MULTIPLE CHOICE (4 POINTS EACH)

1. Which of the following atoms will form an anion (negatively charged) in an ionic compound?
   a. Sr  c. Cl
   b. Ni  d. Cu

2. Which one of the following could not be an empirical formula?
   a. $\text{C}_9\text{H}_{18}\text{O}_3$
   b. $\text{C}_{10}\text{H}_{15}\text{N}_3\text{O}_6$
   c. $\text{C}_{14}\text{H}_{10}\text{CuO}_4$
   d. $\text{C}_{17}\text{H}_{25}\text{NO}_3$

3. Silicon has three naturally occurring isotopes: $^{28}\text{Si}, ^{29}\text{Si}$, and $^{30}\text{Si}$.

<table>
<thead>
<tr>
<th>Isotope</th>
<th>% Abundance</th>
<th>Atomic Mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>$^{28}\text{Si}$</td>
<td>92.23</td>
<td>27.976927</td>
</tr>
<tr>
<td>$^{29}\text{Si}$</td>
<td>4.67</td>
<td>28.976495</td>
</tr>
<tr>
<td>$^{30}\text{Si}$</td>
<td>3.10</td>
<td>29.973770</td>
</tr>
</tbody>
</table>

   a. $^{28}\text{Si}$ has ____ protons and ____ neutrons. (3 points)

   b. What is the atomic mass of naturally occurring silicon (show your work). (5 points)

For the following, identify each as an acid, binary covalent or ionic compound (1 point), and give the name (2 point) and formula mass (2 point).

<table>
<thead>
<tr>
<th>Acid / Ionic / Binary Covalent</th>
<th>Name</th>
<th>Formula Mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.</td>
<td></td>
<td></td>
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<tr>
<td>a. $\text{S}_2\text{F}_4$</td>
<td>A / BC / I</td>
<td></td>
</tr>
<tr>
<td>b. $\text{CoPO}_4$</td>
<td>A / BC / I</td>
<td></td>
</tr>
<tr>
<td>c. $\text{H}_2\text{SO}_3$ (aq)</td>
<td>A / BC / I</td>
<td></td>
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</tbody>
</table>
5. Write the formula (3 points each)
   a. Tetraphosphorous trisulfide
   b. Manganese(II) iodide
   c. Lithium perchlorate

6. Give the number of protons and neutrons in the nucleus of each of the following atoms:
   (4 points each)
   a. $^{59}_{28}$Ni  _____ Protons  _______ Neutrons
   b. $^{14}_{6}$C  _____ Protons  _______ Neutrons

7. The following empirical formula and molecular mass pertain to specific molecules. Determine the molecular formula (4 points each)

   CH: 78.11 g/mol

   BNCI$_2$: 287.17 g/mol

**SHORT PROBLEM**

8. An explosive contains 42.36 % carbon, 3.55 % hydrogen, 32.93 % nitrogen and 37.62 % oxygen.
   a. Determine the empirical formula for this compound (8 points)
9. Balance the following reactions (4 points each)
   a) $\text{HSbCl}_4 + \text{H}_2\text{S} \rightarrow 6 \text{Sb}_2\text{S}_3 + \text{HCl}$
   b) $\text{CH}_3\text{COOH} + \text{O}_2 \rightarrow 6 \text{CO}_2 + \text{H}_2\text{O}$
   c) $\text{NaNO}_3 + \text{H}_2\text{SO}_4 \rightarrow 6 \text{HNO}_3 + \text{Na}_2\text{SO}_4$

10. Balance the following reaction: (4 points)

   $\text{Ca} + \text{H}_2\text{O} \rightarrow 6 \text{Ca(OH)}_2 + \text{H}_2$

   What group number is calcium in? What is the common name of that group? (2 points)
   Group Number ____________ Group Name ___________________
   What are the names of the products? (2 pt. ea.) _______________________  _____________
   If you have a 15.0 mL sample of calcium, what is its mass. (density of Ca = 1.55 g/mL)(3 points)

   If 25.0. g of water is reacted with the calcium, which is the limiting reagent? (5 points)

   What is the stoichiometric yield? (3 points)
   If only 36.0 g of Ca(OH)$_2$ are isolated, what is the percent yield? (3 points)