U2-LM3B-WS – ISOTOPES

1. Two atoms of the same elements must have the same _____number of protons_____.

2. Two atoms of the same element that have different mass numbers are called _isotopes_. They have different mass numbers if they have a different number of _neutrons_in their nuclei. All isotopes of an element must have the same _____number of protons_____.

3. The nuclide symbol of carbon- 12 is: $_{6}^{12}C$ and that of cabon-13 is $_{6}^{13}C$.

4. The higher the mass number, the _greater_ the mass of the atom. Therefore, isotopes of the same element have different _masses_ . One amu is a good approximation of the mass of each a _proton_ and a _neutron_.

5. H-1, H-2, and H-3 are _isotopes_. They have the same number of _protons_. However, they have a different number of _neutrons_. One H-3 atom is approximately_3_ times heavier than one H-1 atom.

6. The atomic mass reported in the periodic table is the _average_of all naturally occurring isotopes of the elements.

7. Naturally occurring copper consists of two isotopes: 69.1% ^{63}Cu with a mass of 62.9 amu and 30.9% ^{65}Cu, which has a mass of 64.9 amu. Calculate the atomic mass of copper.

   62.9 amu x .691 + 64.9 amu x .309 = 63.5 amu

8. Lithium has two isotopes, one with a mass of 6.015 amu and an abundance of 7.42% and the other with a mass of 7.016 amu and abundance of 92.58%. What is the atomic mass of Li? **6.015 amu x .0742 + 7.016 amu x .9258 = 6.942 amu**

9. Naturally occurring lead is composed of four isotopes, ^{204}Pb with a 1.40% abundance and a mass of 203.97 amu, ^{206}Pb with a 24.10% abundance and a mass of 205.97 amu, ^{207}Pb with a 22.10% abundance and a mass of 206.98 amu and ^{208}Pb with a 52.40% abundance and a mass of 207.98 amu. What is the atomic mass of lead?
   203.97 amu x .0140 + 205.97 amu x .2410 + 206.98 amu x .2210 + 207.98 amu x .5240 = 207.22 amu

10. The atomic weight of boron is 10.811 amu. The mass of the naturally occurring isotopes are ^{10}B = 10.013 amu and ^{11}B = 11.009 amu. Calculate the percentage abundance of each isotope. **Percentage of ^{10}B = 19.880% Percentage of ^{11}B =80.120%** X(10.013) + (1-X)(11.009) = 10.811
    X=.1988 see below 11 for details

11. Silver consists of two isotopes ^{107}Ag with a mass of 106.904 and ^{109}Ag with a mass of 108.905. The atomic mass of silver as reported in the periodic table is 107.868 amu. Calculate the natural percent abundance of each isotope.

    Percentage of ^{107}Ag = 51.8241 % Percentage of ^{109}Ag = 48.1759%

    fraction of abundance of Ag-107 = X; fraction of abundance of Ag-109 = 1-X, solve for X:
    X(106.904) +(1-X)(108.905) = 107.868; solve for X, then multiply X by 100% go get abundance of Ag-107. Subtract that value from 100 to get percent abundance Ag-109