I Development of the Atomic Theory:

A. The Beginning of Atomic Theory:

1. Democritus in _____BC, called the smallest particle an _____
   a. He said an atom was _____ and _____ and made of a _____ material.
   b. He was right,,,sort of….An _____ is the _____ particle into which an _____ can be divided.

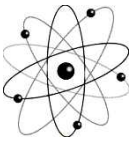
B. Dalton's Atomic Theory Based on Experiments: (almost right)

1. All substances are made of _____ which cannot be _____ ,_____ or _____.
2. Atoms of the _____element are _____alike,and atoms of _____elements are _____.
3. Atoms _____with other atoms to make new _____.

C. Thomson's Discovery of Electrons:

1. In _____ he discovered there are small _____ INSIDE the atom.
2. He discovered _____ charged particles called _____

D. Rutherford's Atomic "Shooting Gallery":



1. He shot _____ particles at gold foil, and some of them _____ back instead of going through.
2. This showed that there was a _____, extremely _____, _____ charged part in the center, a _____.
3. He calculated the nucleus was _____ times smaller than the diameter of the atom.

E. Where are the Electrons?:

1. Bohr Model:

   a. Electrons move around the nucleus in definite _____.

   b. Paths are called _____ levels, or _____.

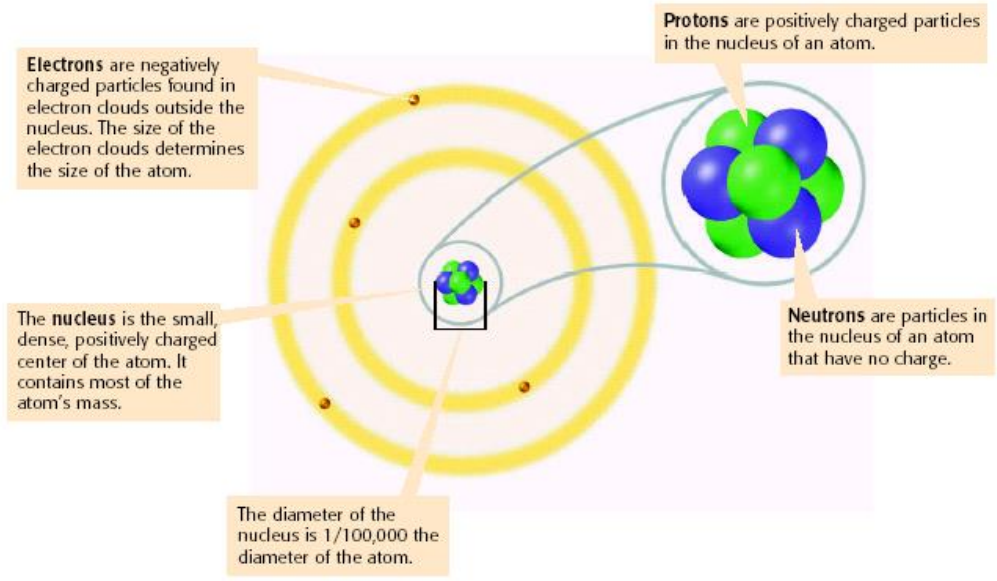
2. Electron Cloud Model:

   a. Electrons do _____ travel in definite paths.

   b. Electrons surround the nucleus in _____.

II The Atom: (has a diameter of about _____cm.)

1. What is an Atom Made Of?



a. Proton:
   - _____ charged particle in the _____
   - Each one has a mass of 1 _____ _____ _____

b. Neutron:
   - Has a _____ electrical charge.
   - It is _____ more massive than a proton.
   - But it's mass is still about _____ amu.

c. Electron:
   - has a _____ electrical charge.
   - It _____ around the nucleus.
   - It takes more than _____ electrons to equal the mass of one _____.

2. How Do Atoms of Different Elements Differ?

a. Atomic Number – the _____ of _____ in the nucleus of an atom.

b. _____ atoms of an element have the _____ atomic number.

c. Atomic Mass Number – is the _____ of the _____ and _____ in an atom.

Element	P	N	E	A. #	A. Mass
Hydrogen	1	0	1	1	1
Helium	2	2	2	2	4
Carbon	6	6	6	6	12
$Carbon^{14}$	6	8	6	6	14
Nitrogen	7	7	7	7	14
Oxygen	8	8	8	8	16

d. Carbon ^{14} is an _____ of carbon.

* An isotope of an element has the same number of _____as the element but..
* different number of _____.

I Arranging the Elements:

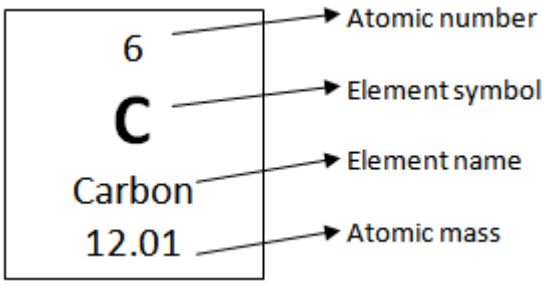
A. Discovering a Pattern:

1. Dmitri _____ discovered a_____ to the elements.
2. He arranged the elements in order of _____ _____. 1869
3. He saw a _____ that repeated every 7 elements.
4. Periodic means _____
5. With this table, he could predict _____elements.

B. Changing the Arrangement (the Modern Periodic Table):

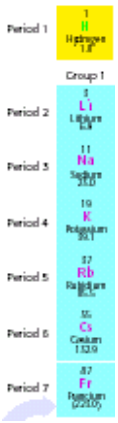
1. A few elements did _____ fit into Mendeleev's table.
2. Henry Moseley determined the _____ of _____ in an atom.

3. All elements _____ into table when arranged by _____ _____ 1914
4. Each element is in its own "box" on the table.
   a. Each element is represented by a _____.
   b. Atomic Number is the number of _____ in the element's _____
   c. Atomic Mass is the number of _____ & _____in the element's nucleus.

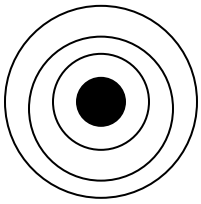


C. Decoding the Periodic Table:

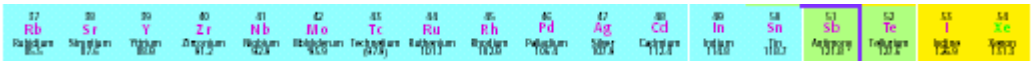
1. Element names come from many _____ such as _____ and _____.
   a. Examples:_____ and _____



2. The Periodic Table is organized into rows called _____ and columns called _____ or _____.
3. Periods: The 7 horizontal _____ in the periodic table.
   a. Properties such as _____ and _____ gradually _____ from left to right.
   b. Each periodic _____ tells you the number of _____ _____ in an atom.



   c. For example the atoms of all elements in period 3 all have _____ energy levels (shells) of electrons.
4. Groups:



   a. The 18 vertical _____ in the periodic table.
   b. A group is also called a _____.
   c. Elements in the same group have _____ chemical and physical _____.
   d. Within groups 1-2, 13-18, elements have the same number of _____ in their outer _____ _____.
   e. These outer electrons are called _____ electrons and are important in the forming of _____ to create a _____.
   f. Elements in groups _____ - _____ do not follow this rule.
   g. Another exception is the element Helium, which is found in group 18 and only has _____ electrons.

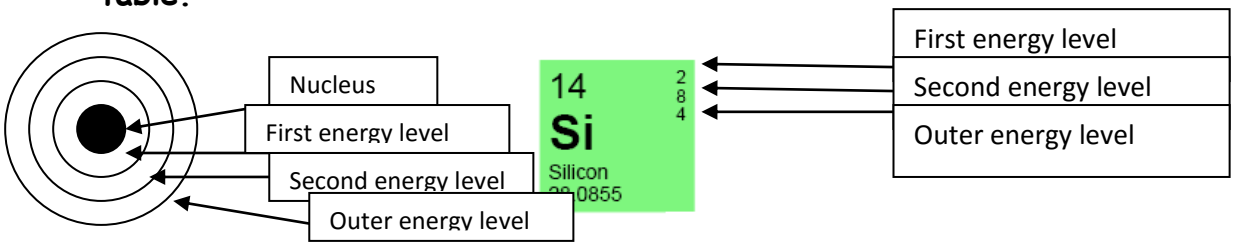
II Atom Diagrams

A. What is an Atom Diagram, aka Bohr Model?

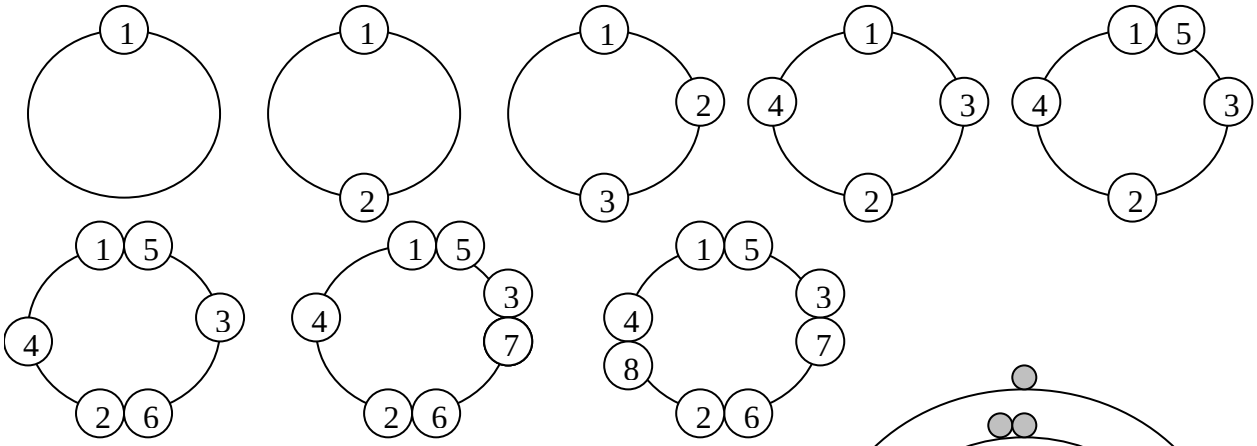
1. Atom diagrams help us visualize atoms that are too small to be seen.
2. These models also help us understand how atoms combine to form compounds.
3. Remember, the electrons do not actually travel in these circular orbits (energy levels) but are thought to be found as an electron cloud.

B. Drawing atom Diagrams:

1. Determine the number of protons, neutrons, and electrons
2. Determine the number of energy levels (AKA shells)
   a. Period (row) number= the number of energy levels
3. Find the number of electrons in each energy level by looking at the periodic table.



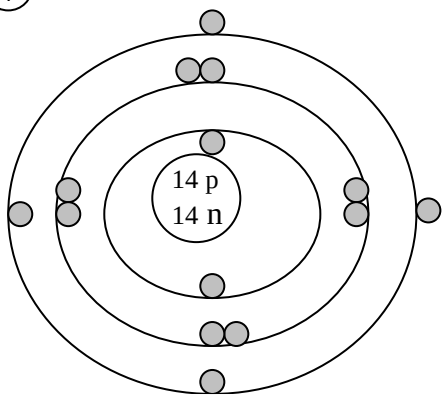
4. Draw the diagram starting from the first energy level (inside)
   a. Electrons should be filled in on top, bottom, right, left one at time and repeated until all electrons are placed in each energy level.
   b. DO NOT randomly space the electrons!



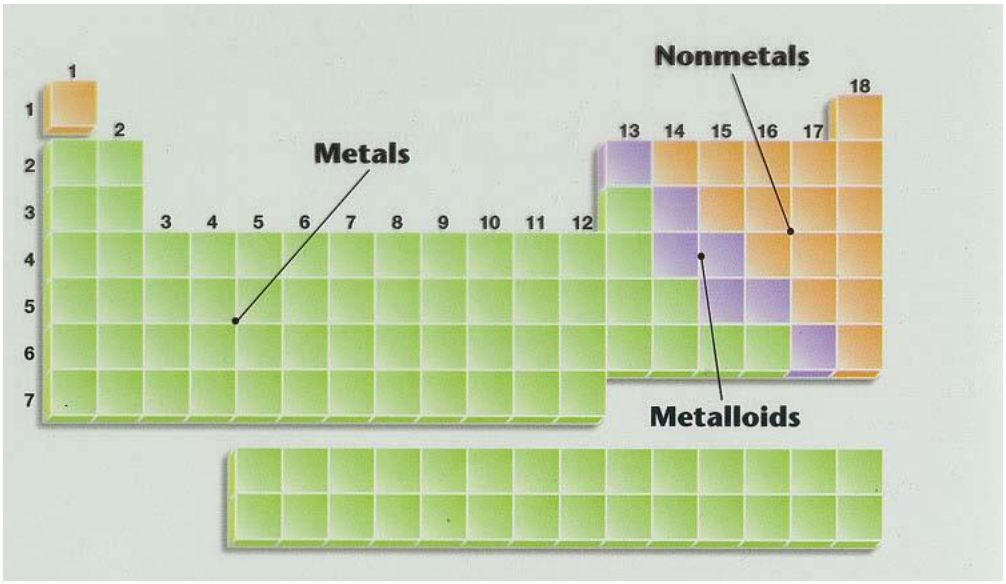
14
Si
Silicon
28.0855
2
8
4

Silicon would be drawn like this:

- -Atomic # 14 = 14 protons, 14 electrons
- -Atomic Mass = 28
- -Number of neutrons = 28-14 = 14 n
- -2, 8 and 4 are the electrons in Silicon's three energy levels.



D. The Periodic Table and Classes of Elements:

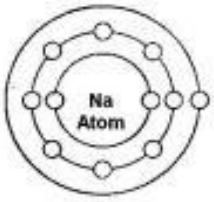


1. Elements are classified as _____,

   _____, and _____.

2. Metals: _____ elements are metals. (about 80%)

   a. They have _____ or fewer electrons in their outer _____level.



   b. Examples:_____ _____

   _____ _____ _____

   b. Characteristics:

   Most are _____ at room temperature.

   _____-_____

   _____-_____

   _____-_____

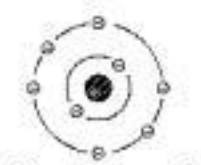
   _____-_____

   _____-_____

   They _____ _____ their outer electrons when making a compound.

3. Nonmetals:_____ elements are nonmetals. (about 20%)

   a. They have _____ or more electrons in their _____ energy level (or shell).


Oxygen atom and its electrons

   b. Examples: _____

   _____ _____ _____

   c. Characteristics:

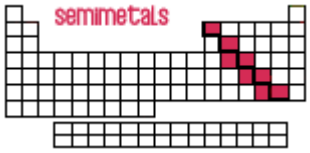
   More than _____ are _____ at room temperature.

   _____-_____

   _____-_____

   They _____ or _____ their outer electrons when making a compound.

4. Metalloids:



   a. They _____ the zigzag line (stair step) on the table.

   b. Examples: _____ _____

   _____ _____ _____


Arsenic (As 33)

   d. Characteristics:

   They have properties of _____ metals & non metals.

   _____-_____

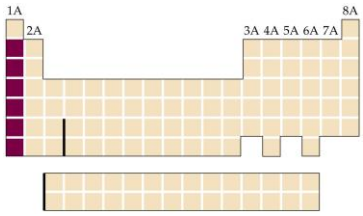
   _____

   Some are _____

   Some are _____

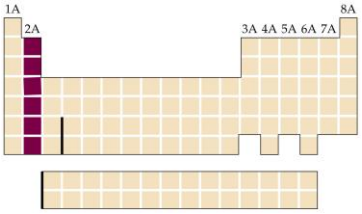
II GROUPING THE ELEMENTS:

A. Group 1 (IA) : Alkali Metals:



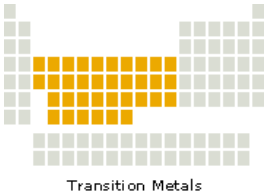
1. Have ___ electron in outer shell, so they lose it easily in compounds.
2. Properties:
   a. Most chemically _____ of all metals.
   b. _____, _____
      low _____, _____
   c. React with _____so stored in _____.
3. Examples:_____ _____ _____

B. Group 2 (IIA): Alkaline-Earth Metals:



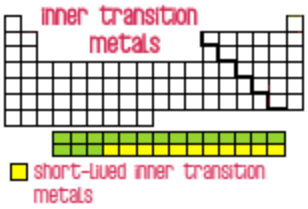
1. Have _____ electrons in outer shell, & they can give both up fairly easily.
2. Properties:
   a. _____ reactive than alkali metals.
   b. _____ , good _____ ,
      higher _____ , _____
   c. Compounds are mostly _____ (_____&_____)
3. Examples:_____ _____ _____

C. Group 3-12 (IB-VIIIB): Transition Metals:



1. They have _____ or _____ electrons in outer shell, they don't give them up as easily.
2. Properties:
   a. _____ reactive than Groups IA and IIA
   b. _____ good_____ ,
      higher _____ & _____points
   c. Compounds are _____ (_____&_____)

3. Lanthanides & Actinides:



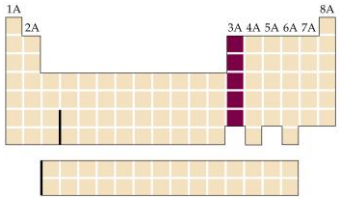
a. In 2 rows on _____so table is not too _____.

b. Lanthanides are _____ & _____metals.

c. Actinides are _____ (_____)

and any after Atomic # _____ are _____

D. <u>Group 13 (IIIA) : Boron Family:</u>



1. They have _____ electrons in their outer shell.
2. One _____ and 4 _____.
3. Properties: _____ _____
4. Aluminum:

a. _____ most abundant element in earth's crust.

b. Found only in _____.

c. _____, _____, good _____

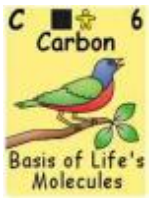
d. Used in _____, _____, _____

5. Boron: the only metalloid in this group

a. Used in _____ and _____

E. <u>Group 14 (IVA) : Carbon Family</u>:

1. They have ___ electrons in outer shell.
2. _____metal, _____metalloids, ___metals.
3. Common property: _____
4. Carbon:



a. Very important in _____ things.

b. _____% of all compounds have _____.

c. Found in: _____ _____ _____

5. Silicon:

a. _____ most abundant element in earth's crust.

b. Found in sand (silicon & _____) _____

c. Used in _____ _____ as semiconductor.

6. Other members: _____ _____ _____

F. Group 15 (VA) : Nitrogen Family:

1. They have _____ electrons in outer shell.

2. ___ nonmetals,____metalloids, ____ metal.

3. Nitrogen:

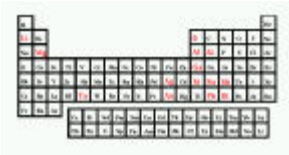
a. _____% of our air.

b. _____, _____, _____

c. nonflammable

4. Other members: _____ _____ _____ _____

G. Group 16 (VIA): Oxygen Family:



1. They have ____ electrons in outer shell.

2. _____ nonmetals, _____ metalloid, ____ metal

3. Oxygen:

a. ____ % of our air.

b. _____ abundant element in earth's _____

c. _____for life.

d. In the air: Oxygen = _____ Ozone = _____

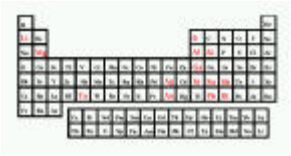
e. Oxygen compounds are called _____

Water:_____ Hydrogen Peroxide:_____

4. Sulfur:

a. _____ acid – used _____ in the chemical industry.

5. Other members: _____ _____ _____



H. Group 17 (VIIA) : Halogens:

1. They have _____ electrons in outer shell, so they only need 1 more for a complete shell.
2. Most chemically _____ of nonmetals.
3. Properties:
   a. _____
   b. _____
   c. _____
4. Chlorine:
   a. Most _____ halogen.
   b. _____, _____ gas
   c. Kills _____.

5. Uses:
   a. Fluorine:_____
   b. Iodine:_____
   c. Chlorine:_____

I. Group 18 (VIIIA) : Noble Gases:

1. They have _____ electrons in outer shell, so the outer shell is full.
2. All are _____ and _____.
3. Properties:

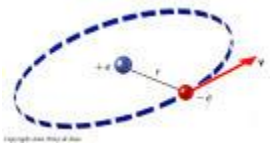
   _____ _____ _____ (inert)

4. Helium:

   a. Less _____ than air, used in _____

5. Other members: _____ _____ _____ _____ _____
6. Many used in _____

J. Hydrogen:



1. Has only _____ electron, but _____ do not match, so set apart.
2. Most abundant element in the _____.
3. Found in _____.
4. Properties:_____, _____, _____, explosive reactions with _____

Small Review: