Isotope Practice

1. Complete the chart, using your Periodic Table and your knowledge of subatomic particles

<table>
<thead>
<tr>
<th>Atomic symbol</th>
<th>Atomic number</th>
<th>Protons</th>
<th>Neutrons</th>
<th>Electrons</th>
<th>Mass number</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>Mg</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>Ga</td>
<td>31</td>
<td>31</td>
<td>40</td>
<td>31</td>
<td>71</td>
</tr>
<tr>
<td>Zr</td>
<td>40</td>
<td>40</td>
<td>59</td>
<td>40</td>
<td>89</td>
</tr>
<tr>
<td>Zn</td>
<td>30</td>
<td>30</td>
<td>35</td>
<td>30</td>
<td>65</td>
</tr>
<tr>
<td>Mo</td>
<td>42</td>
<td>42</td>
<td>56</td>
<td>42</td>
<td>98</td>
</tr>
<tr>
<td>W</td>
<td>74</td>
<td>74</td>
<td>109</td>
<td>74</td>
<td>183</td>
</tr>
</tbody>
</table>

Density

2. To determine the density of an irregularly shaped object, a student immersed the object in 21.2 milliliters of H2O in a graduated cylinder, causing the level of the H2O to rise to 27.8 milliliters. If the object had a mass of 22.4 grams, what was the density of the object.

a. 27.8 g/mL
b. 6.6 g/mL
c. 3.0 g/mL
d. 3.4 g/mL

\[ d = \frac{m}{V} = \frac{22.4 \text{ g}}{6.6 \text{ mL}} = 3.4 \text{ g/mL} \]

3. Which symbols represent atoms that are isotopes?
   a. C-14 and N-14
   b. O-16 and O-18
   c. I-131 and I-131
   d. Rn-222 and Ra-222

Same element, but different number of neutrons (so different mass number)

4. What is the mass number of an atom which contains 28 protons, 28 electrons, and 34 neutrons?

   a. 28
   b. 56
   c. 62
   d. 90

28 + 34 = 62

5. Write out your own definition of the term “isotope”:
Reading Formulas – determine the number of each element in each compound

****If there’s a coefficient out front, DRAW IN THE PARENTHESES!!!!

6. $6(\text{H}_2\text{SO}_4)$  $\text{H}^{\quad 12}$  $\text{S}^{\quad 6}$  $\text{O}^{\quad 24}$
7. $2(\text{HNO}_3)$  $\text{H}^{\quad 2}$  $\text{N}^{\quad 2}$  $\text{O}^{\quad 6}$
8. $6(\text{NaCl})$  $\text{Na}^{\quad 6}$  $\text{Cl}^{\quad 6}$  $\times$  $\times$
9. $135(\text{H}_2\text{O})$  $\text{H}^{\quad 270}$  $\text{O}^{\quad 135}$
10. $3(\text{B}_2(\text{CO}_3)_3)$  $\text{B}^{\quad 6}$  $\text{C}^{\quad 9}$  $\text{O}^{\quad 27}$

Examples...

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. KCl</td>
<td>- one K (potassium)</td>
<td>- one Cl (chlorine)</td>
</tr>
<tr>
<td>2. HNO₃</td>
<td>- one H (hydrogen)</td>
<td>- one N (nitrogen)</td>
</tr>
<tr>
<td>3. Al(OH)₃</td>
<td>- one Al (aluminum)</td>
<td>- three O (oxygen)</td>
</tr>
<tr>
<td>4. 4 K₂SO₄</td>
<td>- eight K (potassium)</td>
<td>- four S (sulphur)</td>
</tr>
</tbody>
</table>
PT Practice Questions – these can be answered using the Periodic Table on the reverse – plus the “important info” (or your notes)

1. What sentence about the periodic table of elements is true?
   a. all elements in group 18 are metals
   b. all elements in group 15 are non-metals
   c. metals are found along the ‘staircase’ of the table
   d. metals are found on the left side of the table

2. What element is most likely to have chemical properties that are similar to Li (lithium)?
   a. K (potassium)
   b. Mg (magnesium)
   c. Cl (chlorine)
   d. Be (beryllium)

3. Which of these elements is classified as a metalloid?
   a. Br (bromine)
   b. As (Astatine)
   c. S (sulfur)
   d. Ne (Neon)

4. What is the most important factor that determines where an element is placed in the periodic table, and defines an element?
   a. number of protons
   b. number of neutrons
   c. atomic property
   d. atomic density

5. The diagram below show the position of different elements on the periodic table. Which picture has 3 elements marked (with X marks) that are likely to have similar chemical properties?

   A. 
   B. 
   C. 
   D. 

6. Which of the following has electrons in 4 energy shells?
   a. Ar (argon)
   b. Br (bromine)
   c. Li (lithium)
   d. Be (beryllium)

7. Find group 11 containing Cu, Ag & Au. What statement is an accurate comparison of the atomic number of Cu (copper) and Au (gold)?
   a. Au has a smaller atomic number than Cu
   b. Ac and Cu have equal atomic numbers because they are in the same group.
   c. Cu has a smaller atomic number than Au
   d. Cu has more protons in the nucleus than Au

8. Which element is likely to be the least reactive?
   a. Br (bromine)
   b. Fe (iron)
   c. Ar (argon)
   d. C (carbon)
Directions: Fill in the blanks using your chemistry knowledge!
Feel free to ask your classmates and/or consult your notes for help!

1. An atom’s identity depends on its \textcolor{blue}{\textbf{atomic}} \textcolor{red}{\text{(mass or atomic)}} number.

2. The atomic number is always equal to the number of \textcolor{blue}{\textbf{protons}} \textcolor{red}{\text{$(p^+)$}}.

3. The mass number is always equal to the sum total of \textcolor{blue}{\textbf{protons}} \textcolor{red}{\text{$(p^+, e^- \text{ or } n^0)$}} and \textcolor{blue}{\textbf{neutrons}} \textcolor{red}{\text{$(p^+, e^- \text{ or } n^0)$}}.

4. For \textcolor{blue}{\textbf{atoms}}, the number of protons and the number of \textcolor{blue}{\textbf{electrons}} \textcolor{red}{\text{$(p^+, e^- \text{ or } n^0)$}} will always be the same.

   As a result, the total charge on an atom is \textcolor{blue}{\textbf{zero}} \textcolor{red}{\text{(positive, negative, or zero)}}.

5. An atom’s \textcolor{blue}{\textbf{electrons}} \textcolor{red}{\text{$(p^+, e^- \text{ or } n^0)$}} are found outside the nucleus.

6. If an oxygen atom has 8 protons and 9 neutrons in the nucleus, what is the mass number of oxygen?

\text{\underline{17}}

7. If an oxygen atom has 8 protons and 9 neutrons in the nucleus, what is the atomic number of oxygen?

\text{\underline{8}}

8. For the oxygen isotope given in Questions \#6 & \#7, write its proper atomic symbol notation.

9. Given the following information \textcolor{blue}{\textbf{$^31$P}}

   a) What is the atomic number?

   \textcolor{blue}{\textbf{15}} (because it's \textcolor{red}{\textbf{P}}!)

   b) How many protons are in the atom?

   \textcolor{blue}{\textbf{15}}

   c) How many electrons are in the atom?

   \textcolor{blue}{\textbf{15}}

   d) How many neutrons are in the atom?

   \textcolor{blue}{\textbf{31}} - \textcolor{blue}{\textbf{15}} = \textbf{16 \text{n}^0} \quad (31 = p^+ + n^0)

   e) What is the mass number?

   \textcolor{blue}{\textbf{31}}
Isotope Practice

Name:

1. Complete this tutorial: goo.gl/QqRKgC

2. Here are three isotopes of an element:
   a. The element is: Carbon
   b. The number 6 refers to the atomic # (# of protons)
   c. The numbers 12, 13, and 14 refer to the mass #s
   d. How many protons and neutrons are in the first isotope? 12
   e. How many protons and neutrons are in the second isotope? 13
   f. How many protons and neutrons are in the third isotope? 14

3. 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>Potassium-37</td>
<td>19</td>
<td>37</td>
<td>19</td>
<td>18</td>
<td>19</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>
</tbody>
</table>

4. Naturally occurring europium (Eu) consists of two isotopes was mass numbers of 151 and 153. Europium-151 has an abundance of 48.03% and Europium-153 has an abundance of 51.97%.
   a. What is the more common isotope of europium? $\text{Eu-153 (51.97\%)} > \text{Eu-151 (48.03\%)}$
   b. Will the Atomic Mass (average mass of all europium atoms) of europium be closer to 151 or closer to 153? Closer to 153 (barely)

5. 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%).

Based on these natural abundances, what whole number would you expect the Atomic Mass (average of all strontium) to be closest to?

$\text{Closest to 88}$