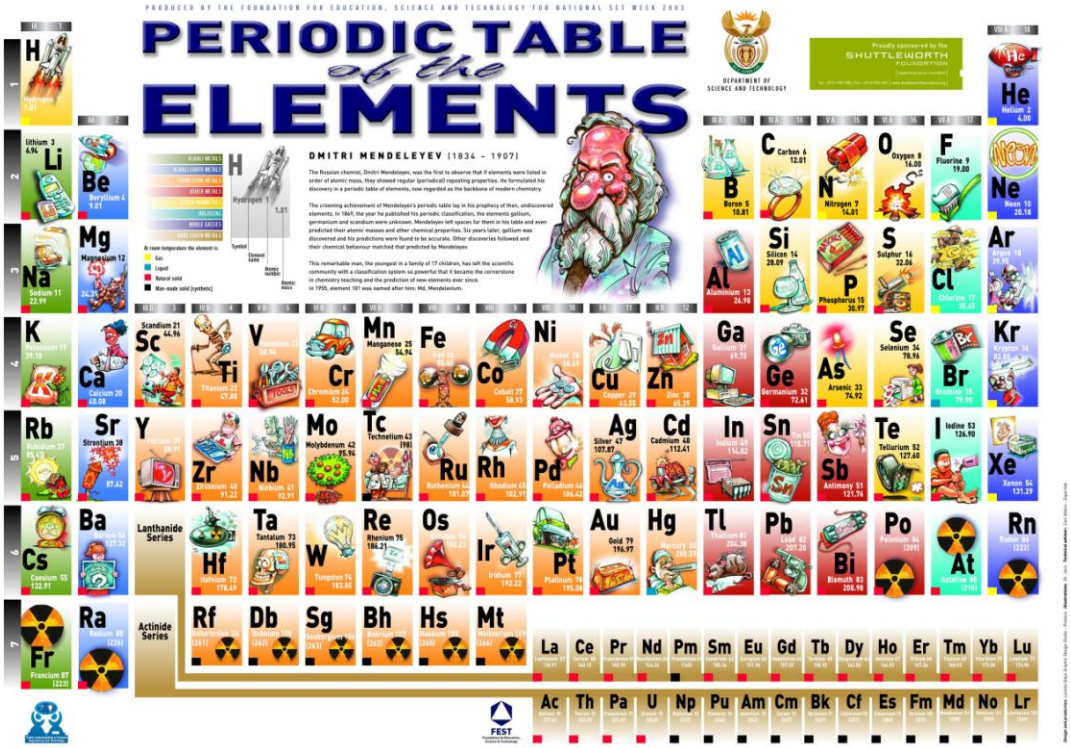
# Unit 7: The Periodic Table




Name_____

Class Website: http://pilarz.weebly.com

PS:7 TLW categorize elements of the periodic table according to common properties and explain how elements differ in structural parts and electrical charges of atoms.

# History of the Atomic Structure

## What is an atom?

**Atom**:

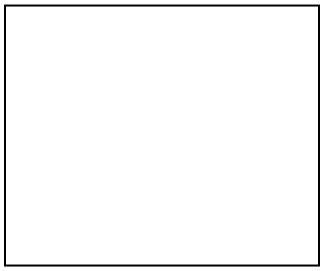
## Atomic Structure

- Atoms are composed of 2 regions:
  - _____: the center of the atom that contains the _____ of the _____ of an atom
  - _____ _____: region that surrounds the nucleus that contains the _____ of the _____ in the atom
- What's in the nucleus?
  - The nucleus contains 2 of the 3 subatomic particles:
    - _____ (p+): _____ charged subatomic particles
    - _____ (n˚): _____ charged subatomic particles
- What's in the electron cloud?
  - The 3rd subatomic particle resides outside of the nucleus in the electron cloud
    - _____ (e-): the subatomic particle with a _____ charge and relatively ____ _____
- How do these particles interact?
  - _____ and _____ live compacted in the tiny positively charged _____ accounting for _____ of the _____ of the atom
  - The _____ charged _____ are _____ and have a relatively _____ _____ but occupy a _____ _____ of space outside the nucleus

## How did we figure this out?... The history of atomic structure…

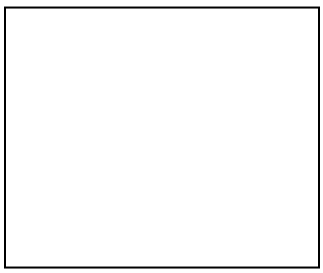
### Democritus

- His theory: matter could _____ be divided into smaller and smaller pieces forever, eventually the smallest possible piece would be obtained
- This piece would be _____
- He named the smallest piece of matter "_____", meaning " _____ ____ ____ _____"



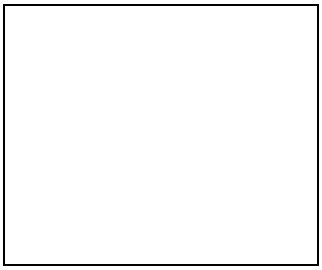
### John Dalton

- Elements consist of tiny particles called atoms
  - Looked like tiny _____ _____
- He thought elements all have the same _____ _____



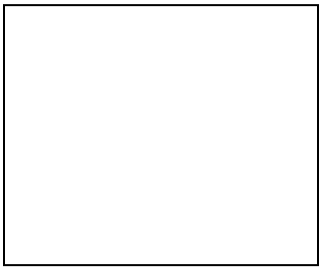
**JJ Thomson**

- Discovered the _____ with the _____ ____ _____
  - Electrons in a vacuum
- Plum Pudding Model



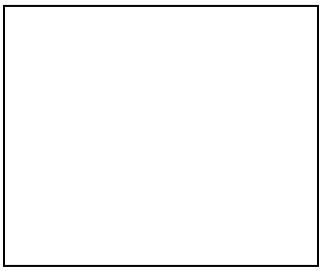
**Earnest Rutherford**

- Experimented with _____ _____
- Discovered that…
  - An atom is _____ _____ _____
  - There is a _____ _____ in an atom

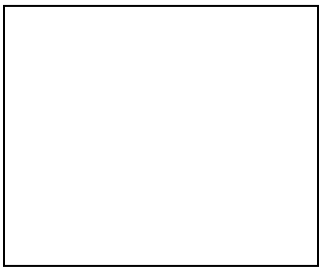


**Niels Bohr**

- Atomic theory that is there is a_____ in an atom and that _____ orbit around it
- _____!



**Now we use the _____ model (or _____ model)…**



| | Indivisible | Electron | Nucleus | Orbits | Electron Cloud |
|---|---|---|---|---|---|
| Democritus | | | | | |
| Dalton | | | | | |
| Thomson | | | | | |
| Rutherford | | | | | |
| Bohr | | | | | |
| Wave | | | | | |

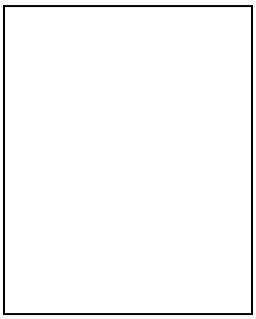
**Dmitri Mendeleev**

- _____ _____ into the periodic table

**Atomic Theory Summary Sheet**

**Atomic Structure:**

**Periodic Table:**



**P/N/E Practice for Stable Elements:**

| Element | Symbol | Atomic Number | Mass number | Number of… | | |
|---|---|---|---|---|---|---|
| | | | | Protons | Neutrons | Electrons |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**Bohr Models:**

**Lewis Dot Structures:**

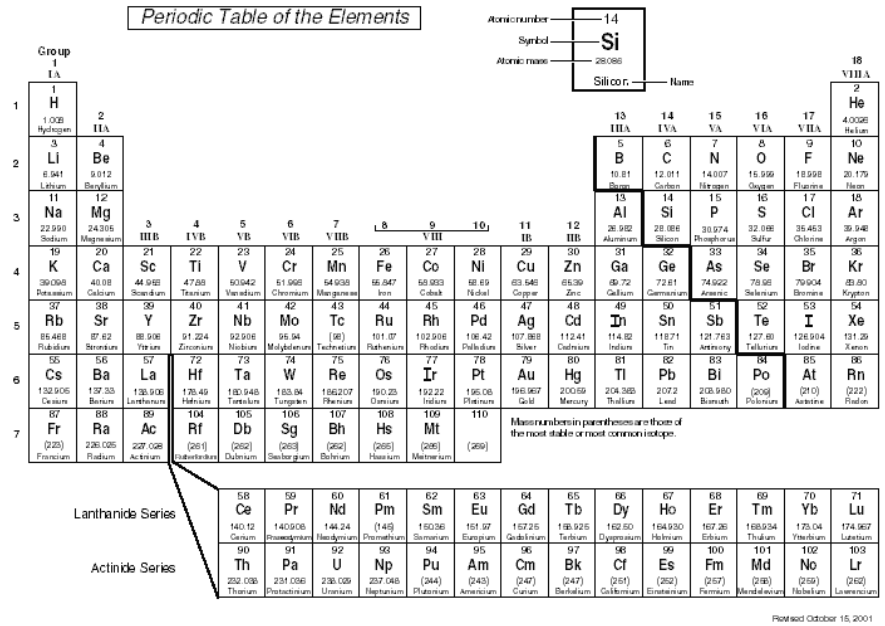
## Periodic Table Basics

### Groups:

### Periods:

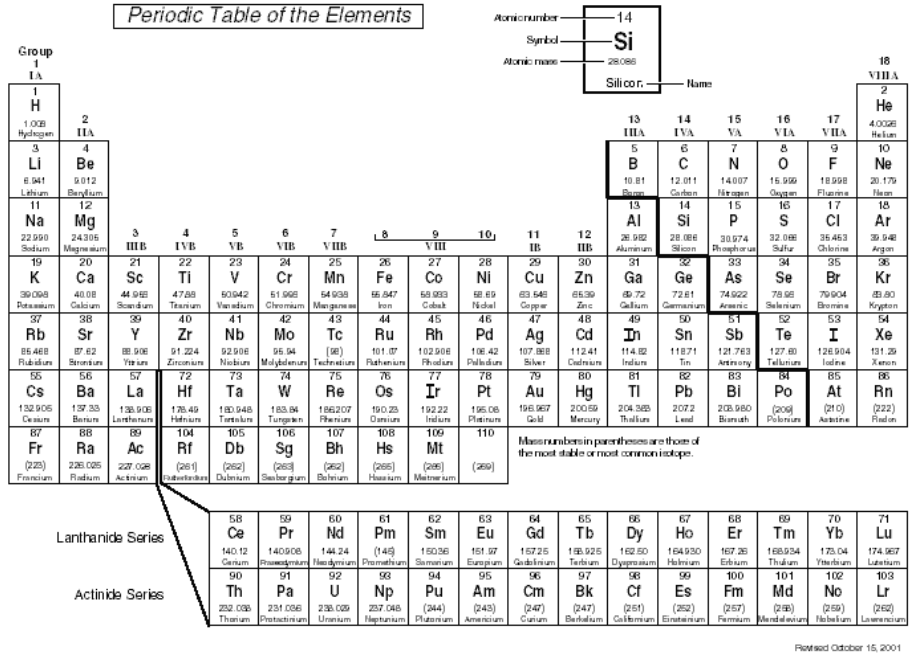
**Using the periodic table below…** Color the different types of elements, be sure to fill in the key below. Then list brief descriptions of elements that fall into these categories.

- ☐ Metals
- ☐ Non-Metals
- ☐ Metalloids




**Using the periodic table below…** Color the different families, be sure to fill in the key below Then list brief descriptions of elements that fall into these categories.

- ☐ Alkali Metals
- ☐ Alkali Earth Metals
- ☐ Transition Metals
- ☐ Halogens
- ☐ Nobel Gases



# Ions Notes and Practice

**Big Idea** → Elements will gain or lose electrons to become _____, by gaining or losing electrons atoms become _____, atoms with a charge are called _____.

Let's break it down…

**What does it mean to be stable?**

- To be stable elements must have a _____
  - The _____ energy level wants ___ electrons
  - All other will be _____ with ____
- Examples: Stable or not stable?

**What happens with the elections?**

- ➔ Quick review – remember that _____ and _____ are found in the _____ and have a _____ force holding them together… so I can't mess around with those.
- _____ will be _____ or _____ based on whatever is _____ to have a _____ outer shell…
- Examples:

**What is with the charge?**

- There are three types of atoms: _____ (no charge), _____ (positive charge), _____ (negative charge)
- Examples:

Let's work through some examples together…

| Element | Atomic Number | Bohr Model | Valance Electrons | How many lost or gained to become stable? | What is it's charge? |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
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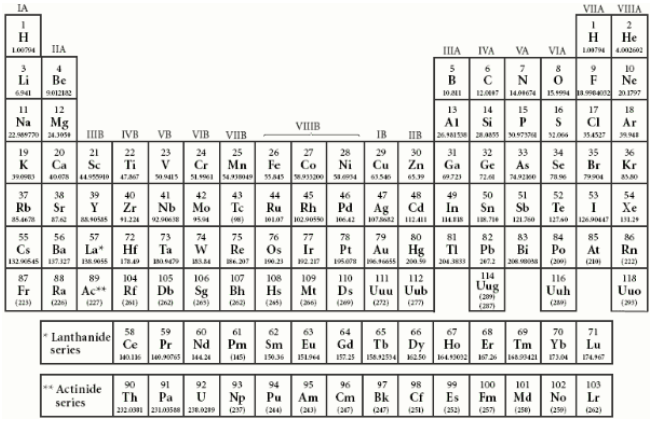
Applying this to the periodic table…



**Isotopes Notes and Practice**

An _____ is an atom that has the _____ but a _____ compared to other atoms of the _____ element

** If I change the number of _____, I change the _____ I have, so the number of _____ will never change for a particular element

**The number of _____ can change, it's called an _____

**We can write isotopes two ways (show them both below, be sure to label the mass number and atomic number where applicable)**

**Isotope Practice**

| Isotope | Number of Protons | Number of Neutrons | Number of Electrons |
|---|---|---|---|
| Neon – 20 | | | |
| Strontium - 88 | | | |
| Sodium – 23 | | | |
| Boron – 11 | | | |
| $^{19}_{9}F$ | | | |
| $^{27}_{13}Al$ | | | |
| $^{65}_{30}Zn$ | | | |
| $^{40}_{18}Ar$ | | | |

## Chemistry Practice Review: Practice finding the protons, neutrons and electrons for ions and isotopes

**Isotopes: Atoms that have the same number of protons and electrons but the number of _____ changes**

1. How do you figure out the number of protons for an isotope?

2. How do you figure out the number of neutrons for an isotope?

3. How do you figure out the number of electrons for an isotope?

| **B-10** | **C-12** | **O-18** |
|---|---|---|
| Protons: | Protons: | Protons: |
| Neutrons: | Neutrons: | Neutrons: |
| Electrons: | Electrons: | Electrons: |
| **O-16** | **B-11** | **C-14** |
| Protons: | Protons: | Protons: |
| Neutrons: | Neutrons: | Neutrons: |
| Electrons: | Electrons: | Electrons: |

**Ions: Atoms with a _____!**

1. How do you figure out the number of protons for an ion?

2. How do you figure out the number of neutrons for an ion?

3. How do you figure out the number of electrons for an ion?

| **$Fl^{-1}$** | **$Al^{+3}$** | **$N^{-3}$** |
|---|---|---|
| Protons: | Protons: | Protons: |
| Neutrons: | Neutrons: | Neutrons: |
| Electrons: | Electrons: | Electrons: |
| **$Mg^{+2}$** | **$Na^{+1}$** | **$S^{-2}$** |
| Protons: | Protons: | Protons: |
| Neutrons: | Neutrons: | Neutrons: |
| Electrons: | Electrons: | Electrons: |

# The Golden Penny Lab

Purpose: To learn common lab procedures by using lab equipment and to learn about elements by working with some common ones.

Materials: Zinc (Zn) dust, sodium hydroxide (NaOH), pre-1982 penny, tongs, 2 beakers, safety goggles, burner, spoon, forceps (tweezers), hot plate, scale

**Procedure:**

1. Use spoon to put 5 g of zinc dust into beaker.
2. Add sodium hydroxide to beaker, just enough to cover zinc.
3. Warm the mixture on a hot plate.
4. Use forceps (tweezers) to place penny in the mixture.
5. Remove the beaker from hot plate, use heat gloves to do so.
6. Observe the penny, record any observations below.
7. Remove penny from mixture with forceps and clean off in beaker of clean water, dry on paper towel.
8. Light the burner, then pick up penny with forceps and hold in flame for a couple of seconds
9. Return penny to beaker of clean water to cool off.
10. Cut penny with pliers to see inside

**Questions:**

1. What happened when you put the penny in the NaOH and Zn solution?

2. What happened when you held the penny to the flame?

3. After cutting the penny open, describe what you see.

4. Did you turn copper (Cu) into gold (Au) ?

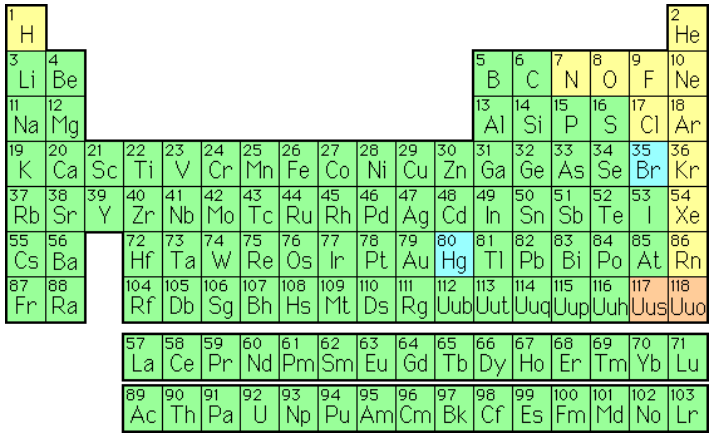
**Review Sheet – Unit 7 Atomic Theory and Periodic Table Test**

**Objective: History of the Atomic Theory**

1. What were the major discoveries of the following scientists?
    a. Dalton –
    b. JJ Thomson –
    c. Rutherford –
    d. Bohr –
    e. Mendeleev –
2. What is an atom?

**Objective: Periodic Table Arrangement**

3. Label the families of the periodic table. Transitional metals, metalloids, nonmetals, halogens, alkali metals, noble gases, alkali earth metals. Be prepared to know basic properties of each.




4. Define the following vocabulary words:
    a. Ductile –
    b. Malleable –
    c. Alloy –

**Objective: Atomic Structure**

5. Draw a picture below of an atom, in your picture label the following: nucleus, electron cloud, protons, neutrons, electrons

6. List the three subatomic particles of an atom then describe their size and charge:
    1.
    2.
    3.

7. What are valence electrons?

8. Using a drawing, depict how many electrons make up each energy level in a Bohr model.

9. Assume the following are neutral atoms (with no charge, complete the table below).

| | Symbol | Atomic Number | Mass Number | Protons | Neutrons | Electrons |
|---|---|---|---|---|---|---|
| Oxygen | | | | | | |
| Carbon | | | | | | |
| Calcium | | | | | | |
| Potassium | | | | | | |

**Objective: Ions and Isotopes**

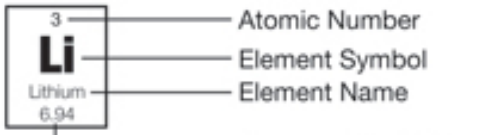
10. What is an ion?

11. What is an isotope?

12. How many protons, neutrons and electrons do the following elements have?

| | Proton | Neutron | Electron |
|---|---|---|---|
| Carbon - 14 | | | |
| Oxygen - 18 | | | |
| Magnesium - 22 | | | |
| $F^{-}$ | | | |
| $O^{2-}$ | | | |
| $Mg^{+2}$ | | | |
| $C^{+4}$ | | | |
| $Na^{+}$ | | | |

# The Periodic Table of the Elements




| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 H Hydrogen 1.01 | | | | | | | | | | | | | | | | | 2 He Helium 4.00 |
| 3 Li Lithium 6.94 | 4 Be Beryllium 9.01 | | | | | | | | | | | 5 B Boron 10.81 | 6 C Carbon 12.01 | 7 N Nitrogen 14.01 | 8 O Oxygen 16.00 | 9 F Fluorine 19.00 | 10 Ne Neon 20.18 |
| 11 Na Sodium 22.99 | 12 Mg Magnesium 24.31 | | | | | | | | | | | 13 Al Aluminum 26.98 | 14 Si Silicon 28.09 | 15 P Phosphorus 30.97 | 16 S Sulfur 32.07 | 17 Cl Chlorine 35.45 | 18 Ar Argon 39.95 |
| 19 K Potassium 39.10 | 20 Ca Calcium 40.08 | 21 Sc Scandium 44.96 | 22 Ti Titanium 47.87 | 23 V Vanadium 50.94 | 24 Cr Chromium 52.00 | 25 Mn Manganese 54.94 | 26 Fe Iron 55.85 | 27 Co Cobalt 58.93 | 28 Ni Nickel 58.69 | 29 Cu Copper 63.55 | 30 Zn Zinc 65.39 | 31 Ga Gallium 69.72 | 32 Ge Germanium 72.61 | 33 As Arsenic 74.92 | 34 Se Selenium 78.96 | 35 Br Bromine 79.90 | 36 Kr Krypton 83.80 |
| 37 Rb Rubidium 85.47 | 38 Sr Strontium 87.62 | 39 Y Yttrium 88.91 | 40 Zr Zirconium 91.22 | 41 Nb Niobium 92.91 | 42 Mo Molybednum 95.94 | 43 Tc Technetium (98) | 44 Ru Ruthenium 101.07 | 45 Rh Rhodium 102.91 | 46 Pd Palladium 106.42 | 47 Ag Silver 107.87 | 48 Cd Cadmium 112.41 | 49 In Indium 114.82 | 50 Sn Tin 118.71 | 51 Sb Antimony 121.76 | 52 Te Tellurium 127.60 | 53 I Iodine 126.90 | 54 Xe Xenon 131.29 |
| 55 Cs Cesium 132.91 | 56 Ba Barium 137.33 | 57 La Lanthanum 138.91 | 72 Hf Hafnium 178.49 | 73 Ta Tantalum 180.95 | 74 W Tungsten 183.84 | 75 Re Rhenium 186.21 | 76 Os Osmium 190.23 | 77 Ir Iridium 192.22 | 78 Pt Platinum 195.08 | 79 Au Gold 196.97 | 80 Hg Mercury 200.59 | 81 Tl Thallium 204.38 | 82 Pb Lead 207.2 | 83 Bi Bismuth 208.98 | 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 178.49 | 105 Db Dubnium (262) | 106 Sg Seaborgium (266) | 107 Bh Bohrium (264) | 108 Hs Hassium (269) | 109 Mt Meitnerium (268) | 110 Ds Darmstadtium (281) | 111 Rg Roentgenium (272) | 112 Cn Copernicium (285) | | | | | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58 Ce Cerium 140.12 | 59 Pr Praseodymium 140.91 | 60 Nd Neodymium 144.24 | 61 Pm Promethium (145) | 62 Sm Samarium 150.36 | 63 Eu Europium 151.96 | 64 Gd Gadolinium 157.25 | 65 Tb Terbium 158.93 | 66 Dy Dysprosium 162.50 | 67 Ho Holmium 164.93 | 68 Er Erbium 167.26 | 69 Tm Thulium 168.93 | 70 Yb Ytterbium 173.04 | 71 Lu Lutetium 174.97 |
| 90 Th Thorium 232.04 | 91 Pa Proactinium 231.04 | 92 U Uranium 238.03 | 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 168.93 | 102 No Nobelium (259) | 103 Lr Lawrencium (262) |

Element Report

You are going to prepare and present a PowerPoint slide show on an element. The report will be done as an election campaign against other elements. Your job is to find facts about the element you signed up for and convince the class that it is more important than the other elements you are running against. 25pts

**PowerPoint must include**:

-6-10 slides
-a works cited slide at the end listing all your information sources
-must use some type of transition from one slide to another
-each slide can have no more than 3 points/facts on it

**Content**:

-Physical description of the element and a picture
-how plentiful, where is it found , use a map
-how useful it is for humans, use pictures to help explain
-two more interesting facts you come across

Set up your presentation with the idea of pointing out how cool, important etc this element is why the class should vote for your element instead of the others. Use catchy slogans, pictures, maps etc.

Due Date:_____

# Grading Rubric

| **Assignment:** | **Points Possible:** | **Points Earned:** |
|---|---|---|
| 1. History of the Atomic Structure | 10 | _____ |
| 2. Atomic Theory Summary Sheet | 5 | _____ |
| 3. Periodic Table Basics | 5 | _____ |
| 4. Ions Notes and Practice | 10 | _____ |
| 5. Isotopes Notes and Practice | 10 | _____ |
| 6. Chemistry Practice Review (signed) | 10 | _____ |
| 7. Review Sheet (signed) | 10 | _____ |
| **Lab Grades:** | | |
| 1. The Golden Penny Lab | 10 | _____ |
| **Element Report:** | | |
| 1. Presentation Grade | 25 | _____ |