1. Here are three isotopes of an element: $^{12}_6\text{C}$, $^{13}_6\text{C}$, $^{14}_6\text{C}$
   a. The element is: Carbon
   b. The number 6 refers to the atomic number
   c. The numbers 12, 13, and 14 refer to the atomic mass
   d. How many protons and neutrons are in the first isotope? 6
      How many protons and neutrons are in the first isotope? 6
   e. How many protons and neutrons are in the second isotope? 6
      How many protons and neutrons are in the second isotope? 7
   f. How many protons and neutrons are in the third isotope? 6
      How many protons and neutrons are in the third isotope? 8

2. Complete the following chart:

<table>
<thead>
<tr>
<th>Isotope name</th>
<th>atomic #</th>
<th>mass #</th>
<th># of protons</th>
<th># of neutrons</th>
<th># of electrons</th>
</tr>
</thead>
<tbody>
<tr>
<td>uranium-235</td>
<td>92</td>
<td>235</td>
<td>92</td>
<td>143</td>
<td>92</td>
</tr>
<tr>
<td>uranium-238</td>
<td>92</td>
<td>238</td>
<td>92</td>
<td>146</td>
<td>92</td>
</tr>
<tr>
<td>boron-10</td>
<td>5</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>boron-11</td>
<td>5</td>
<td>11</td>
<td>5</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Phosphorus-33</td>
<td>15</td>
<td>33</td>
<td>15</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>Potassium-41</td>
<td>19</td>
<td>41</td>
<td>19</td>
<td>22</td>
<td>19</td>
</tr>
</tbody>
</table>

3. Write the hyphen notation and the nuclide (nuclear) symbol for an isotope that has 17 protons, 17 electrons, and 20 neutrons.
   mass = 17 + 20 = 37
   $^{37}_{17}\text{Cl}$ and $^{37}_{17}\text{Cl}$

4. Isotopes are atoms of the same element with a different number of neutrons in the nucleus and therefore a different atomic mass.
1. Determine the average atomic mass of the following mixtures of isotopes.

   a. 80% $^{127}$I, 17% $^{126}$I, 3% $^{128}$I
   \[
   (0.80)(127) + (0.17)(126) + (0.03)(128) = 126.86
   \]

   b. 50% $^{197}$Au, 50% $^{198}$Au
   \[
   (0.50)(197) + (0.50)(198) = 197.5
   \]

   c. 15% $^{55}$Fe, 85% $^{56}$Fe
   \[
   (0.15)(55) + (0.85)(56) = 55.85
   \]

   d. 98% $^{12}$C, 2% $^{14}$C
   \[
   (0.98)(12) + (0.02)(14) = 12.04
   \]

   e. 95% $^{14}$N, 3% $^{15}$N, 2% $^{15}$N
   \[
   (0.95)(14) + (0.03)(15) + (0.02)(16) = 14.07
   \]

2. How many neutrons does Zn-66 have? 36

   \[
   \text{at. mass} \quad 66
   \\
   \text{at. #} \quad 30
   \\
   \text{neutrons} = 66 - 30 = 36
   \]

3. Give the hyphen notation for this atom, p=76, e=76, n=116
   \[
   \text{mass} = p + n = 76 + 116 = 192
   \]
   *Table says 190, but this is an isotope of Os.

4. Give the nuclear symbol notation for this atom, p=11, e=11, n=11
   \[
   p=11 \text{ is Na} \quad 23\text{Na}
   \]