

1a. Fill in the masses and charges of the following subatomic particles. (OK to round to the nearest whole numbers.)

| Subatomic Particle: | Mass (amu*) | Charge | * 1 atomic mass unit (amu) = 1.66×10^{-24} grams. |
|---------------------|-------------|--------|--|
| proton | _____ | _____ | |
| neutron | _____ | _____ | |
| electron | _____ | _____ | |

1b. Which of the above particles are in the nucleus of the atom? _____

2. Determine the number of protons, neutrons, and electrons for the most common isotope of each element:

| Atom: | # of protons | #of neutrons | # of electrons |
|-------|--------------|--------------|----------------|
| F | _____ | _____ | _____ |
| Ar | _____ | _____ | _____ |
| H | _____ | _____ | _____ |
| Ag | _____ | _____ | _____ |

3. What are isotopes?

4. Fill out this chart. Do NOT assume that the type of atom shown is the most common isotope of that element.

| Isotope | Symbol | Atomic # | Mass # | # of protons | # of neutrons | # of electrons |
|---------|--------|----------|--------|--------------|---------------|----------------|
| Ra-222 | _____ | _____ | _____ | _____ | _____ | _____ |
| U-235 | _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | 82 | 126 | _____ |
| _____ | _____ | _____ | 131 | _____ | 78 | _____ |
| H-3 | _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | 8 | 18 | _____ | _____ | _____ |
| Pu- | _____ | _____ | _____ | _____ | 145 | _____ |

5. Write symbols (like in the “symbol” column, above) for the following:

- a. A zinc atom with a mass of 66 amu _____
- b. An atom with 5 protons and 5 neutrons. _____
- c. An atom with 82 neutrons and a mass of 136 amu. _____
- d. A copper atom with 36 neutrons _____

6. Chlorine has two naturally occurring isotopes. 75.77% of chlorine atoms have a mass of 34.9689 amu. The remainder of chlorine atoms have a mass of 36.9659 amu.

- a. Is chlorine a metal, nonmetal, or metalloid? (which one?) _____
- b. Write the symbol for each isotope of chlorine: _____
- c. How many protons are in each isotope? _____
- d. How many neutrons are in each isotope? _____
- e. Determine the “natural abundance” of chlorine’s more massive isotope. _____
- f. Determine the atomic mass of chlorine, based on a weighted average.

(This side of this worksheet is optional. Answers will be posted on the website.)

7. Write symbols (like in the "symbol" column in #4) for the following:

- a. An atom that has 19 protons and 20 neutrons _____
- b. The most common isotope of bromine _____
- c. An atom with a mass of 31 amu and 16 neutrons. _____

8. Fill out this chart. Do NOT assume that the type of atom shown is the most common isotope of that element.

| <i>Isotope</i> | <i>Symbol</i> | <i>Atomic #</i> | <i>Mass #</i> | <i># of protons</i> | <i># of neutrons</i> |
|----------------|---------------|-----------------|---------------|---------------------|----------------------|
| Hydrogen-2 | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | 92 | _____ | _____ | 146 |
| carbon-_____ | _____ | _____ | _____ | _____ | 8 |
| _____ | _____ | _____ | 201 | 80 | _____ |

9. Boron has two isotopes. 19.9% of Boron atoms have a mass of 10.012936 amu, and the remainder of Boron atoms have a mass of 11.009305 amu.

- a. Determine the natural abundance of Boron-11.
- b. Calculate the atomic mass of boron.
- c. How many protons and neutrons are in B-10? p _____ n _____
- d. How many protons and neutrons are in B-11? p _____ n _____

10. Consider the following data for Strontium (Sr), which has four naturally occurring isotopes:

| Isotope | Mass (amu) | Natural Abundance |
|------------------|------------|-------------------|
| ⁸⁴ Sr | 83.9134 | 0.56% |
| _____ | 85.9093 | 9.86% |
| _____ | 86.9089 | 7.00% |
| _____ | 87.9056 | _____ |

- a. Fill in the blanks in the chart.
- b. Calculate the average atomic mass of this element.