

Isotope Practice

1. Here are three isotopes of an element: ^{12}C ^{13}C ^{14}C
- The element is: CARBON
 - The number 6 refers to the # OF PROTONS & ATOMIC #
 - The numbers 12, 13, and 14 refer to the ATOMIC MASS
 - How many protons and neutrons are in the first isotope? 6 & 6 RESPECTIVELY
 - How many protons and neutrons are in the second isotope? 6 & 7
 - How many protons and neutrons are in the third isotope? 6 & 8

2. Complete the following chart:

Isotope name	atomic #	mass #	# of protons	# of neutrons	# of electrons
Potassium-37	19	37	19	18	19
Oxygen-17	8	17	8	9	8
uranium-235	92	235	92	143	92
uranium-238	92	238	92	146	92
boron-10	5	10	5	5	5
boron-11	5	11	5	6	5

DIRECTIONS: For the following problems, show your work! Be thorough.

- Naturally occurring europium (Eu) consists of two isotopes was a mass of 151 and 153. Europium-151 has an abundance of 48.03% and Europium-153 has an abundance of 51.97%. What is the atomic mass of europium?

$$(151 \text{ AMU} \times 0.4803) + (153 \text{ AMU} \times 0.5197) = 152.0334 \text{ AMU}$$
- Strontium consists of four isotopes with masses of 84 (abundance 0.50%), 86 (abundance of 9.9%), 87 (abundance of 7.0%), and 88 (abundance of 82.6%). Calculate the atomic mass of strontium.

$$(84 \text{ AMU} \times 0.005) + (86 \text{ AMU} \times 0.099) + (87 \text{ AMU} \times 0.07) + (88 \text{ AMU} \times 0.826) = 87.712 \text{ AMU}$$
- Titanium has five common isotopes: ^{46}Ti (8.0%), ^{47}Ti (7.8%), ^{48}Ti (73.4%), ^{49}Ti (5.5%), ^{50}Ti (5.3%). What is the average atomic mass of titanium?

$$(46 \text{ AMU} \times 0.08) + (47 \text{ AMU} \times 0.078) + (48 \text{ AMU} \times 0.734) + (49 \text{ AMU} \times 0.055) + (50 \text{ AMU} \times 0.053) = 47.923 \text{ AMU}$$

6. Calculate the atomic mass of copper if copper-63 is 69.17% abundant and copper-65 is 30.83% abundant.

$$(63 \text{ AMU})(.6917) + (65 \text{ AMU})(.3083) = \boxed{63.6166 \text{ AMU}}$$

43.5771 AMU 20.0385 AMU

7. Boron exists in two isotopes, boron-10 and boron-11. Based on the atomic mass, which isotope should be more abundant?

Boron-11 (¹¹B) is most abundant because the avg. atomic mass is closer to it than to 10.

8. Lithium-6 is 4% abundant and lithium-7 is 96% abundant. What is the average mass of lithium?

$$(6 \text{ AMU})(.04) + 7 \text{ AMU}(.96) = \boxed{6.96 \text{ AMU}}$$

9. Iodine is 80% ¹²⁷I, 17% ¹²⁶I, and 3% ¹²⁸I. Calculate the average atomic mass of iodine.

$$(127 \text{ AMU})(.8) + (126 \text{ AMU})(.17) + (128 \text{ AMU})(.03) = \boxed{126.86 \text{ AMU}}$$

10. The natural abundance for boron isotopes is 19.9% ¹⁰B and 80.1% ¹¹B. Calculate boron's atomic mass.

$$(10 \text{ AMU})(.199) + (11 \text{ AMU})(.801) = \boxed{10.801 \text{ AMU}}$$

11. Hydrogen is 99% ¹H, 0.8% ²H, and 0.2% ³H. Calculate its average atomic mass.

$$(1 \text{ AMU})(.99) + 2 \text{ AMU}(.008) + (3 \text{ AMU})(.002) = \boxed{1.012 \text{ AMU}}$$

12. Rubidium is a soft, silvery-white metal that has two common isotopes, ⁸⁵Rb and ⁸⁷Rb. If the abundance of ⁸⁵Rb is 80.2% and the abundance of ⁸⁷Rb is 19.8%, what is the average atomic mass of rubidium?

$$(85 \text{ AMU})(.802) + (87 \text{ AMU})(.198) = \boxed{85.386 \text{ AMU}}$$

13. What is the atomic mass of hafnium if, out of every 100 atoms, 5 have a mass of 176, 19 have a mass of 177, 27 have a mass of 178, 14 have a mass of 179, and 35 have a mass of 180.0?

$$(176 \text{ AMU})(.05) + (177 \text{ AMU})(.19) + (178 \text{ AMU})(.27) + (179 \text{ AMU})(.14) + (180 \text{ AMU})(.35) = \boxed{178.55 \text{ AMU}}$$