

### Isotope Abundance Questions

1. Naturally occurring iron consists of four isotopes with the abundances indicated here. From the masses and relative abundances of these isotopes, calculate the atomic weight of naturally occurring iron.

| Isotope          | Isotope Mass (u) | % Natural Abundance |
|------------------|------------------|---------------------|
| $^{54}\text{Fe}$ | 53.9396          | 5.82                |
| $^{56}\text{Fe}$ | 55.9349          | 91.66               |
| $^{57}\text{Fe}$ | 56.9354          | 2.19                |
| $^{58}\text{Fe}$ | 57.9333          | 0.33                |

2. Calculate the atomic weight of silicon using the following data for the percent natural abundance and mass of each isotope: (a) 92.23%  $^{28}\text{Si}$  (27.9769 u); (b) 4.67%  $^{29}\text{Si}$  (28.9765 u); (c) 3.10%  $^{30}\text{Si}$  (29.9738 u).
3. Calculate the atomic weight of chromium using the following data for the percent natural abundance and mass of each isotope: (a) 4.35%  $^{50}\text{Cr}$  (49.9461 u); (b) 83.79%  $^{52}\text{Cr}$  (51.9405 u); (c) 9.50%  $^{53}\text{Cr}$  (52.9406 u); (d) 2.36%  $^{54}\text{Cr}$  (53.9389 u).
4. The atomic weight of lithium is 6.941 u. The two naturally occurring isotopes of lithium have the following masses:  $^6\text{Li}$ , 6.01512 u;  $^7\text{Li}$ , 7.01600 u. Calculate the percent of  $^6\text{Li}$  in naturally occurring lithium.
5. The atomic weight of rubidium is 85.4678 u. The two naturally occurring isotopes of rubidium have the following masses:  $^{85}\text{Rb}$ , 84.9118 u;  $^{87}\text{Rb}$ , 86.9092 u. Calculate the percent of  $^{85}\text{Rb}$  in naturally occurring rubidium.
6. Bromine is composed of  $^{79}\text{Br}$ , 78.9183 u, and  $^{81}\text{Br}$ , 80.9163 u. The percent composition of a sample is 50.69% Br-79 and 49.31% Br-81. Based on this sample, calculate the atomic weight of bromine.
7. Calculate the atomic weight of nickel from the following information.

| Isotope          | Isotope Mass (u) | % Natural Abundance |
|------------------|------------------|---------------------|
| $^{58}\text{Ni}$ | 57.9353          | 67.88               |
| $^{60}\text{Ni}$ | 59.9332          | 26.23               |
| $^{61}\text{Ni}$ | 60.9310          | 1.19                |
| $^{62}\text{Ni}$ | 61.9283          | 3.66                |
| $^{64}\text{Ni}$ | 63.9280          | 1.08                |

8. The atomic weight of copper is 63.546 u. The two naturally occurring isotopes of copper have the following masses:  $^{63}\text{Cu}$ , 62.9298 u;  $^{65}\text{Cu}$ , 64.9278 u. Calculate the percent of  $^{63}\text{Cu}$  in naturally occurring copper.
9. Silver consists of two naturally occurring isotopes:  $^{107}\text{Ag}$ , which has a mass of 106.90509 u, and  $^{109}\text{Ag}$ , which has a mass of 108.9047 u. The atomic weight of silver is 107.8682 u. Determine the percent abundance of each isotope in naturally occurring silver.