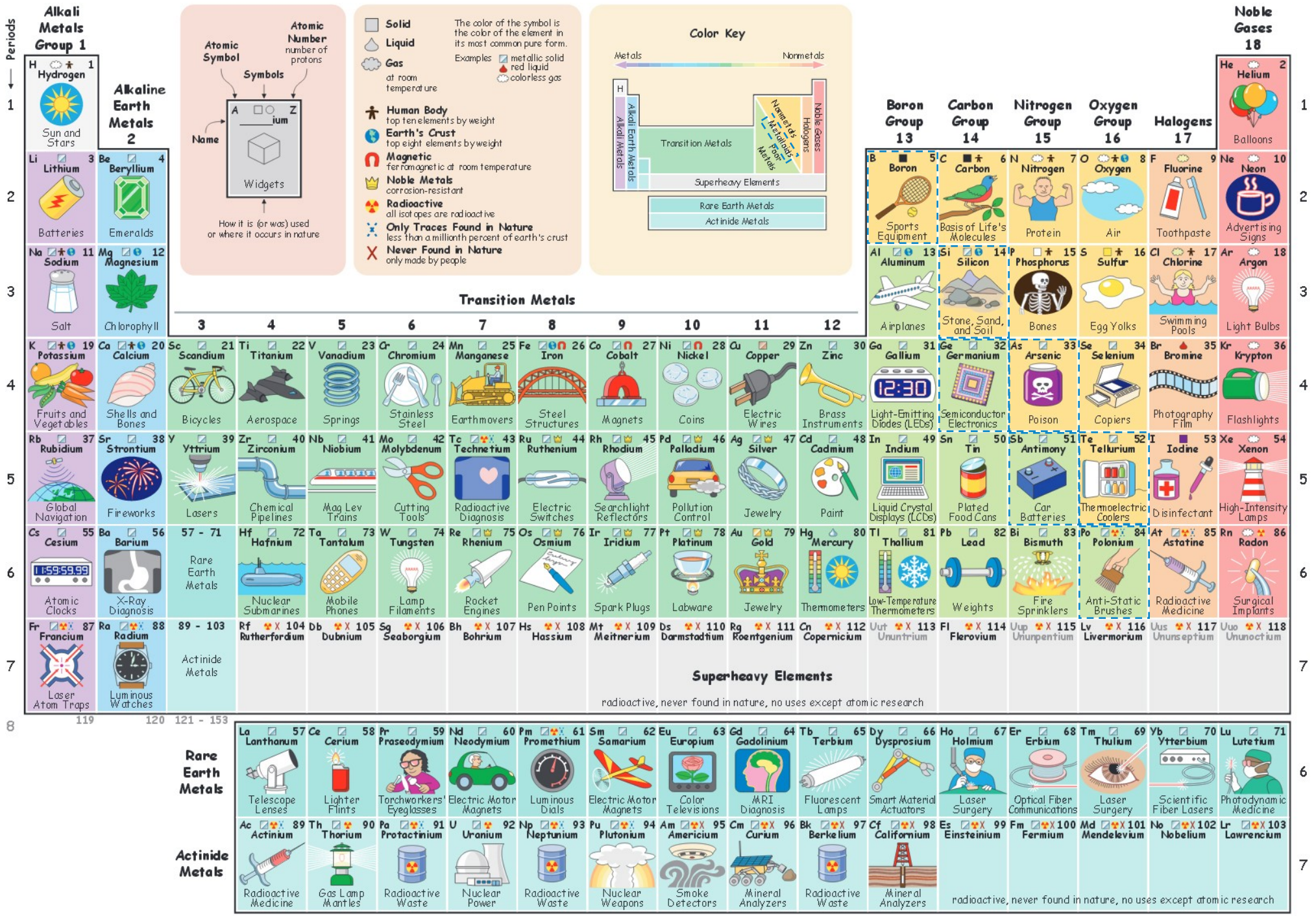
- What happened (Observations/Data):

- What did we learn (Conclusions):

Definitions:

- **Acid** - have a sour taste and dissolve many materials, in water it will release a hydrogen ion
- **Atom** - building block for all matter
- **Base** - have a bitter taste and tend to be slimy or slippery, in water it will release a hydroxide ion
- **Buoyant** - ability to float in a fluid
- **Capillary Action** - water being drawn along a solid
- **Catalyst** - A substance that increases the rate of a chemical reaction without itself being consumed or changed
- **Chemical Reaction** - when two or more molecules interact and the molecules change
- **Chemistry** - the study of matter and the changes that take place with that matter.
- **Electron** - a negatively charged part of an atom outside of the nucleus
- **Element** - A pure substance made from a single type of atom
- **Endothermic** - A reaction that lowers the temperature of the product
- **Exothermic** - A chemical reaction that gives off heat
- **Gas** - consisting of particles that will fill a container of any shape or size, as its molecules will always spread out evenly
- **Liquid** - consisting of particles that are free to flow. Has a defined volume, but not shape.
- **Matter** - anything that has mass and takes up space.
- **Mass** - the amount of matter of "stuff" is in an item
- **Molecule** - Any atoms that are connected
- **Neutron** - part of the nucleus of an atom with a neutral charge
- **Nucleus** - the positively charged center of an atom
- **Plasma** - a fourth state of matter present in stars, occurs when atoms' electrons become free
- **Proton** - part of the nucleus of an atom with a positive charge
- **Solid** - matter that retains its shape and structure when not confined.
- **Viscosity** - how resistant a liquid is to flowing.

The Periodic Table of the Elements, in Pictures



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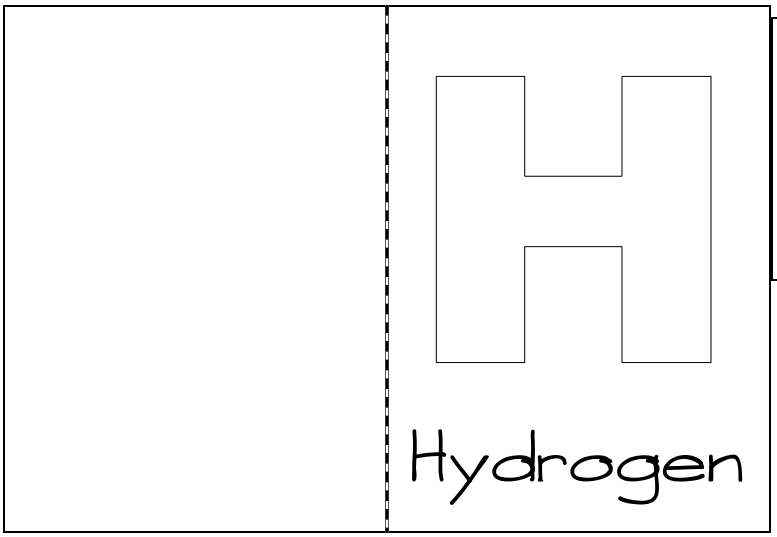

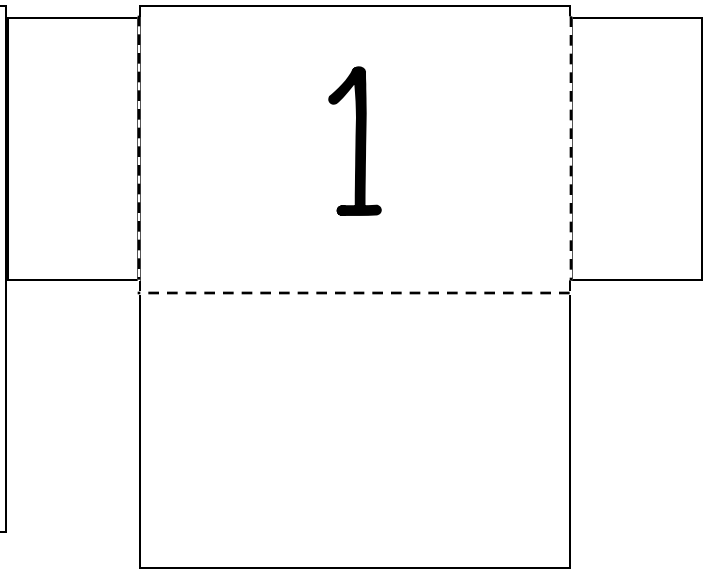

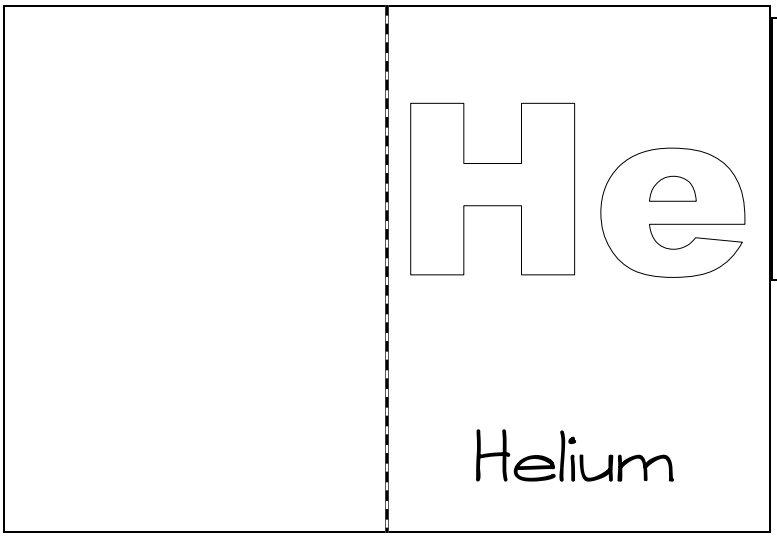

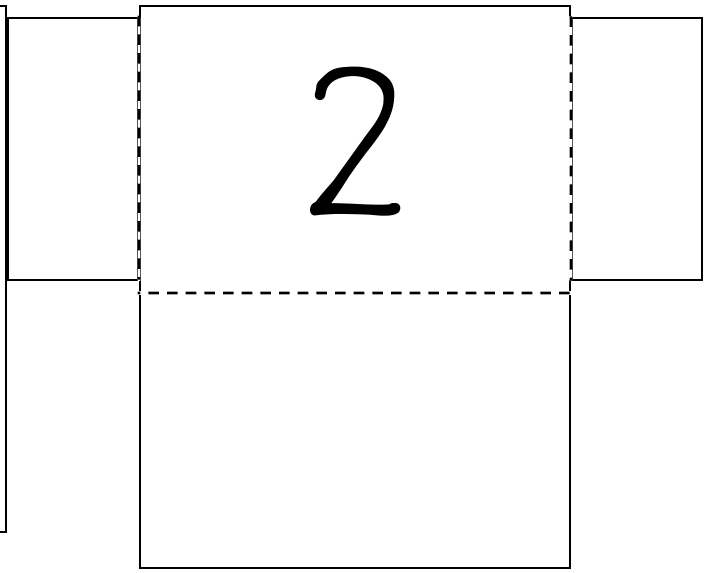

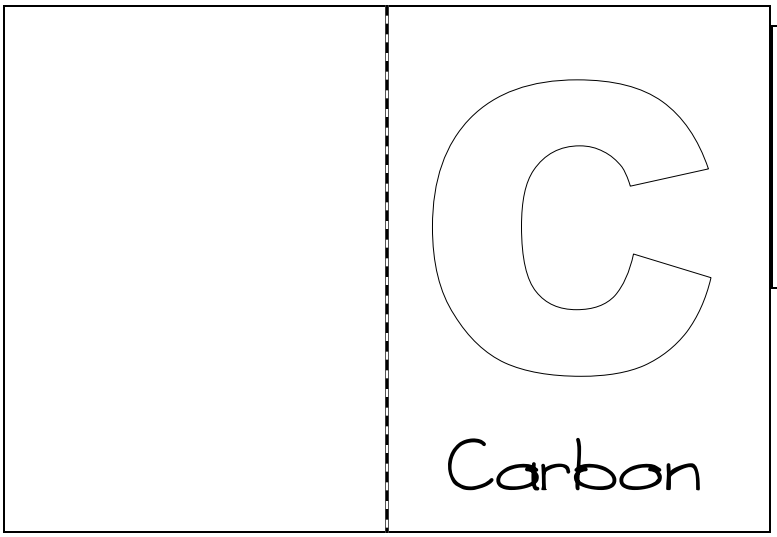

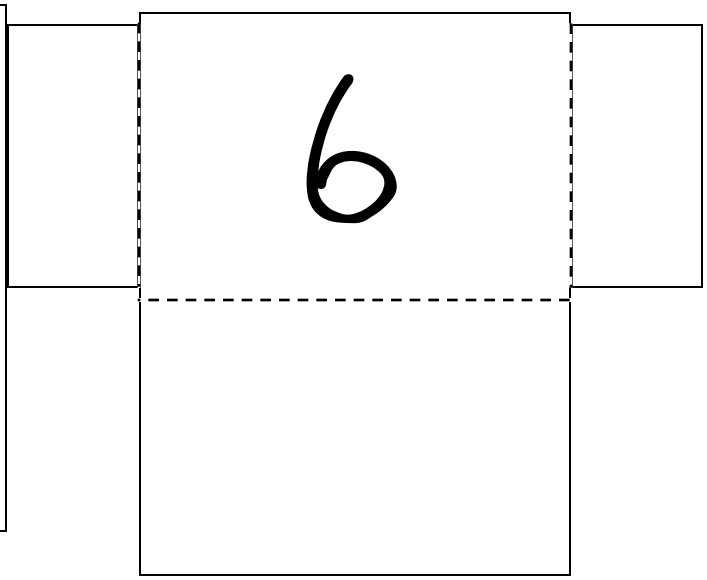

Cut along solid lines, fold along dashed lines. The pocket should be folded so the number faces out and the tabs will be glued to the solid back piece to make a pocket. Then fold the element book style and slide it into the pocket after it has been glued to the appropriate page.

O

Oxygen

8

Ne

Neon

10

Na

Sodium

11

Cut along solid lines, fold along dashed lines. The pocket should be folded so the number faces out and the tabs will be glued to the solid back piece to make a pocket. Then fold the element book style and slide it into the pocket after it has been glued to the appropriate page.

Mg

Magnesium

12

Al

Aluminum

13

Si

Silicon

14

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Cl

Chlorine

17

Ar

Argon

18

Li

Lithium

3

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Be

Berylium

4

B

Boron

5

N

Nitrogen

7

Cut along solid lines, fold along dashed lines. The pocket should be folded so the number faces out and the tabs will be glued to the solid back piece to make a pocket. Then fold the element book style and slide it into the pocket after it has been glued to the appropriate page.

F

Fluorine

9

P

Phosphorus

15

S

Sulfur

16

Cut along solid lines, fold along dashed lines. The pocket should be folded so the number faces out and the tabs will be glued to the solid back piece to make a pocket. Then fold the element book style and slide it into the pocket after it has been glued to the appropriate page.

+Separating Water ⇋Elements
Using ⇋Electrolysis

Electricity is "created" when certain chemicals react together. Water is a simple chemical made from two gases -- hydrogen and oxygen. Every molecule of water has two atoms of hydrogen for every atom of oxygen. H_2O is the chemical formula for a molecule of water.

If an electrical current is passed through water between the positive and negative poles of a battery the water is split into its two parts: oxygen and hydrogen. This process is called electrolysis.

You can use electricity to split hydrogen gas out of the water similar to the process called electrolysis.

Materials:

9 volt battery
1 cup of pure water in a clear glass
1 Tbsp. Salt
Small Electrical Cap
Matches or lighter

Process:

1. Drop the battery into the glass of water. Nothing will happen as water is a poor conductor of electricity.
2. Add the salt (sodium chloride). Mix until dissolved. Positive sodium and negative chlorine ions from the dissolved salt can carry current.
3. Place the battery back in the water. Hydrogen gas will bubble off the (larger) negative lead.
4. Chlorine gas will form on the (smaller) positive lead more slowly.
5. Place the electrical cap over the negative lead to capture the hydrogen gas. Let it sit for about a minute so the cap can fill with hydrogen gas.
6. The water may turn brown from the formation of iron oxide (rust) at the positive lead.
7. To test if the gas trapped in the cap is hydrogen light the match or lighter then lift the cap up and quickly ignite the trapped gas. Hydrogen is flammable.

+Separating Water⇋Elements
Using⇋Electrolysis

The Science:

During electrolysis, we pass an electric current through an ionic substance to break it down into simpler substances. Pure water doesn't conduct electricity, so we need to add an electrolyte.

Hydrogen is positively charged in the H_2O molecule, so it collects at the negative electrode. Salt contains chloride so you get chlorine gas at the positively charged electrode (but chlorine dissolves easily in water so it will not bubble up as quickly).

Twice as much hydrogen as is produced, reflecting the molecular composition of water.

The other two elements floating around in our experiment are oxygen and sodium. They have their own secondary reaction and form hydroxyl ions. The oxygen in the hydroxyl ions stay in the solution.

In true electrolysis systems a different solution is used and higher levels of electricity. This helps split the water molecules into hydrogen and oxygen without the secondary reaction.

Sources: California Energy Commission and Easy Science for Kids
(see a video of the experiment HERE)

⇋El°ep[h]an[t] →Too[t][h]pas+[t]e

Materials:

- Empty plastic soda bottle 16 oz. or larger
- 1/2 c. 20 volume hydrogen peroxide *(can be purchased from a beauty supply store or it can be done with regular household hydrogen peroxide, the reaction will be smaller)*
- Squirt of Dawn dish detergent
- 3-4 drops food coloring
- 1 tsp. yeast dissolved in 2 Tbsp. very warm water
- Funnel
- Pan or tub
- Safety Glasses, Smock, and safety gloves
- Splint (optional)

Process:

1. Put on safety glasses, gloves, and lab smock.

2. Stand the bottle up in the center of the cake pan. Put the funnel in the opening. Add 3-4 drops of food coloring to the peroxide and pour the peroxide through the funnel into the bottle.

3. Add the Dawn detergent to the peroxide in the bottle.

4. Pour the yeast mixture into the bottle and quickly remove the funnel.

5. The students can touch the bottle to feel any changes that take place.

6. You may place a glowing splint in the foam to test for the release of oxygen (do not drop it into the bottle). The splint will relight indicating the presence of oxygen.

The Science:

This experiment shows the decomposition of hydrogen peroxide. The yeast is a catalyst, which makes the peroxide molecule release the extra oxygen atom faster, but it is left unchanged (the yeast is still in the bottle). The bottle will feel warm to the touch as this is an exothermic reaction. The students can play with the foam as the peroxide has broken down and it is just soap and water with oxygen bubbles.

Note: *This can be done with a 2 liter bottle, 40 volume hydrogen peroxide and a full packet of yeast in 4 Tbsp. of very warm water. The reaction will be larger which means the bottle will get hotter. This should be performed by an adult.*

-Buzzing Hornet

Sound is a form of energy, and is caused by something vibrating. Molecules are vibrating back and forth at fairly high rates of speed, creating waves. Energy moves from place to place by waves. Sound energy moves by longitudinal waves (the waves that are like a slinky). The molecules vibrate back and forth, crashing into the molecules next to them, causing them to vibrate, and so on and so forth. All sounds come from vibrations.

Waves are the way energy moves from place to place. As you sit there reading this, you are surrounded by radio waves, television waves, cell phone waves, light waves, sound waves and more.

Frequency is a measure of how many times something moves back and forth. A swing, a pendulum, a leg of a walking person all have a frequency. All those things start at one place, move, and come back to the same position that they started. This moving and coming back is one vibration. The faster something vibrates, the more frequency that something has. Frequency is measured in Hertz (Hz). It is difficult for people to make microphones that are as sensitive as our ears. Our ears can pick up and tell the difference between sounds as low-pitched as 20 Hz and as high-pitched as 20,000 Hz. Some animals can hear things that are even higher or lower pitched than that.

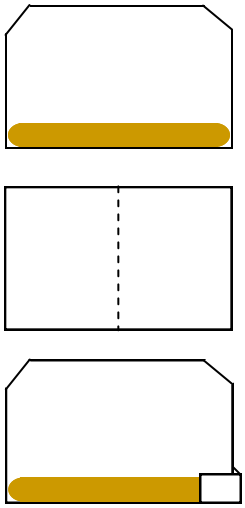
We're going to use everyday objects to build a harmonica that uses wind speed and resonance to make a buzzing sound.

Materials:

- tongue-depressor size popsicle stick
- approximately 3" x 1/4" rubber band
- 2 index cards
- 3 feet of string (or yarn)
- Scissors
- tape or hot glue

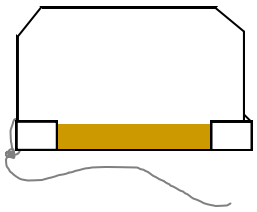
Process:

1. Take an index card and cut two corners off along a long side.
2. Run a bead of hot glue down the length of the popsicle stick and attach it to the uncut length of the index card. Right at the edge. If there is a little length past the end of the stick trim it off.
3. Take the second index card and, from a landscape orientation, cut it in half. Then fold each half 3 times (it does not matter which way you start your folds).
4. Then put a gob of hot glue on both sides of one end of the glued on popsicle stick and attach **one** of your folded up pieces. The folded up piece should be "sandwiched" over the short end of the index card.



5. Then take the other folded up piece and tie the string around the middle of the fold. Then attach it to the other end of the popsicle stick with hot glue. In a like manner as before.

6. Once the glue is dry, take your fat rubber band and wrap it around the pieces you've assembled so it is laying on either side of the popsicle stick.



7. Grab the string and whip it around your head really fast to make the hornet sound.

The Science:

Sound waves come from vibrating particles. The waves move, the particles don't. The waves carry the energy from place to place. When we speak the vibrating air molecules that make the sound of our voices in our mouths do not travel across the air into your ears. The energy from a speaking mouth is moved, by waves, across the room.

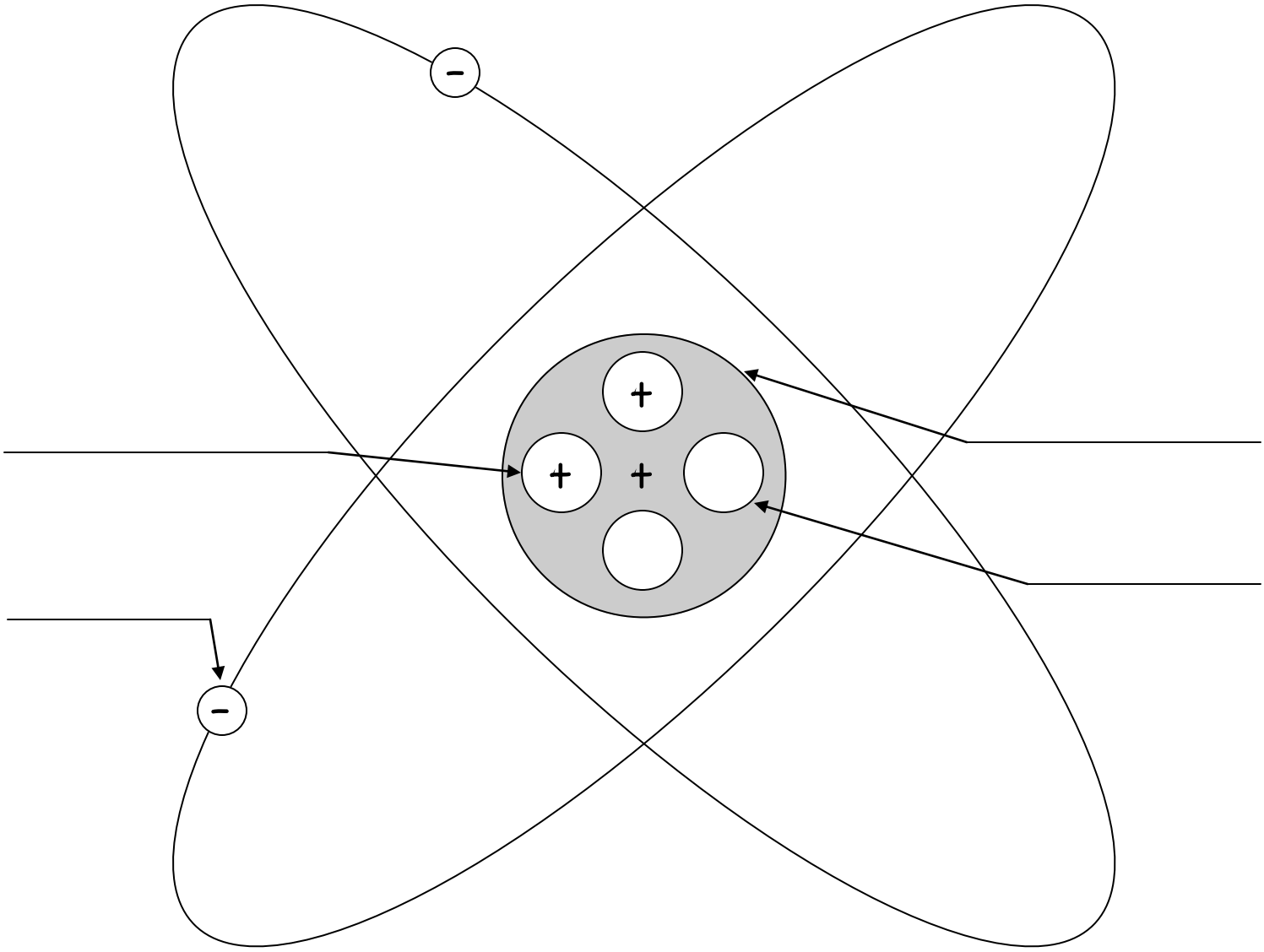
Source: Supercharged Science (click to watch a video of the experiment)

Atoms

Atoms are made of a positively charged center called the **nucleus**. It is orbited by negatively charged particles called **electrons**.

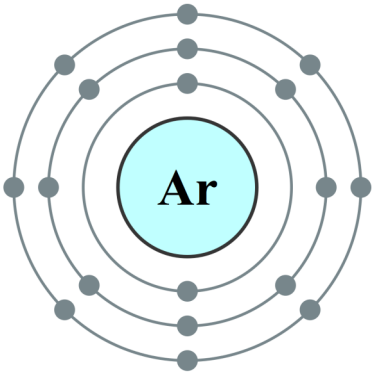
The nucleus is made of smaller particles called **protons** and **neutrons**. Protons carry a positive charge. Neutrons have no charge. Protons and Neutrons are called nucleons because they are found in the nucleus

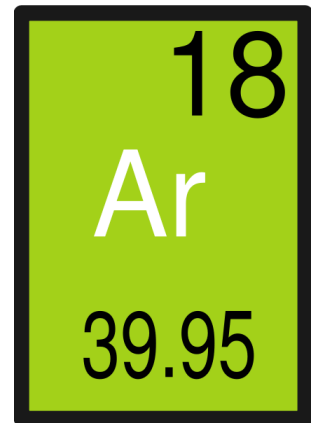
Label the parts of the atom:



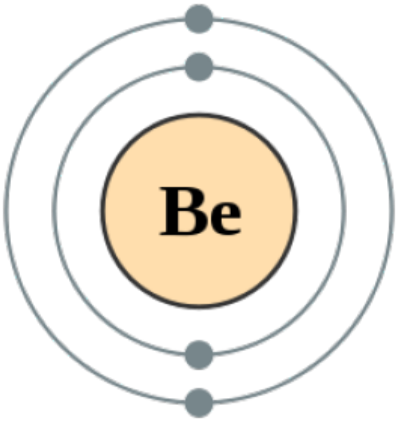
-Ber→yl°l°*ium*°, -Bor→*on*, +N*i*[t]r→*ogen*, [F]l°*uor*→*ine*, and Ar→gon

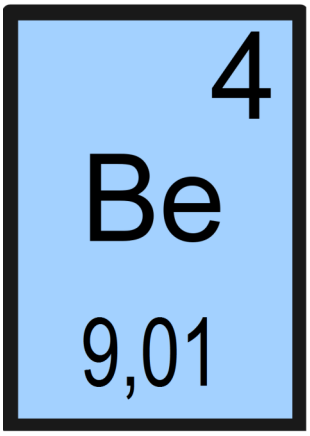
Argon is a noble gas with no smell or color. It is non-reactive because its shells are full (meaning its outer shell is filled with eight electrons). This is why it does not easily combine with other elements. It is used in welding, growing silicon crystals, and light bulbs.



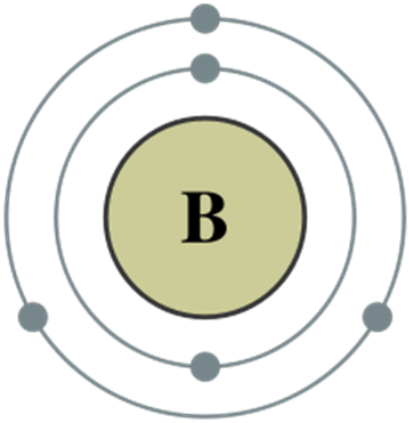


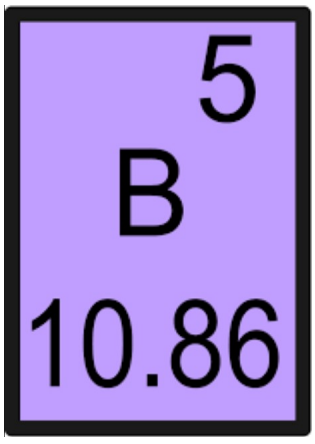
Beryllium was discovered when a scientist was working with Emeralds. It is a grey, light, hard, non-magnetic metal that is very poisonous. Beryllium is only found combined with other elements. You can find beryllium in nuclear reactors, emeralds and gems, springs, satellites & spacecraft.





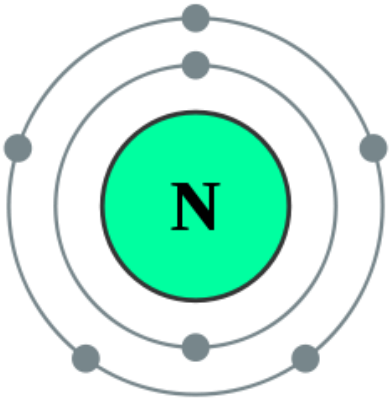
Boron is never found alone in nature. It is always part of a larger compound. It is found as a brown powder or a crystal. It is a poor conductor of electricity. Boron is found in ceramics, soaps, glass, flare guns (if it's green), and fiberglass.

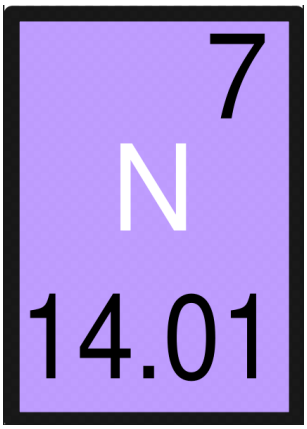




-Ber→yl°l°*iu*m°, -Bor→on, +Ni t r→ogen, F l°*uor→ine*, and Ar→gon

Nitrogen is essential in most of the compounds that allow life to exist. Almost 80% of Earth's atmosphere is made of nitrogen. It is a clear gas that has no smell. You can find nitrogen in Ammonia, to make steel, as a coolant to keep things frozen, in oil refineries, and as nutrients for plants in the soil.





Fluorine is a halogen gas. It is yellowish at room temperature and very dangerous. It is also highly reactive with other elements—it can combine with nearly any element on earth. You can find fluorine in rocket fuels, refining uranium (another element), in Freon which is used to keep your refrigerator cool, in toothpaste, and to etch glass.