AIM: How is the atomic mass calculated?

Average Atomic Mass is the weighted average of all naturally occurring isotopes of that atom.

The formula to calculate average atomic mass is

Mass(%)/100 + Mass (%)/100 +.....

Or

Mass(% converted to decimal) + Mass(% converted to decimal) ...

Base your answers to questions 1 and 2 on the data table below.

The accepted values for the atomic mass and percent natural abundance of each naturally occurring isotope of silicon are given in the data table below.

Naturally Occurring Isotopes of Silicon

Isotope	Atomic Mass (amu)	Percent Natural Abundance (%)
Si-28	27.98	92.22
Si-29	28.98	4.69
Si-30	29.97	3.09

1. Determine the total number of neutrons in an atom of Si-29. _____

2. Show a correct numerical setup for calculating the atomic mass of Si.

Atomic Mass Calculations

1. The atomic mass unit is defined as exactly $\frac{1}{12}$ the mass of an atom of

   A) $^{12}_{6}C$ B) $^{14}_{6}C$ C) $^{24}_{12}Mg$ D) $^{26}_{12}Mg$

2. The atomic mass of an element is the weighted average of the

   A) number of protons in the isotopes of that element
   B) number of neutrons in the isotopes of that element
   C) atomic numbers of the naturally occurring isotopes of that element
   D) atomic masses of the naturally occurring isotopes of that element

3. The table below gives the atomic mass and the abundance of the two naturally occurring isotopes of chlorine.

Naturally Occuring Isotopes of Chlorine

Isotopes	AtomicMassof theIsotopes (u)	Natural Abundance (%)
^{35}Cl	34.97	75.76
^{37}Cl	36.97	24.24

Which numerical setup can be used to calculate the atomic mass of the element chlorine?

A) (34.97 u)(75.76) + (36.97 u)(24.24) B) (34.97 u)(0.2424) + (36.97 u)(0.7576)
C) (34.97 u)(0.7576) + (36.97 u)(0.2424) D) (34.97 u)(24.24) + (36.97 u)(75.76)

4. The atomic masses and the natural abundances of the two naturally occurring isotopes of lithium are shown in the table below.

Lithium Isotopes

Isotope	Atomic Mass (u)	Natural Abundance (%)
Li-6	6.02	7.5
Li-7	7.02	92.5

Which numerical setup can be used to determine the atomic mass of lithium?

A) (0.075)(6.02 u) + (0.925)(7.02 u)
B) (0.925)(6.02 u) + (0.075)(7.02 u)
C) (7.5)(6.02 u) + (92.5)(7.02 u)
D) (92.5)(6.02 u) + (7.5)(7.02 u)

5. The atomic mass of titanium is 47.88 atomic mass units. This atomic mass represents the

   A) total mass of all the protons and neutrons in an atom of Ti
   B) total mass of all the protons, neutrons, and electrons in an atom of Ti
   C) weighted average mass of the most abundant isotope of Ti
   D) weighted average mass of all the naturally occurring isotopes of Ti

6. What information is necessary to determine the atomic mass of the element chlorine?

   A) the atomic mass of each artificially produced isotope of chlorine, only
   B) the relative abundance of each naturally occurring isotope of chlorine, only
   C) the atomic mass and the relative abundance of each naturally occurring isotope of chlorine
   D) the atomic mass and the relative abundance of each naturally occurring and artificially produced isotope of chlorine

7. Which value of an element is calculated using both the mass and the relative abundance of each of the naturally occurring isotopes of this element?

   A) atomic number B) atomic mass
   C) half-life D) molar volume

8. An element occurs as a mixture of isotopes. The atomic mass of the element is based upon

   A) the masses of the individual isotopes, only
   B) the relative abundances of the isotopes, only
   C) both the masses and the relative abundances of the individual isotopes
   D) neither the masses nor the relative abundances of the individual isotopes

9. The average isotopic mass of chlorine is 35.5. Which mixture of isotopes (shown as percents) produces this average mass?

   A) 50% ^{12}C and 50% ^{13}C
   B) 50% ^{35}Cl and 50% ^{37}Cl
   C) 75% ^{35}Cl and 25% ^{37}Cl
   D) 75% ^{12}C and 25% ^{13}C

10. The atomic mass of an element is defined as the weighted average mass of that element's

    A) most abundant isotope
    B) least abundant isotope
    C) naturally occurring isotopes
    D) radioactive isotopes

11. If 75.0% of the isotopes of an element have a mass of 35.0 amu and 25.0% of the isotopes have a mass of 37.0 amu, what is the atomic mass of the element?

    A) 35.0 amu B) 36.0 amu
    C) 35.5 amu D) 37.0 amu

12. A sample of element X contains 90. percent ^{35}X atoms, 8.0 percent ^{37}X atoms, and 2.0 percent ^{38}X atoms. The average isotopic mass is closest to

    A) 32 B) 35 C) 37 D) 38

13. A 100.00-gram sample of naturally occurring boron contains 19.78 grams of boron-10 (atomic mass = 10.01 atomic mass units) and 80.22 grams of boron-11 (atomic mass = 11.01 atomic mass units). Which numerical setup can be used to determine the atomic mass of naturally occurring boron?

A) (0.1978)(10.01) + (0.8022)(11.01)
B) (0.8022)(10.01) + (0.1978)(11.01)
C) (0.1978)(10.01)/(0.8022)(11.01)
D) (0.8022)(10.01)/(0.1978)(11.01)

14. The atomic mass of element *A* is 63.6 atomic mass units. The only naturally occurring isotopes of element *A* are *A*-63 and *A*-65. The percent abundances in a naturally occurring sample of element *A* are closest to

A) 31% *A*-63 and 69% *A*-65
B) 50% *A*-63 and 50% *A*-65
C) 69% *A*-63 and 31% *A*-65
D) 100% *A*-63 and 0% *A*-65

15. Hydrogen has three isotopes with mass numbers of 1, 2, and 3 and has an average atomic mass of 1.00794 amu. This information indicates that

A) equal numbers of each isotope are present
B) more isotopes have an atomic mass of 2 or 3 than of 1
C) more isotopes have an atomic mass of 1 than of 2 or 3
D) isotopes have only an atomic mass of 1