Name _____ January 31, 2017
Period_____

$C = \lambda f$
$E = hf$
$c = 3.00 \times 10^{8}$ m/sec
$h = 6.626 \times 10^{-34}$ J • sec
Hz = $\frac{1}{\text{sec}}$ 1nm = 10^{-9}m

Bio – Chem Semester Review

Directions: Go through the checklist and make sure you are familiar with the terms and with operations. Answer the review questions ON A SEPARATE PIECE OF PAPER!!, this review is a test grade, (95%) and I will not accept late!

Checklist

- ☐ I can evaluate and solve for wavelength, and frequency using the light equation: c= ʎf
- ☐ I can find how much energy is in one photon of light by using the energy equation : E = hf
- ☐ I can define and apply what I've learned on **electronegativity, atomic radius, Coulombic attraction and ionization** energy to the periodic table, and give examples
- ☐ Other vocabulary: *electron, proton, neutron, isotope, atomic mass, average atomic mass, quantum energy level n, electron configuration, electron orbital, subatomic particles, mixtures, homogenous, heterogeneous, elements, compounds, pure substance, groups, period, alkaline earth metals, alkali metals, lewis –dot diagram, transition elements, noble gas, cation, anion, ion vs atom, ionic compound, covalent compound, conservation of mass and energy,*
- ☐ I can describe what happens when an electron moves to a higher energy level, or to a lower energy level.
- ☐ I can memorize these cations, (in the transition metals) that form multiple positive cations:
  Fe^{+2}, Fe^{+3} Ni^{+2} Ni^{+3} Au^{+}, $Au^{+3,}$ Hg^{+}, Hg^{+2}, Sn^{+2}, Sn^{+4}, Pb^{+2}, Pb^{+4}, Cu^{+}, Cu^{+2}
- ☐ Be able to determine if an element makes an ion and its charge.
- ☐ Be able to write chemical formulas, or names for ions and ionic compounds
- ☐ Mendeleev and the periodic table

Please SHOW ALL WORK on a separate piece of paper

1. The yellow light given off by a sodium vapor lamp used for public lighting has a wavelength of 589 nm. What is the frequency of this radiation?

$589 \text{ nm} \times \frac{10^{-9} \text{ m}}{1 \text{nm}} = 589 \times 10^{-9} \text{m}$ $f = c/\lambda$ $f = \frac{3.0 \times 10^{8} \text{ m/s}}{589 \times 10^{-9} \text{ m}} = 5.09 \times 10^{14}$ 1/sec

2. A certain microwave has a wavelength of 0.032 meters. (put in scientific notation first). Calculate the frequency of this microwave. 3.2×10^{-2} m so $f = c/ʎ$ $f = \frac{3.0 \times 10^{8} \text{ m/s}}{3.2 \times 10^{-2} \text{ m}} = 9.37 \times 10^{9}$ 1/sec

3. A radio station broadcasts at a frequency of 590 KHz, (You must convert from KHz to Hz, 1Hz = 1/sec) What is the wavelength of the radio waves?ʎ

$590 \text{ KHz} \times \frac{1000 \text{ Hz}}{1 \text{ KHz}} = 5.9 \times 10^{5}$1/sec $\lambda = c/f = \frac{3.0 \times 10^{8} \text{ m/s}}{5.9 \times 10^{5} \text{ 1/sec}} = 508.47$ m

4. Microwave ovens emit microwave energy with a wavelength of 12.9 cm, (remember to convert to meters). What is the energy of exactly one photon of this microwave radiation? (2 step problem)

$c = \lambda f$ we have wavelength need frequency to solve for energy. $12.9\text{cm} \times \frac{1\text{m}}{100\text{cm}}$

$f = c/\lambda = \frac{3.0 \times 10^{8} \text{ m/s}}{.129 \text{ m}} = 2.33 \times 10^{9}$ 1/sec

$E = hf = (6.63 \times 10^{-34} \text{ J*sec})(2.33 \times 10^{9} \text{ 1/sec}) = 1.54 \times 10^{-24}$ J

5. Calculate the energy of one photon of yellow light that has a wavelength of 589nm. (2 step problem)

$f = c/\lambda = \frac{3.0 \times 10^{8} \text{ m/s}}{589 \times 10^{-9} \text{ m}} = 5.09 \times 10^{14}$ 1/sec $589 \text{ nm} \times \frac{10^{-9} \text{ m}}{1 \text{ nm}} = 589 \times 10^{-9}$ m

$E = hf = (6.63 \times 10^{-34} \text{ J*sec})(5.09 \times 10^{14} \text{ 1/sec}) = 3.37 \times 10\text{-}^{19}$ J

6. Define and give examples from the periodic table for electronegativity, atomic radius, and Coulombic attraction, ionization energy:

EXAMPLE: Ionization energy: the energy needed to remove one electron from an atom. Fluorine has a higher ionization energy than sodium.

Atomic radius is the distance from the nucleus of an atom to the outer most electrons. As quantum number n increases so does atomic radius. So Cs will have a larger radius than K because Cs is in energy level 6 and K is in energy level 4.

Electronegativity: is the ability for atoms to attract electrons to themselves. Fluorine is the most electronegative element on the periodic table with an electronegativity of 4.0.

Coulombic Attraction: is the opposite force of attraction between protons and electrons. The two main variables that affect the strength of this attraction is distance and number of protons. Coulombic attraction relates inversely with atomic radius, as you move across a period atomic radius gets smaller and Coulombic attraction becomes greater, due to more protons which = stronger attraction.

7. Fill in this table: There will not be a chart on the test but you will be able to decipher information from the periodic table similar to this.

Symbol	Atomic #	# Protons	# electrons	#neutrons	Mass #	Average Atomic Mass
Ga	31	31	31	39	70	69.723
I	53	53	53	74	127	126.9044
Mn	25	25	25	30	55	54.938
Ra	88	88	88	138	226	(22

Bio-Chem Review Continued

8. Which of the following are poor conductors of heat and electricity?
   a. alkaline earth elements
   b. metals
   c. metalloids
   d. nonmetals

9. How many protons are present in Ba2+? 56

10. Which element has the lowest first ionization energy?
   a. K
   b. Li
   c. Cs
   d. Na

11. Why was Mendeleev's periodic table widely accepted?
   a. He was the first to notice a pattern of similar properties among elements.
   b. He predicted the existence and properties of undiscovered elements.
   c. He organized the first 14 known elements.
   d. His periodic table listed all of the elements in the correct order.

12. Atoms with large ionization energy values are _____.
   a. lacking valence electrons
   b. more likely to form positive ions
   c. most likely to lose their outer electrons
   d. less likely to form positive ions

13. Which of these is the electron configuration of an atom most likely to lose an electron?

a. [He] 2s2 2p5
b. 1s2 2s2 2p6 3s2 3p5
c. 1s2 2s2 2p6 3s2 3p6 4s1
d. 1s2 2s2 2p6

14. A positive ion forms when _____.

a. electrons are pushed out of the nucleus
b. an atom loses one or more valence electrons
c. an atom gains one or more valence electrons
d. electrons are pulled into the nucleus

15. What forms chemical bonds?

a. noble gases
b. atomic nuclei
c. valence electrons
d. inner-level electrons

16. How many ions are produced when one unit of sodium phosphate (Na_3PO_4) dissolves in water?

a. 2
b. 4
c. 8
d. 3

17. First quickly scan the worksheet and ***circle any metals*** (as a symbol or as a name) that are a transition metal. Then write the charges of each and the formula or name where appropriate
Remember that transition metals can have multiple ion states, so you are required to indicate the appropriate ion state in parenthesis when naming them.

a. LiF_Lithium fluoride

b. lithium chloride _ LiCl

c. Li_2O Lithium oxide

d. lithium nitride - Li_3N

e. Li_3P – Lithium phosphide

f. beryllium fluoride – BeF_2

g. BeO _Beryllium oxide

h. beryllium sulfide – Be_3S_2

i. BF_3 _Boron fluoride

j. sodium chloride – NaCl

k. $GaBr_3$ - Gallium bromide

l. calcium oxide - CaO

m. Be_3N_2 _Beryllium nitride

n. sodium fluoride - NaF

o. CuF – Copper I fluoride

p. copper (II) chloride $CuCl_2$

18. What element has the highest electronegativity?

a. Hydrogen
b. Carbon
c. Fluorine.
d. Boron

19. When an electron moves form energy level n = 4 to n = 1 the electron will _____ energy.

a. absorb
b. heat energy
c. kinetic energy
d. release energy in form of photons

20. Go through the list of vocabulary above and make sure you can describe each of the words.
electron, proton, neutron, isotope, atomic mass, average atomic mass, quantum energy level n, electron configuration, electron orbital, subatomic particles, mixtures, homogenous, heterogeneous, elements, compounds, pure substance, groups, period, alkaline earth metals, alkali metals, lewis –dot diagram, transition elements, noble gas, cation, anion, ion vs atom, ionic compound, covalent compound, conservation of mass and energy
Suggestion is to make vocabulary cards/flash cards. You can also use an App Studyblue and make flash cards on your phone.

21. With a partner come up with a pneumonic device to help you remember the ions listed that make more than one cation
Fe^{+2}, Fe^{+3} Ni^{+2} Ni^{+3} Au^{+}, $Au^{+3,}$ Hg^{+}, Hg^{+2}, Sn^{+2}, Sn^{+4}, Pb^{+2}, Pb^{+4}, Cu^{+}, Cu^{+2}
I found a decent video on Brightstorm web site : www.brightstorm.com Remembering common ions for transitions metals is the title.

Monday February 6, 2017 will be the start of the new semester. We will be getting the exam back and you will be correcting them if you wish to retake. Retake will happen on Tuesday.

Again I'm not accepting any late reviews! Make sure it is finished on time