Multiple Choice Questions: Circle the single best answer. No penalty for guessing.

1. What is the length of a 1300 cm long block of wood in km? (2 points)
   A) 1.3x10^-6 km   B) 1.3x10^0 km   C) 1.3x10^-2 km   D) 1.3x10^1 km   E) 1.3x10^-1 km

2. What is the SI unit of length? (2 points)
   A) kilogram   B) meter   C) second   D) coulomb   E) mole

3. Which of the following is not an element? (2 points)
   A) oxygen   B) krypton   C) natural gas   D) carbon   E) neon

4. What is the density of a coin which weighs 9.1 g and has a volume of 1.6 cm^3? (2 points)
   A) 5.7 g/cm^3   B) 0.18 g/cm^3   C) 10.7 g cm^3   D) 14.6 g cm^3   E) 0.18 cm^3/g

5. Which of the following numbers has the most number of significant digits? (2 points)
   A) 0.0005102   B) 1,030,000   C) 10.8   D) 0.0410   E) 9.2100

6. The mass of 3.0 mole of chloroform is 358.13 g. Chloroform is made up of 10.06 % (by mass) carbon, 89.09% chlorine and the remainder hydrogen. Calculate the molecular formula of this compound. (10 points)

   chloroform molecular formula =

7. Write down three different isotopes of carbon with the correct atomic symbols, indicating both mass and atomic number. (6 points)
8. Name the following ionic compounds. (4 points each)

- \( \text{K}_2\text{CO}_3 \)
- \( \text{Cu}_2\text{SO}_4 \)
- \( \text{Ca(OH)}_2 \)
- \( \text{PCl}_5 \)

9. Write the empirical formula for the following compounds. (4 points each)

- Hydrochloric acid
- Sulfur dioxide
- Iron (III) sulfite
- Calcium hypochlorite

10. Calculate the molecular weight of the following compounds. (5 points each)

- \( \text{Li}_2\text{HPO}_4 \)
- Testosterone, \( \text{C}_{19}\text{H}_{28}\text{O}_2 \)

11. Calculate the number of moles in a tablespoon of sugar, \( \text{C}_{12}\text{H}_{22}\text{O}_{11} \), weighing 12.6 g. (6 points)

\[
\text{moles } \text{C}_{12}\text{H}_{22}\text{O}_{11} = \ 
\]
12. Ethylene, $\text{C}_2\text{H}_4 (g)$, burns in oxygen gas to produce only $\text{CO}_2 (g)$ and $\text{H}_2\text{O} (l)$. Write the balanced equation below. Using this equation, calculate the maximum amount of $\text{CO}_2$ which could be formed when 2.93 g of $\text{C}_2\text{H}_4$ reacts with 5.29 g of $\text{O}_2$. (12 points)

$$\text{CO}_2 \text{ produced} = \boxed{\text{_____________}}$$

13. Determine the number of neutrons and protons in a given atom for each of the following elements. (9 points)

<table>
<thead>
<tr>
<th>Element</th>
<th>Protons</th>
<th>Neutrons</th>
</tr>
</thead>
<tbody>
<tr>
<td>$^{190}\text{Os}$</td>
<td>____</td>
<td>____</td>
</tr>
<tr>
<td>$^{25}\text{Mg}$</td>
<td>____</td>
<td>____</td>
</tr>
<tr>
<td>$^{35}\text{Cl}$</td>
<td>____</td>
<td>____</td>
</tr>
</tbody>
</table>

14. Balance the following three equations. (15 points)

$$\boxed{\text{____ PBr}_5 (s) + \text{____ H}_2\text{O} (l) \rightarrow \text{____ H}_3\text{PO}_4 (aq) + \text{____ HBr} (aq)}$$

$$\boxed{\text{____ Li}_3\text{N} (s) + \text{____ H}_2\text{O} (l) \rightarrow \text{____ NH}_3 (g) + \text{____ LiOH} (aq)}$$

$$\boxed{\text{____ C}_4\text{H}_9\text{OH} (l) + \text{____ O}_2 (l) \rightarrow \text{____ CO}_2 (g) + \text{____ H}_2\text{O} (l)}$$

15. BONUS QUESTION: Describe in no more than 6 sentences the differences between the Dalton model and the Rutherford model of the atom. (5 bonus points)