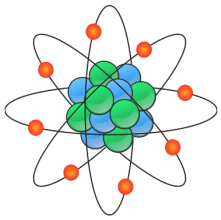
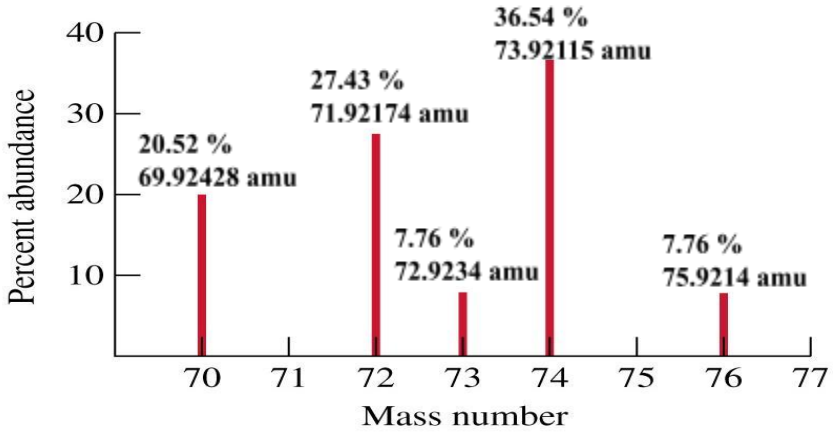
SCH3U: Isotopes Problem Set Date: _____



1. The following data regarding the element Germanium was taken from a mass Spectrometer. After analysis, the following isotope data was produced:



Based on the mass spectrometer data, what is the average atomic mass of Germanium?

2. a) Write the standard atomic notation for Potassium. (Look at your periodic table for atomic & mass numbers).
b) What is the average atomic mass (A) for Potassium? What is the atomic number (Z) for Potassium? How many protons, electrons, and neutrons are present?

In addition to standard atomic notation, Potassium can also be written like this: K-39 or Potassium-39. Familiarize yourself with all 3 notations (they all mean the same thing – Potassium with an average atomic mass of 39)

3. Hydrogen has three isotopes. Most hydrogen (99%) has 1 proton and 0 neutrons. Deuterium is an isotope of Hydrogen which has 1 proton and 1 neutron. Tritium is another isotope of hydrogen which contains 1 proton and 2 neutrons. Write the standard atomic notation for all three hydrogen isotopes.

4. a) Isotopes of an element contain different masses, due to differences in the number of neutrons. Protons also contribute to an atom's mass. Why don't we define isotopes as the change in proton number?

b) Two atoms have the following information: Z=15, A=30, and Z=14, A=30. Are they isotopes of one another? Explain. If they are NOT isotopes of each other, explain what they are!

5. Interpretation of the mass spectrograph of the element neon yields this composition for ordinary neon: Ne-20 (90.92%), Ne-21 (0.26%), Ne-22 (8.82%). Calculate the atomic mass of neon.

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6. An element whose atomic mass is 22.7 u is a mixture of two isotopes with mass numbers of 22.0 amu and 24.0 amu. Calculate the relative abundance of each isotope in the mixture.

7. The atomic mass of thallium (TI) is 204.4 u. It exists in nature as TI-203 and TI-205. Calculate the relative abundance of each isotope in the mixture.

8. Lanthanium is composed of two isotopes: La-138 (mass=137.91amu) and La-139 (mass=138.91amu). Look at your periodic table. What can you say about the % abundance of La-138?

9. Cl-35 is 75.78% abundant in nature, and Cl-37 is 24.22% abundant in nature. Cl-35 has a mass of 34.969amu. If the average atomic mass of Chlorine is 35.45, what is the mass of Cl-37?

10. The average atomic mass of iridium is 192.22amu. If Ir-191 has an atomic mass of 190.961amu and an abundance of 37.3%, and Ir-193 is the only other naturally occurring isotope, what is the atomic mass of Ir-193 rounded to 2 decimal places?

11. **CHALLENGE! Think about how you could set this up algebraically:** Pb has an average atomic mass of 207.19 amu. The three major isotopes of Pb are Pb-206 (205.98 amu); Pb-207 (206.98 amu); and Pb-208 (207.98 amu). If the isotopes of Pb-207 and Pb-208 are present in equal amounts, calculate the percent abundance of Pb-206, Pb-207, Pb-208.