Key - Unit 1 Test Study Guide

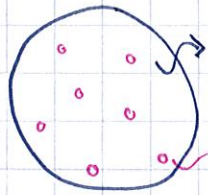
1. a) Democritus - 1st person to develop the idea that all matter is made of atoms

b.) John Dalton - brought back the idea of atoms, his atomic theory:

Dalton's Atomic Theory

(1.) Elements are made of particles, called atoms
(2) All atoms of an element are identical
(3) Atoms of 1 element are different from atoms of another element.
(4) Atoms of an element combine with other elements in simple, whole # ratios.
(5) Atoms cannot be created or destroyed in a chemical reaction, they are just rearranged.

c) JJ Thompson - completed the cathode ray experiment which proved the existence of electrons in an atom.
- Plum Pudding Model

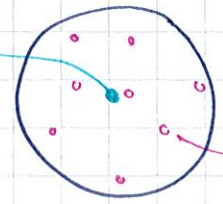


sphere of positive charge

negatively charged electrons randomly distributed w/i the atom

d) Earnest Rutherford - completed the gold foil experiment by hitting gold foil w/positively charged alpha particles, expecting them to go straight through the material. When some particles bounced off the foil at weird angles, he surmised they were being repelled by something positive in the gold foil's atoms. He named it the nucleus. He later discovered protons & neutrons inside the nucleus
- Rutherford's model

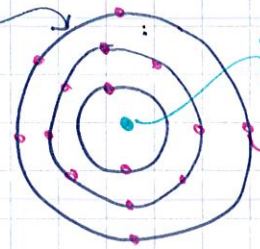
nucleus containing protons & neutrons



randomly placed electrons

e) Neils Bohr - Bohr Planetary Model

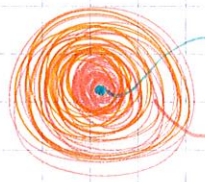
orbits or energy levels



nucleus containing protons & neutrons

electrons

f) Quantum Mechanical Model



→ nucleus containing protons & neutrons

→ electron cloud - 90% area of probability of finding an electron which exist in orbitals w/i the cloud

2. a) protons (p^+) & neutrons (n^0) - located inside the nucleus
electrons (e^-) - located inside orbitals inside the e^- cloud.
b) atomic # = # p^+ in the nucleus (It's also the # e^-)
mass # = sum of the p^+ & n^0 in the nucleus
c) isotope - atoms of an element that have different # n^0
d) do not answer, we will discuss this next unit.
e)

Name	Chemical symbol	Atomic # (Z)	Mass # (A)	# p^+	# e^-	# n^0	Isotopic symbol
beryllium	Be	4	9	4	4	9-4 = 5	$^{9}_{4}Be$
manganese	Mn	25	25+31 = 56	25	25	31	$^{56}_{25}Mn$
cadmium	Cd	48	48+62 = 110	48	48	62	$^{110}_{48}Cd$
arsenic	As	53	75	53	53	75-53 22	$^{75}_{53}As$

f. A.M. = (23.98504amu · .7870) + (24.98584amu · .1013) + (25.98259amu · .1117)
A.M. = 18.87622648amu + 2.531065592amu + 2.902255303 amu
A.M. = 24.30954738 amu
A.M. = 24.31 amu

3 a) O - 8e^- $1s^2 2s^2 2p^6$ or $[He]2s^2 2p^6$
b) K - 19e^- $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$ or $[Ar]4s^1$
c) As - 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 - 43e^- $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^5$ or $[Kr]5s^2 4d^5$
e) Sn - 50e^- $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^2$ or $[Kr]5s^2 4d^{10} 5p^2$

use the diagonal rule or the Periodic Table to do your e^- configurations.

4 a) Light is made of photons (packets of energy) riding along a wave.

b.)

i.) All light, regardless of color, travels at the same speed, the speed of light, 3.00×10^8 m/s.

ii) If frequency increases, the wavelength decreases.

iii) If frequency decreases, the energy decreases.

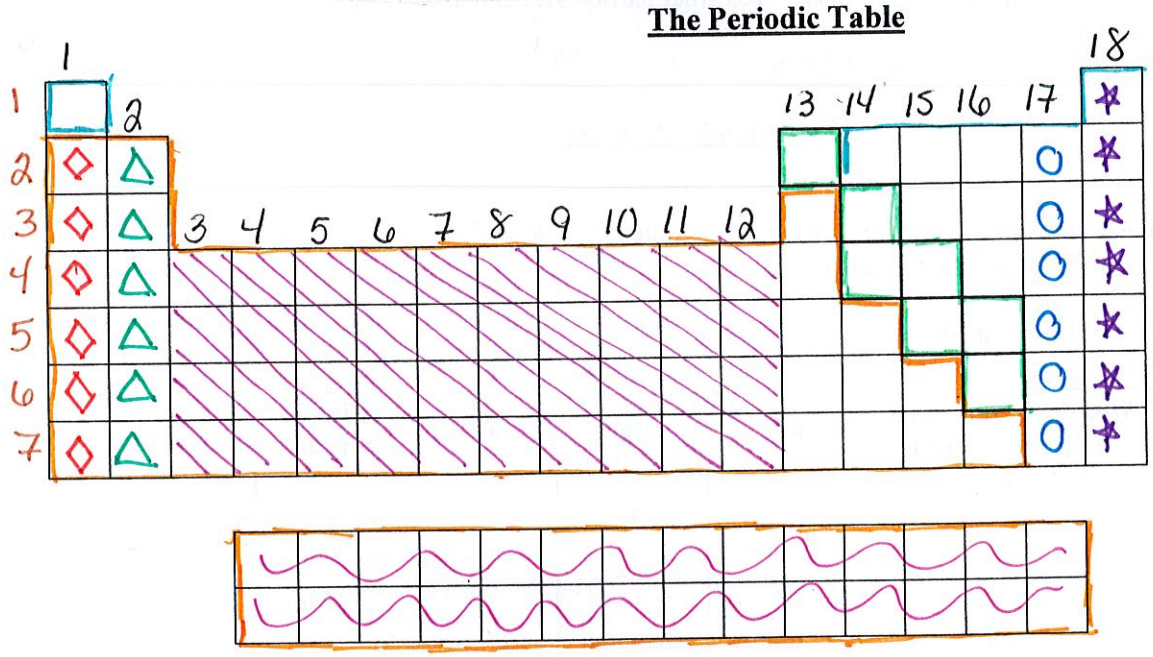
iv) orange light has a larger wavelength.

v) green light has a larger frequency.

vi) The electrons in the element's atoms absorbed the energy in the flame and jumped to a higher energy level or orbital. They are unstable there so they release photons of energy that have frequencies in the visible light spectrum.

5. Elements from helium to iron are formed by nuclear fusion in stars. Elements heavier than iron are formed when a star dies and goes supernova

The Periodic Table



6. group - vertical columns, there are 18.

7. period - horizontal rows, there are 7.

8. metals □ nonmetals □ metalloids □

9 a. transition metals

b. noble gases ✶

c. inner transition metals

d. halogens ○

e. alkaline earth metals △

f. alkali metals ◇

10. The modern Periodic Table is arranged in order of increasing atomic number.

11.

	atomic radius	ionization energy	electronegativity
down a group	increases	decreases	decreases
across a period	decreases	increases	increases

12. a) Radius decreases across a period because there is increased atomic #, increased + charge w/more protons in nucleus, and more electrons added to the same energy level or orbital. The amount of shielding does not increase, therefore the electrons w/a negative charge move closer to the protons in the nucleus.

b) Radius increases down a group because the electrons get added to higher & higher energy levels. The electrons on lower levels, closer to the nucleus, shield the valence e^- from the full + charge of the protons. Therefore, they are not as attracted to the nucleus and exist farther away from it.

c) Ionization energy increases across a period because the atoms get smaller (radius decreases). The electrons are more & more attracted to the protons in the nucleus and it will take more & more energy to remove them from the atom.

d) Ionization energy decreases down a group because the atoms get larger. The larger the atom, the farther away the valence e^- is from the nucleus & the less attraction the electron "feels" for the nucleus. This makes it easier (less energy) to remove.

e) Cr has a larger radius than Cu.

f) Cr has a larger ionization energy than W.

g)
(i) Si → Pb → Fl
(ii) Sb → Ag → Mo

h)
(i) Si → Pb → Fl
(ii) Sb → Ag → Mo

i)
(i) Fl → Pb → Si
(ii) Mo → Ag → Sb