

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	<u>1</u>	<u>+1</u>	
neutron	<u>1</u>	<u>0</u>	
electron	<u>0</u>	<u>-1</u>	

1b. Which of the above particles are in the nucleus of the atom? p + n

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	<u>9</u>	<u>10</u>	<u>9</u>
Ar	<u>18</u>	<u>22</u>	<u>18</u>
H	<u>1</u>	<u>0</u>	<u>1</u>
Ag	<u>47</u>	<u>61</u>	<u>47</u>

3. What are isotopes? Same elements w/ different # of neutrons

ex) oxygen-16 vs oxygen-18

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>²²²₈₈Ra</u>	<u>88</u>	<u>222</u>	<u>88</u>	<u>134</u>	<u>88</u>
U-235	<u>²³⁵₉₂U</u>	<u>92</u>	<u>235</u>	<u>92</u>	<u>143</u>	<u>92</u>
<u>Pb-208</u>	<u>²⁰⁸₈₂Pb</u>	<u>82</u>	<u>208</u>	82	126	<u>82</u>
<u>I-131</u>	<u>¹³¹₅₃I</u>	<u>53</u>	131	<u>53</u>	78	<u>53</u>
H-3	<u>³₁H</u>	<u>1</u>	<u>3</u>	<u>1</u>	<u>2</u>	<u>1</u>
<u>O-18</u>	<u>¹⁸₈O</u>	8	18	<u>8</u>	<u>10</u>	<u>8</u>
Pu-239	<u>²³⁹₉₄Pu</u>	<u>94</u>	<u>239</u>	<u>94</u>	145	<u>94</u>

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

- a. A zinc atom with a mass of 66 amu ⁶⁶₃₀Zn
- b. An atom with 5 protons and 5 neutrons. ¹⁰₅B
- c. An atom with 82 neutrons and a mass of 136 amu. ¹³⁶₅₄Xe
- d. A copper atom with 36 neutrons ⁶⁵₂₉Cu

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?) non-metal

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.

<u>³⁵₁₇Cl</u>	<u>³⁷₁₇Cl</u>
<u>17</u>	<u>17</u>
<u>18</u>	<u>20</u>

f. Determine the atomic mass of chlorine, based on a weighted average.

$$100 - 75.77 = 24.23\%$$

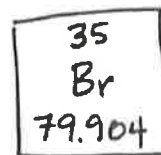
$$\frac{(75.77 \times 34.9689) + (24.23 \times 36.9659)}{100} =$$

$$= \boxed{35.45 \text{ amu}}$$

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

a. An atom that has 19 protons and 20 neutrons $\frac{39}{19}K$

b. The most common isotope of bromine $\frac{80}{35}Br$



c. An atom with a mass of 31 amu and 16 neutrons. $\frac{31}{15}P$

8. 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
Hydrogen-2	$\frac{2}{1}H$	1	2	1	1
Tungsten-184	$\frac{184}{74}W$	74	184	74	110
Uranium-238	$\frac{238}{92}U$	92	238	92	146
carbon-14	$\frac{14}{6}C$	6	14	6	8
Mercury-201	$\frac{201}{80}Hg$	80	201	80	121

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. $100\% - 19.9\% = 80.1\%$

b. Calculate the atomic mass of boron.

$$(0.199)(10.012936 \text{ amu}) + (0.801)(11.009305 \text{ amu}) = 10.81 \text{ amu}$$

c. How many protons and neutrons are in B-10? p $\frac{5}{5}$ n $\frac{5}{5}$
 d. How many protons and neutrons are in B-11? p $\frac{5}{5}$ n $\frac{6}{6}$

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%
^{86}Sr	85.9093	9.86%
^{87}Sr	86.9089	7.00%
^{88}Sr	87.9056	82.58%

$$\leftarrow 100\% - (0.56\% + 9.86\% + 7.00\%)$$

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

$$(0.0056)(83.9134 \text{ amu}) + (0.0986)(85.9093 \text{ amu}) + (0.0700)(86.9089 \text{ amu})$$

$$+ (0.8258)(87.9056 \text{ amu}) = 87.62 \text{ amu}$$

$$(87.61664)$$