

## Chapter 4

### End-of-Chapter Questions

1. What is the difference between atomic number and mass number?
2. What does the term radioactive isotope mean?
3. What are the numbers of protons, neutron, and electrons in each of the following isotopes:  
(a) carbon-14            (b) iodine-127            (c) helium-3
4. What are the numbers of protons, neutron, and electrons in each of the following isotopes:  
(a) uranium-235            (b) calcium-48            (c) potassium-41
5. The element strontium (symbol Sr) has four naturally-occurring isotopes. The isotopes have atomic masses of 83.91 u, 85.91 u, 86.91 u, and 87.91 u. As the mass number of an isotope is always close to its atomic mass, then the isotope of mass 83.91 u must be strontium-84. How many neutrons would this isotope have? What are the number of neutrons in the other isotopes?
6. Boron, average atomic mass 10.81 u, consists of two isotopes, boron-10 (atomic mass 10.01 u) and boron-11 (atomic mass 11.01 u). Without calculation, identify which of the two isotopes is most common on Earth.
7. The element, antimony (Sb), has two naturally-occurring isotopes: antimony-121, atomic mass 120.90 u, and abundance 57.25%; and antimony-123, atomic mass 122.90 u. Calculate the average atomic mass of antimony.
8. Calculate the average atomic mass of lithium. There are two naturally-occurring isotopes: lithium-6, atomic mass 6.015 u and abundance 7.68%; and lithium-7, atomic mass 7.016 u and abundance 92.32%.
9. Silicon has three stable isotopes: silicon-28, atomic mass 27.98 u and abundance 92.18%; silicon-29, atomic mass 28.98 u and abundance 4.71%; and silicon-30, atomic mass 29.97 u. Before commencing the calculation (and without consulting a Periodic Table), what would you expect approximately the average atomic mass of naturally-occurring silicon to be? Confirm your estimation by calculating the value.

10. Calculate the average atomic mass of magnesium. There are three naturally-occurring isotopes: magnesium-24, atomic mass 23.98 u and abundance 78.60%; magnesium-25, atomic mass 24.99 u and abundance 10.11%; and magnesium 26, atomic mass 25.98 u.
11. To one place after the decimal point, what are the average molar masses of:  
(a) oxygen                      (b) aluminum                      (c) potassium
12. To one place after the decimal point, what are the average molar masses of:  
(a) fluorine                      (b) zinc                      (c) sodium
13. Calculate the number of atoms in:  
(a) 8.60 mol of copper                      (b)  $4.11 \times 10^{-4}$  mol of calcium
14. Calculate the number of moles in:  
(a)  $1.64 \times 10^{22}$  atoms of lead                      (b)  $5.2 \times 10^{24}$  atoms of iron
15. Calculate the mass of:  
(a) 4.87 mol of sulfur                      (b) 0.342 mol of carbon
16. Calculate the number of moles of:  
(a) 27.0 g of lead                      (b) 0.5108 g of silicon
17. Calculate the mass of:  
(a)  $1.92 \times 10^{21}$  atoms of magnesium                      (b)  $8.00 \times 10^{24}$  atoms of helium
18. Calculate the number of atoms in:  
(a) 0.100 g of manganese                      (b) 86.7 g of chromium