Question 1
10 Points
1. How many significant figures are there in each of the following numbers?
   a. 0.0703  3
   b. 241.9  4
2. When 18.44 is added to 36.1, the result should be reported with 1 digit(s) after the decimal point.
3. When 18.44 is multiplied by 36.1, the answer should be reported to 3 significant digit(s).
4. There are 12 eggs in a dozen. If a farmer’s chickens produce an average of 524 dozen eggs in a month, how should the average number of eggs per month be reported?  6.29×10³

Question 2
3 Points
Carry out the following calculation and report the answer in the correct number of significant figures.

\[
\left(168\right) \frac{23.56 - 2.3}{1.248 \times 10^3} = 2.86
\]

Question 3
8 Points
Give the correct name for the following polyatomic ion.
   a. \(\text{ClO}_2^-\) Chlorite
   b. \(\text{SO}_4^{2-}\) Sulfate
   c. \(\text{SO}_3^{2-}\) Sulfite
   d. \(\text{NO}_3^-\) Nitrate

Question 4
3 Points
A nucleus has 19 protons and 20 neutrons. Fill in the three blanks to complete the atomic symbol.

\[39 \quad K \quad 19\]

Question 5
4 Points
Gallium has two naturally occurring isomers:

<table>
<thead>
<tr>
<th>Isomer</th>
<th>Exact Mass (amu)</th>
<th>Abundance</th>
</tr>
</thead>
<tbody>
<tr>
<td>(^{69}\text{Ga})</td>
<td>69.925581</td>
<td>60.10</td>
</tr>
<tr>
<td>(^{71}\text{Ga})</td>
<td>70.924701</td>
<td>39.90</td>
</tr>
</tbody>
</table>

What is the average atomic mass of Gallium? Give answer to 6 decimal places.

\[69.925581(0.6010) + 70.924701(0.3990) = 70.324230 \text{ amu}\]

Average atomic mass: 70.324230 amu
Question 6
10 Points
The following questions pertain to the periodic table given at the front of this exam:

a. Element 22 belongs to which group? IVB
b. Element 22 belongs to which period? 4
c. Element 22 is one of the Transition metals.
d. The symbol for the lightest Alkali Earth Metal is? Be
e. The name of the diatomic element in period 3. Chlorine

Question 7
8 Points

a. What is the formula for magnesium sulfide? MgS
b. Name of the compound with the formula CaCO₃? Calcium carbonate
c. What is the formula for ammonium iodide? NH₄I
d. Name of the compound with the formula Cu₃PO₄? Copper(I) phosphate

Question 8
4 Points

A sample of cinnamaldehyde, C₆H₆O, contains 0.168 mol of the compound. What is the mass of this sample, in grams?

\[ \text{Mass of sample} = 0.168 \text{ mol} \times 106.2 \text{ g/mol} = 17.8 \text{ g} \]

Question 9
6 Points
How many moles of nitrate ions are present in a sample that contains 2.88 moles of magnesium nitrate, Mg(NO₃)₂?

[Must Show Work]

\[ \frac{2.88 \text{ mol Mg(NO₃)₂}}{1 \text{ mol Mg(NO₃)₂}} \times 2 \text{ NO}_3^- = 5.76 \text{ mol NO}_3^- \]

Moles of NO₃⁻ \[ 5.76 \]

Question 10
8 Points
How many grams of Co²⁺ are present in 1.59 moles of Co₃(PO₄)₂?

[Must Show Work]

\[ \frac{1.59 \text{ mol Co₃(PO₄)₂}}{1 \text{ mol Co₃(PO₄)₂}} \times 3 \text{ Co}^{2+} = 4.77 \text{ mol Co}^{2+} \]

\[ \frac{4.77 \text{ mol Co}^{2+}}{1 \text{ mol}} \times 58.39 \text{ g} = 281 \text{ g Co}^{2+} \]

Grams of Co²⁺ \[ 281 \text{ g} \]
Question 11 6 Points
1. Balance the following molecular equations using the smallest possible integer coefficients.
   a. \( \text{P}_2\text{O}_5(s) + 3 \text{H}_2\text{O}(l) = 2 \text{H}_3\text{PO}_4(aq) \)
   b. \( 2 \text{C}_2\text{H}_6(l) + 7 \text{O}_2(g) = 4 \text{CO}_2(g) + 6 \text{H}_2\text{O}(l) \)

2. Write a balanced equation for the reaction described, using the smallest possible integer coefficients.
   When iron reacts with oxygen, iron(II) oxide is formed.
   \[ 2 \text{Fe}(s) + \text{O}_2(g) = 2 \text{FeO} \]

Question 12 8 Points
1. How many orbitals are there in the shell with \( n = 4 \) in an atom? 16
2. The maximum number of electrons possible in a set of 4s orbitals is? 2
3. The orbital depicted directly below is what type of orbital? d
   ![Orbitals Diagram]

4. The 2s orbital is smaller/lower in energy/closer to the nucleus than the 3s orbital.

Question 13 14 Points
1. Write the electron configuration for the chlorine atom: \( 1s^22s^22p^63s^23p^5 \).
2. Write the electron configuration for the calcium atom: \( 1s^22s^22p^63s^23p^64s^2 \).
3. Write the Noble Gas configuration for iron: \( [\text{Ar}]4s^23d^6 \).
4. The Lewis diagram represents the valence electron configuration of a main-group element. This element is in group: VIA
5. The element with an electron configuration of \( 1s^22s^22p^63s^23p^64s^23d^3 \) is in group VB and period 4.
6. Carbon has 4 valence electrons.

Question 14 4 Points
Rank the following elements, from 1-4 with 1 being the smallest, according to atomic size.

2  C  1  O  3  Be  4  Ca
Question 15  Rank the following elements, from 1-4 with 1 being the smallest, according to ionization energy.

3  C  4  O  2  Be  1  Ca