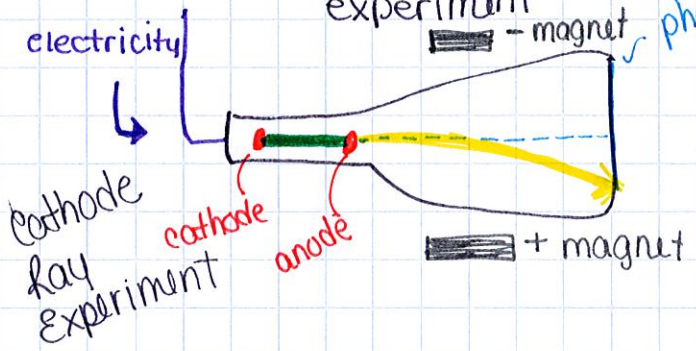
Unit 2 Test Review Key

Atomic Theory

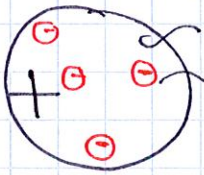
1. Democritus - 1st person to say everything is made of atoms.
2. John Dalton - brought back the idea of atoms

   Dalton's Atomic Theory
   1) All matter is made of tiny, indivisible particles, called atoms.
   2) All atoms of a given element are identical.
   3) Compounds are a combination of 2 or more elements
   4) In chemical reactions, atoms are rearranged.
3. JJ Thomson - discovered electrons (e^-) in the cathode ray experiment



When electricity is passed through the cathode tube, the light should go straight. However, when JJ put magnets around the tube, the light bent toward the positive magnet, leading JJ to the idea of tiny negative particles in the light, called electrons

Plum Pudding model

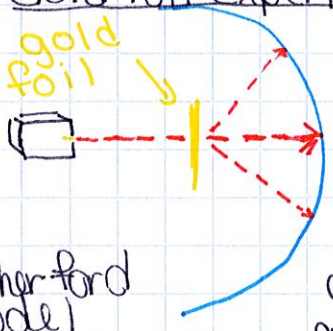


positively charged sphere

negatively charged e^-, randomly spaced.

4. Ernst Rutherford - discovered the nucleus in the atom & the protons (p^+) and neutrons (n^0) in the nucleus

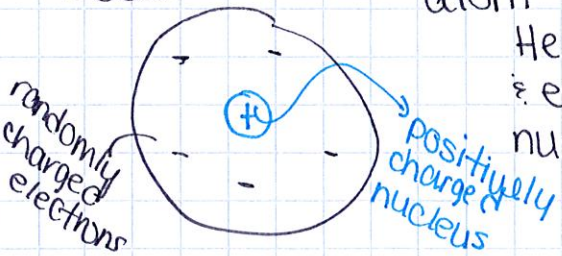
Gold Foil Experiment



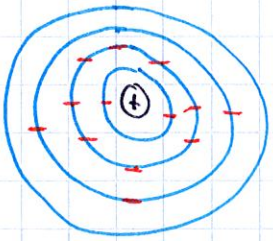
Ernst shot alpha particles (+ particles) at a piece of gold foil, expecting the particles to pass straight through. Most did, but some bounced off at odd angles, leading Ernst to theorize that those alpha particles were repelled by a tiny, positive charge in the center of the atom that he called the nucleus.

He later discovered protons in the nucleus & even later he discovered neutrons in the nucleus with James Chadwick

Rutherford model

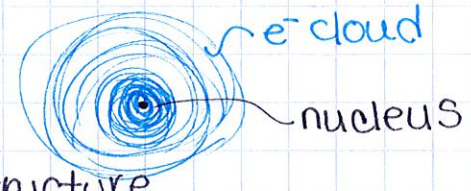


5 Neils Bohr - Planetary model



Nucleus contains protons & neutrons. Electrons circle the nucleus in orbits of specific energy.

6. Quantum Mechanical Model (Erwin Schrödinger)



Atomic Structure

2. A. protons & neutrons - in the nucleus
electrons - in orbitals in the e⁻ cloud

B atomic number (z) = #protons (p^+) = #electrons (e^-)
mass number (A) = #protons (p^+) + #neutrons (n^0)

C. isotope - atoms of the same element that have different #neutrons (n^0)

D.

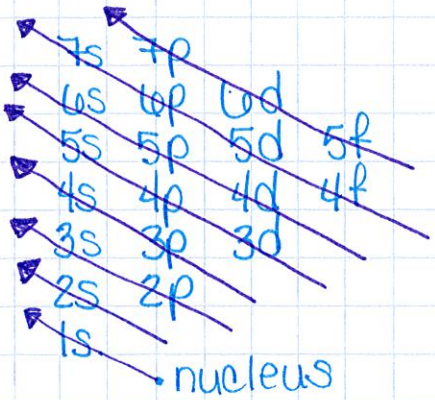
Name	Symbol	Atomic #	mass #	# p^+	# e^-	# n^0	Isotopic symbol
beryllium	Be	4	9	4	4	5	$^{9}_{4}Be$
manganese	Mn	25	56	25	25	31	$^{56}_{25}Mn$
cadmium	Cd	48	110	48	48	62	$^{110}_{48}Cd$
arsenic	As	33	75	33	33	42	$^{75}_{33}As$

E. A.M. = (23.98504amu · .7870) + (24.98584amu · .1013) + (25.98259amu · .1117)

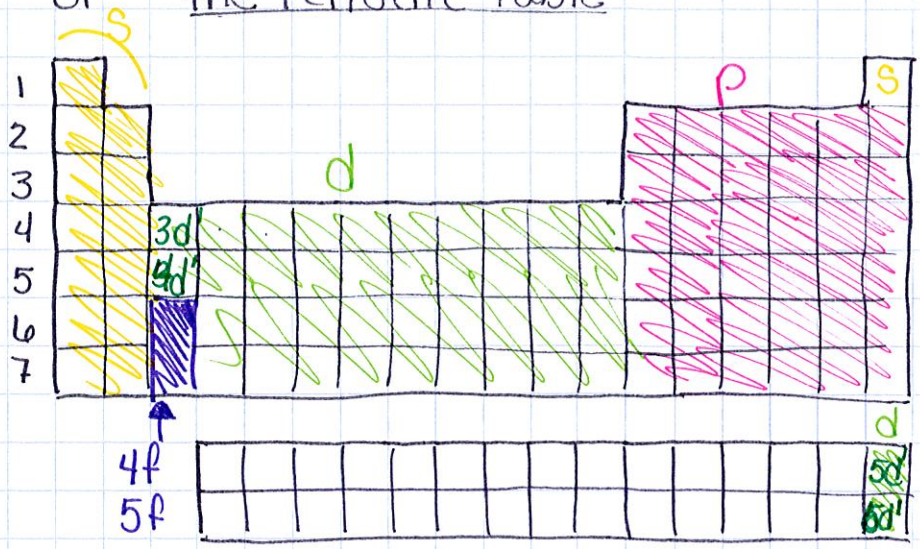
A.M. = 24.30955 amu

Remember to change % to a decimal; (move decimal pt. 2 places to the left.

3. For e⁻ configurations, you can use either:
the diagonal rule or the Periodic Table



s = 2e⁻ p = 6e⁻
d = 10e⁻ f = 14e⁻



A. O - has 8e⁻ $1s^2 2s^2 2p^4$ or $[He]2s^2 2p^4$

B. K - has 19e⁻ $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$ or $[Ar]4s^1$

C. As - has 33e⁻ $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^3$ or $[Ar]4s^2 3d^{10} 4p^3$

D. Tc - has 43e⁻ $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^5$ or $[Kr]5s^2 4d^5$

4. A. The valence e⁻ absorb energy, jump up an orbital (get excited) where they are unstable. They release photons of colored light (in the visible light frequencies we can see) to get rid of the extra energy.

B. i. $\lambda = 6.80 \times 10^{-7}\ m$
$c = 3.00 \times 10^{8}\ m/s$
$\nu = ?$

$\nu = \frac{3.00 \times 10^{8}\ m/s}{6.80 \times 10^{-7}\ m} = 4.41 \times 10^{14}\ 1/s$

ii. $c = 3.00 \times 10^{8}\ m/s$
$\lambda = ?$
$\nu = 5.25 \times 10^{14}\ 1/s$

$\lambda = \frac{3.00 \times 10^{8}\ m/s}{5.25 \times 10^{14}\ 1/s} = 5.71 \times 10^{-7}\ m$

iii $c = 3.00 \times 10^{8}\ m/s$
$\lambda = 4.85 \times 10^{-7}\ m$
$\nu = ?$
$E = ?$
$h = 6.626 \times 10^{-34}\ J \cdot s$
$\nu = 6.19 \times 10^{14}\ 1/s$

$\nu = \frac{3.00 \times 10^{8}\ m/s}{4.85 \times 10^{-7}\ m} = 6.19 \times 10^{14}\ 1/s$

$E = (6.626 \times 10^{-34}\ J \cdot s)(6.19 \times 10^{14}\ 1/s)$
$E = 4.10 \times 10^{-19}\ J$

iv. $c = 3.00 \times 10^8$ m/s
$\lambda = ?$
$\nu = 7.00 \times 10^{14}$ 1/s

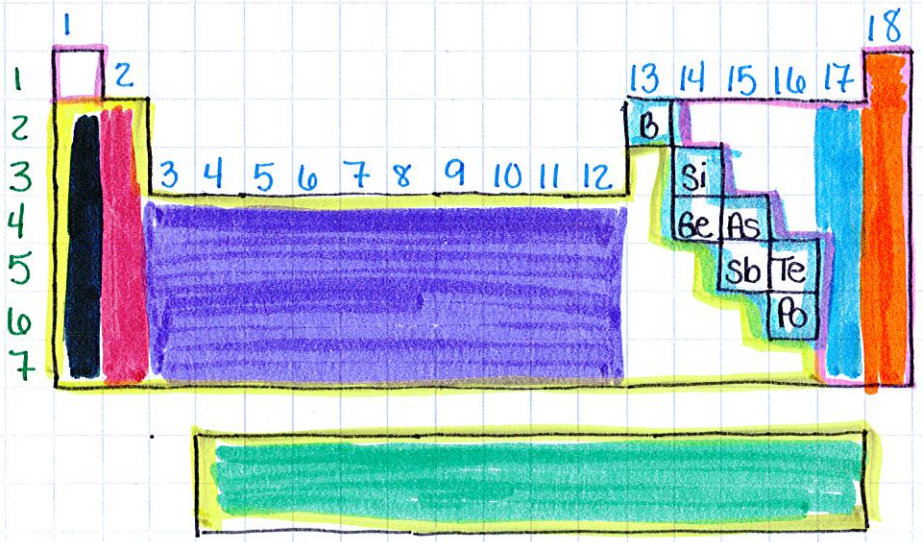
$\lambda = \frac{3.00 \times 10^8 \text{ m/s}}{7.00 \times 10^{14} \text{ 1/s}} = 4.29 \times 10^{-7}$ m

$E = ?$
$h = 6.626 \times 10^{-34}$ J·s
$\nu = 7.00 \times 10^{14}$ 1/s

$E = (6.626 \times 10^{-34} \text{ J·s})(7.00 \times 10^{14} \text{ 1/s})$
$E = 4.64 \times 10^{-19}$ J

5. A. fission: larger atom decays into smaller particles
fusion: 2 smaller particles fuse into a larger atom

Periodic Table



6. groups - numbered in blue - vertical columns
7. periods - numbered in green - horizontal rows
8. metals metalloids nonmetals

9. A. transition metals
B. noble gases
C. inner transition metals
D. halogens
E. alkaline earth metals
F. alkali metals

10. Dmitri Mendeleev - in order of increasing atomic mass
11. In order of increasing atomic #

12-13. Not on the test other than definitions for:
- atomic radius - ½ the distance b/w the nuclei of 2 bonded atoms
- ionization energy - energy needed to remove a valence e⁻
- electronegativity - measure of the attraction one atom has for another atom's e⁻