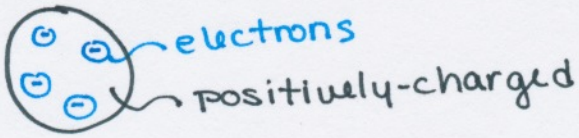
Unit 3 Test Review

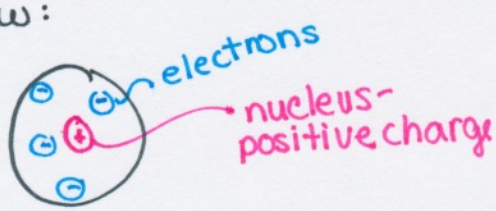
Atomic Theory

1) Democritus first came up w/ idea of atoms

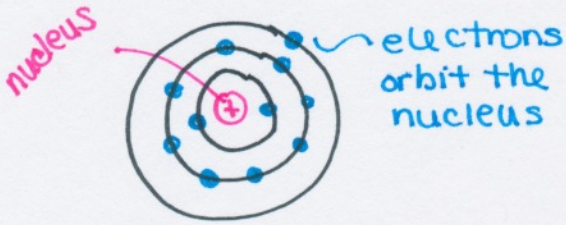
2) JJ Thomson performed the cathode ray experiment & discovered electrons. His plum pudding model is below:



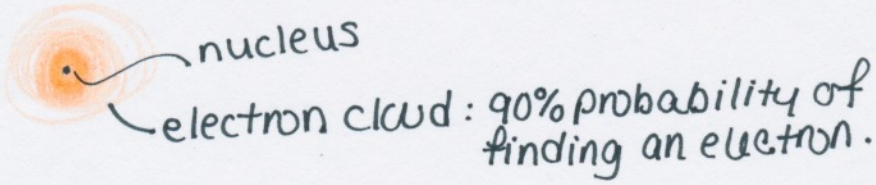
3) Ernest Rutherford performed the gold foil experiment & discovered the positively-charged nucleus. He later discovered protons & neutrons in the nucleus. His model is below:



4) Niels Bohr's planetary model



5) Erwin Schrödinger's quantum mechanical model



6) protons & neutrons → nucleus
electrons → electron cloud

7) atomic # = # protons = # electrons
mass # = # protons + # neutrons

8)

isotopic symbol	atomic #	mass #	# protons	# electrons	# neutrons
$^{19}_{9}F$	9	19	9	9	10
$^{41}_{20}Ca$	20	41	20	20	21
$^{210}_{84}Po$	84	210	84	84	$210 - 84 = 126$

9) a. N - 7e⁻ $1s^2 2s^2 2p^3$ or $[He]2s^2 2p^3$

b. Ar - 18e⁻ $1s^2 2s^2 2p^6 3s^2 3p^6$ or $[Ne]3s^2 3p^6$

c. Sc - 21e⁻ $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^1$ or $[Ar]4s^2 3d^1$

d. In - 49e⁻ $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^3$ or $[Kr]5s^2 4d^{10} 5p^5$

10) a. Au - 79e⁻ $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^9$ or $[Xe]6s^2 4f^{14} 5d^9$

b. Te - 52e⁻ $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^4$ or $[Kr]5s^2 4d^{10} 5p^4$

c. Pr - 59e⁻ $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^3$ or $[Xe]6s^2 4f^3$

d. Ds - 110e⁻ $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10} 6p^6 7s^2 5f^{14} 6d^8$ or $[Rn]7s^2 5f^{14} 6d^8$

11) a. Ca = 2 valence e⁻

b. Li = 1 valence e⁻

c. Ge = 4 valence e⁻

d. Ar = 8 valence e⁻

e. P = 5 valence e⁻

12) When an element is heated, its valence e^- absorb the energy and move up to a higher orbital or energy level. This is unstable so the valence e^- will emit a light photon in order to move back down to its ground state. The light photon is a packet of energy with a frequency in the visible light spectrum.

13) If the wavelength (λ) decreases, the frequency (ν) increases.

14) a. $c = \lambda \cdot \nu$

$c = 3.00 \times 10^{8}\ m/s$

$\lambda = ?$

$\nu = 4.3 \times 10^{15}\ 1/s$

$$\frac{3.00 \times 10^{8}\ m/\cancel{s}}{4.3 \times 10^{15}\ 1/\cancel{s}} = \frac{\lambda \cdot (\cancel{4.3 \times 10^{15}\ 1/s})}{\cancel{4.3 \times 10^{15}\ 1/s}}$$

$$\boxed{7.0 \times 10^{-8}\ m = \lambda}$$

b. $c = \lambda \cdot \nu$

$c = 3.00 \times 10^{8}\ m/s$

$\lambda = 9.8 \times 10^{-9}\ m$

$\nu = ?$

$$\frac{3.00 \times 10^{8}\ \cancel{m}/s}{9.8 \times 10^{-9}\ \cancel{m}} = \frac{(\cancel{9.8 \times 10^{-9}\ m}) \cdot \nu}{\cancel{9.8 \times 10^{-9}\ m}}$$

$$\boxed{3.1 \times 10^{16}\ 1/s = \nu}$$

c. $E = h \cdot \nu$

$E = ?$

$h = 6.626 \times 10^{-34}\ J \cdot s$

$\nu = 3.1 \times 10^{16}\ 1/s$

$$E = (6.626 \times 10^{-34}\ J \cdot \cancel{s})(3.1 \times 10^{16}\ 1/\cancel{s})$$

$$\boxed{E = \cancel{20 \times 1} \quad 2.1 \times 10^{-17}\ J}$$

15) 5 Assumptions of the Kinetic Molecular Theory

1. Gas particles move in rapid, constant, random motion.
2. Gas particles' volume is insignificant.
3. There are no attractions b/w particles in a gas.
4. Collisions b/w particles are perfectly elastic
5. The temperature is directly ~~popental~~ proportional is the particles average kinetic energy.

16) Heating the air in the balloon makes the air particles move faster so they hit the inner walls of the balloon with more force, increasing pressure on the flexible balloon which increases in volume