Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Honors Chemistry Final Exam Review- Part 1: Units 1-3**

*(\*thorough completion of Parts 1 & 2 = 5% of the 15% Final Exam grade)*

**Unit 1:**

**Scientific Method**

1. What is the scientific method?
2. What are the steps to the scientific method?

**Parts of an experiment**

1. Be able to recognize the following parts of an experiment:
   1. Dependent variable
   2. Independent variable
   3. Control
   4. Data
      1. What is **qualitative** data?
      2. What is **quantitative** data?
2. What is the difference between: an observation and an inference?

**Classification of matter**

1. What is the difference between a substance and a mixture?
2. Be familiar with separation techniques
   1. What is distillation?
   2. What is filtration?
   3. What is crystallization?
3. What is the difference between a compound and an element?
4. Phases of matter
   1. What are the properties of gases?
   2. What are the properties of liquids?
   3. What are the properties of solids?

**Chemical Laws**

1. What is the Law of Conservation of Mass?
   1. Example Problem: 10.00 g of HgO was heated until it decomposed into liquid mercury and oxygen gas according to the chemical equation show below. 9.26 g of Hg was recovered. What mass of oxygen was produced? (HgO 🡪 Hg + O2)
   2. In the complete reaction of 22.99 g of sodium with 35.45 g of chlorine, what mass of sodium chloride is formed? (2 Na + Cl2 🡪 2 NaCl\_
2. What is the Law of Definite Proportions?
3. Percent by mass (% mass = mass element/mass compound x 100)
   1. Example Problems: A 78.0 g sample of an unknown compound contains 12.4 g of hydrogen. What is the percent by mass of hydrogen in the compound?
   2. A 25.3 g sample of an unknown compound contains 0.8 g of oxygen. What is the percent by mass of oxygen in the compound?

* **Unit 1: Units of measurement**

1. What are the base units for each of the following quantities?
   1. Time
   2. Length
   3. Amount of a substance
   4. Temperature
   5. Mass

**Density**

1. How is density calculated? What are the units for density?
2. Example Problems:
   1. A piece of metal with a mass of 147 g is placed in a 50 mL graduated cylinder. The water level rises from 20 mL to 41 mL. What is the density of the metal?
   2. If 103 g of ethanol is needed for a chemical reaction, what volume of ethanol would you use if the density is 0.789 g/mL?

**Data Analysis**

1. What is the difference between accuracy and precision?
2. Significant Figures – Be familiar with rules for significant figures (refer to Unit 1- Measuement PPt- remember: Atlantic and Pacific):
   1. Rules for adding and subtracting
   2. Rules for multiplication and division

* **Unit 2:**

**Early models of the atom**

1. What was Dalton’s atomic theory?
2. How did the discovery of the electron disprove part of Dalton’s atomic theory?
3. What did J.J. Thomson’s Plum Pudding model look like?
   1. What were the “plums”?
4. What subatomic particle did Rutherford’s Gold Foil Experiment prove the existence of?

**Subatomic Particles**

1. What is atomic number and how is it related to the # of protons in the nucleus?
2. Which particle has the smallest mass?
3. What is an isotope? What exactly makes isotopes of the same element different from each other?
4. What is mass number?

Sample Problems:

* 1. A certain isotope of calcium has a mass number of 46. How many neutrons does it have in its nucleus?
  2. Mercury has an atomic number of 80 and a certain isotope of mercury has 124 neutrons in its nucleus. What is the mass number of this isotope?

1. What is the difference between mass number and atomic mass?
2. How is atomic mass calculated?

Sample Problems:

* 1. The element chlorine exists as a mixture of 75% chlorine-35 and 25% chlorine-37. What is the atomic mass of chlorine?
  2. The element lithium exists as 7.5% lithium-6 and 92.5% lithium 7. What is the atomic mass of lithium?

**Radioactive Decay**

1. Why do certain atoms undergo radioactive decay? What is their ratio of protons to neutrons?
2. Three types of radioactive decay
   1. (1.)
   2. (2.)
   3. (3.)

**Unit 3:**

**Electrons and Electronic Configurations**

1. Wave properties of electrons – be able to label or identify the following:
   1. Crest
   2. Amplitude
   3. Wavelength
2. Calculations involving wavelength (c = λv). Spped of light= 3 x 108 m/sec
   1. What is the frequency of light that has a wavelength of 6.80 x 10-7 m?
   2. What is the frequency of a photon of light that has a wavelength of 221 nm?

**Electron Configurations**

1. What is the s block?
2. p block?
3. d block?
4. f block?
5. What is Hund’s rule?
6. What is Pauli exclusion principle?
7. Assign the electron configurations to the following elements:
   1. Fe d. U
   2. Cl e. Cs
   3. Au f. S
8. Identify the element represented:
   1. [Ne]3s23p4 c.) [Ar]4s23d8
   2. [Xe]6s2

**Valence electrons**

1. What are valence electrons?
2. How can the periodic table be used to identify how many valenceelectrons a particular element has?
3. Assign the valence electrons to the following elements and draw orbital diagrams for those valence electrons:
   1. Na d. Cl
   2. Rb e. Mg
   3. F f. O

**Periodic Trends**

1. Identify the periodic trends that involve an element’s ‘willingness’ to GAIN electrons
2. Identify the periodic trends that involve an element’s willingness to LOSE electrons
3. List the elements As, Cl, S, and Hg in order of:
   1. Largest to smallest atomic radius
   2. Least to greatest electronegativity
   3. Least to greatest chemical reactivity