Alchemy Unit III-1: Building Atoms gpb video: Chem 301&302 Chem Std: 1e,1h,11g
I&E: 1d,1k,1n

(34) Building Atoms

ChemCatalyst:

Q: A Bohr model of He & Be are given. List 3 similarities & 3 differences.

A:

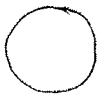
Q: How do you think a Au (gold) atom is different from a Cu (copper) atom?

A:

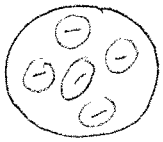
Notes:

- History of the Model of the Atom:

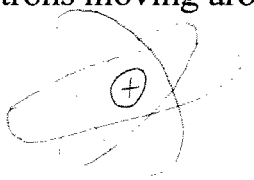
- Dalton (1806)
  solid ball



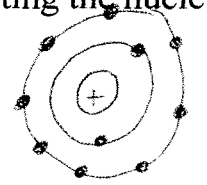
JJ Thomson (1897)
"plum pudding model"
discovered electrons
(+) pudding/(-) raisins
neutral overall



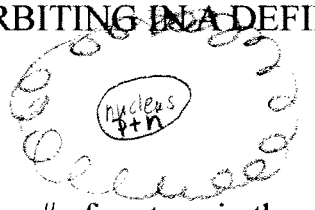
Rutherford (1911)
"nuclear model"
atom has a (+) nucleus
atom has lots of empty space
(-) electrons moving around



Bohr (1913)
protons discovered
e-'s at certain distances
in electron shells
orbiting the nucleus



Electron cloud/quantum (1932)
protons & neutrons in the nucleus
electrons in probability clouds around the nucleus
(e-'s NOT ORBITING IN A DEFINITE PATTERN)



- Atomic Number
  vs
  Atomic Mass

- Atomic Number: # of protons in the nucleus
- Atomic Mass: mass of an atom (protons + neutrons)
  * e- mass is negligible compared to p & n
  * p & n have nearly identical masses

Student Worksheet

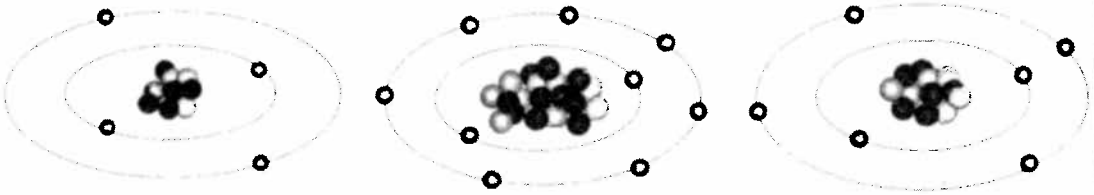
Building Atoms

Name: _____ 35

Period:_____ Date:_____

Purpose: This lesson will formally introduce you to atomic structure.

The following drawings are Bohr models for a beryllium, fluorine, and carbon atom.



Beryllium Atom **Fluorine Atom** **Carbon Atom**

Answer the following questions:

1. Label the electrons, nucleus, neutrons, and protons in the pictures above.
2. Each atom is neutral. Explain why.

3. How did you know which were the protons and which were the neutrons?

4. Is the nucleus of these atoms positive, negative, or neutral? Explain your reasoning.

5. Use a periodic table to fill in the following table:

= p⁺ + n⁰

element	chemical symbol	atomic number	# of protons	# of electrons	# of neutrons	mass number	atomic weight
beryllium	Be	4	4	4	5	9	9.01
fluorine					10		
				6		12	
chlorine					18		35.45
lead					126		
potassium	K	19	19	19	20	39	39.10

element	chemical symbol	atomic number	# of protons	# of electrons	# of neutrons	mass number	atomic weight
tin					70		
tungsten						184	183.85
			29		36		
gold					118		

6. How did you figure out the number of electrons in each atom?

7. How did you figure out the number of protons in each atom?

8. How did you figure out the number of neutrons in each atom?

9. How does the mass number of each atom compare to the atomic weight given on the periodic table?

10. Make a drawing of a nitrogen atom, similar to those given for beryllium, fluorine, and carbon.

Making Sense

If you know the atomic number of an element, what other information can you figure out about the atoms of that element?

If you know the atomic number of an element, can you figure out how many neutrons an atom of that element has? Can you come up with a close guess? Explain.

If you finish early...

Examine tellurium, Te, and iodine, I, in the periodic table. What are their atomic numbers? What are their atomic weights? Share your ideas about why iodine does not have an atomic weight that is higher than tellurium, even though its atomic number is higher. Can you find other examples?

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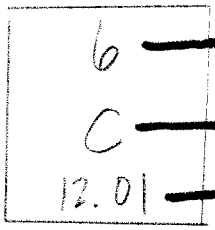
Making Sense Notes:

- What do the symbols on the P.T. mean?



6 → atomic #
C → element symbol
12.01 → avg atomic mass

- What does the Atomic # tell us?
  - Atomic # = # of protons in nucleus
    --also tells the # of electrons in a neutral atom
    Ex: neutral Carbon has atomic #6 => 6 p and 6 e-
- What is atomic mass?
  - Atomic mass = mass of atom (p + n)
    --measured in atomic mass units (amu)
    --proton = 1 amu; neutron = 1 amu; electron = 0 amu
    Ex: atomic mass of Carbon (6p + 6n) ≈ 12 amu
  - # of neutrons = ~~atomic mass~~ mass # - atomic #
- What is mass #?
  - mass # = # of p + # of n
- How could we turn our Cu penny to Au?

	Cu	Au
# protons	29	79
# neutrons	34 or 35	117 or 118
# electrons	29	79

** We would have to change the # of protons, neutrons and electrons! This doesn't happen through CHEMICAL RXNS!

Check-In:

Q: Identify the following elements

A: a) atomic # 18 = Ar
b) Has 3 e- = Li
c) Atomic mass of 16.0 = O