

Name: _____ Date: _____ Period: _____

Graded problems are 2 points each. This assignment is graded out of **16** points.

1) Calculate the average atomic mass of carbon. The relative abundances of the isotopes of carbon are:

- $^{12}_6\text{C}$: 98.93 %; and
- $^{13}_6\text{C}$: 1.07%.

2) Calculate the average atomic mass of chlorine. The relative abundances of the isotopes of chlorine are:

- $^{35}_{17}\text{Cl}$: 75.76 %; and
- $^{37}_{17}\text{Cl}$: 24.24 %.

The relative abundances of the isotopes of nitrogen are:

- nitrogen-14: 99.64 %; and
- nitrogen-15: 0.36 %.

3) Give the nuclide symbols for each isotope of nitrogen.

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4) **Graded.** Calculate the average atomic mass of nitrogen.

5) **Graded.** Calculate the average atomic mass of neon. The relative abundances of the isotopes of neon are:

- $^{20}_{10}\text{Ne}$: 90.48 %;
- $^{21}_{10}\text{Ne}$: 0.27 %; and
- $^{22}_{10}\text{Ne}$: 9.25 %.

6) **Graded.** Calculate the average atomic mass of oxygen. The relative abundances of the isotopes of oxygen are:

- $^{16}_8\text{O}$: 99.75 %,
- $^{17}_8\text{O}$: 0.04 %, and
- $^{18}_8\text{O}$: 0.21 %.

The relative abundances of the isotopes of iron are:

- iron-54: 5.85 %;
- iron-56: 91.75 %;
- iron-57: 2.12 %; and
- iron-58: 0.28 %

7) **Graded.** Give the nuclide symbols for each isotope of iron.

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8) **Graded.** Calculate the average atomic mass of iron.

9) **Graded.** Calculate the average atomic mass of sulfur. The relative abundances of the isotopes of sulfur are:

- $^{32}_{16}\text{S}$: 94.99 %;
- $^{33}_{16}\text{S}$: 0.75 %;
- $^{34}_{16}\text{S}$: 4.25 %; and
- $^{36}_{16}\text{S}$: 0.01 %

10) **Graded.** Calculate the average atomic mass of nickel. The relative abundances of the isotopes of nickel are:

- nickel-58: 68.08%;
- nickel-60: 26.22 %;
- nickel-61: 1.14 %;
- nickel-62: 3.63 %;
- nickel-64: 0.93 %.

11) **Graded.** Calculate the average atomic mass of calcium. The relative abundances of the isotopes of calcium are:

- calcium-40: 96.94 %;
- calcium-42: 0.65 %;
- calcium-43: 0.13 %;
- calcium-44: 2.09 %;
- calcium-48: 0.19 %.

Selected Answers

Calculating the average atomic masses of elements follows the same pattern:

for each isotope, multiply the mass number of the isotope by the relative abundance (converted to a decimal). Once you have all these products, add them together to get the average atomic mass.

The units for average atomic mass are atomic mass units, or amu. Some texts use “u” as the unit instead of “amu.”

- 1) Calculate the average atomic mass of carbon. The relative abundances of the isotopes of carbon are:

- $^{12}_6\text{C}$: 98.93 %; and
- $^{13}_6\text{C}$: 1.07%

$$12 \times 0.9893 = 11.8716$$

$$13 \times 0.0107 = 0.1391$$

$$11.8716 + 0.1391 = 12.01 \text{ amu (rounded)}$$

- 2) Calculate the average atomic mass of chlorine. The relative abundances of the isotopes of chlorine are:

- $^{35}_{17}\text{Cl}$: 75.76 %; and
- $^{37}_{17}\text{Cl}$: 24.24 %

$$35 \times 0.7576 = 26.516$$

$$37 \times 0.2424 = 8.9688$$

$$26.516 + 8.9688 = 35.48 \text{ amu (rounded)}$$

- 3) Give the nuclide symbols for each isotope of nitrogen.

$^{14}_7\text{N}$	$^{15}_7\text{N}$
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