Chemistry Unit 2: <u>Atomic Structure Unit</u>

Assignment #1

- 1. State the five parts of Dalton's Atomic Theory.
- 2. State the law of conservation of mass.
- 3. Compound Z is made by chemically combining elements X and Y. If only 4 grams of element Y were used to make 12 grams of compound Z, how many grams of element X were required?
- 4. According to the law of conservation of mass, if element A has a mass of 2 mass units, and element B has a mass of 3 mass units, what mass would be expected for compound AB?
- 5. State the law of definite proportions [composition].
- 6. A yellow material was decomposed and found to contain 22.0 g of sodium and 26.9 g of sulfur. Another yellow material was decomposed and foun to contain 11.4 g of sodium and 26.5 g of sulfur. Using the law of definite proportions, determine if these two compounds are the same substance.
- 7. State the law of multiple proportions [composition].
- 8. Who first proposed the law of multiple proportions ?

Assignment #2

- 1. What does the word atomos mean?
- 2. What is an atom?
- 3. What is the difference between an atom and a molecule?
- 4. Describe the composition of the nucleus of the atom.(ie: what subatomic particles are in the nucleus?)
- 5. What is the meaning of the term 'atomic number of an element'?
- 6. What does the mass number of an isotope indicate?
- 7. Compare/contrast the three types of subatomic particles in terms of:

location in the atom relative mass relative charge

protons

neutrons

electrons

- 8. How did the discovery of subatomic particles and isotopes affect Dalton's theories?
- 9. Concerning isotopes:
 - a. How are the isotopes of a particular element a like?
 - b. How are the isotopes of a particular element different?
- 10. Carbon–12 and carbon–13 both occur naturally in the earth. How do they differ chemically?
- 11. How many protons are in the nuclei of the following atoms?
 - a. Sulfur
 - b. Hydrogen
 - c. Phosphorus
 - d. Cadmium

- e. Calcium
- 12. How do the three isotopes of hydrogen (H–1, H–2, H–3) compare in terms of the numbers of subatomic particles in each?
- 13. Write the nuclear symbol for deuterium (H-2):
 - a. Identify the atomic number
 - b. Identify the mass number
- 14. Determine the number of protons, neutrons, and electrons in Co-59.
- 15. How many protons, neutrons, and electrons are in an atom of Ac-221?
- 16. How many electrons, neutrons, and protons are in atoms of chlorine with mass number 35?
- 17. Two isotopes of oxygen are oxygen-16 and oxygen-18. Write the nuclear symbol for each.
- 18. A particular atom of potassium contains 19 protons, 19 electrons, and 20 neutrons.
 - a. What is the atomic number of this atom?
 - b. What is its mass number?
 - c. Write the nuclear symbol for this potassium nucleus.
- 19. Yttrium was discovered in 1794. It is one of the elements used in superconductors. How many electrons, protons, and neutrons are in an atom of yttrium–88?
- 20. How many neutrons and protons are in each of the following nuclides?
 - a. carbon-14
 - b. phosphorus-32
 - c. nickel-63
 - d. iridium–192
 - e. iron-54
 - f. neptunium-235
- 21. What is the difference between atomic number and atomic mass?
- 22. In the development of the relative scale for atomic masses, what atom is used as the standard and what is its relative mass assignment?
- 23. What is the basic atomic difference between isotopes of the same element?

Assignment #3

- 1. Explain why the average atomic masses for most elements are rarely whole numbers.
- 2. What is the atomic mass of each of the following?
 - a. Oxygen
 - b. Aluminum
 - c. Copper
 - d. Gold
- 3. What would the atomic mass of an atom be if its mass is approximately:
 - a. one-third that of C-12
 - b. one-half that of C-12
 - c. 12 times that of C–12
 - d. 4.5 times as much as C-12
- 4. Choose the integer (whole–number) quantities from the following list:
 - a. atomic number
 - b. atomic mass

- c. mass number
- 5. If your chemistry grade is broken down so that 55% of it is based on tests, 25% on labs, 10% quizzes, and 10% homework, what would your weighted average score be if your averages for each type of assignment were as follows? tests=83, labs=94, quizzes= 96, homework= 95
- 6. Bromine–79 comprises 50.54% of naturally occurring bromine, and Bromine–81 comprises 49.46%. The mass of Br–79 is 78.9183 amu. The mass of Br–81 is 80.9163. What is the atomic mass of bromine?
- 7. Element X has two naturally occurring isotopes. One isotope has a mass of 35.0 amu and comprises 75.4% by mass of the element. The other isotope has a mass of 37.0 amu.
 - a. What is the atomic mass of element X?
 - b. What is the name of element X?

Assignment #4-Nuclear Chemistry

- 1. What is nuclear radiation and list the three types. Which has the strongest penetrating power?
- 2. What is radioactive decay? How is it different from nuclear radiation?
- 3. Define Half Life.
- 4. A patient is administered 20 mg of iodone-131. How much of this isotope remains after in the body after 40 days if the half life of I-131 is 8 days?
- 5. What was the original mass of a substance if after 7.5 days 12 grams remains? [the half life of this substance is 2.5 days.]
- 6. Manganese-56 is a beta emitter with a half life of 2.6 hours. What mass of Mn-56 in a 1 mg gram sample remains after 10.4 hours?
- 7. The mass of Cobalt-60 in a sample is found to decrease from 0.8 grams to 0.1 grams in a period of 15.75 years. What is the half life of Co-60 ?
- 8. The half life of Pa-234 is 6.75 hrs. How much of a 100 gram sample remains after 27.0 hrs.?
- 9. The half life of Rn-222 is 3.823 days. What was the original mass of Rn-222 if 0.0500 grams remains after 7.646 days?

Assignment #5- Nuclear Chemistry

- 1. Define fission
- 2. Define fusion
- 3. Differentiate between fission and fusion in terms of: where they occur, the energy given off, and the nuclear waste generated.
- 4. Define chain reaction.
- 5. What is Einstein's equation and what does it each variable stand for?
- 6. What is the purpose of a nuclear reactor?
- 7. What are some control methods in place to control the neutrons available for a chain reaction?