1. (10 points) Balance the following equations.

\[
\begin{align*}
\text{Fe} \text{ (s)} & \quad + \quad \text{O}_2 \text{ (g)} \quad \rightarrow \quad \text{Fe}_3\text{O}_4 \text{ (s)} \\
\text{KClO}_3 \text{ (s)} & \quad \rightarrow \quad \text{KCl} \text{ (s)} \quad + \quad \text{O}_2 \text{ (g)} \\
\text{FeCl}_2 \text{ (aq)} & \quad + \quad \text{Na}_2\text{SiO}_3 \text{ (aq)} \quad \rightarrow \quad \text{NaCl} \text{ (aq)} \quad + \quad \text{FeSiO}_3 \text{ (s)} \\
\text{N}_2\text{O}_5 \text{ (g)} & \quad + \quad \text{H}_2\text{O} \text{ (ℓ)} \quad \rightarrow \quad \text{HNO}_3 \text{ (aq)} \\
\text{Ca}_3\text{P}_2 \text{ (s)} & \quad + \quad \text{H}_2\text{O} \text{ (ℓ)} \quad \rightarrow \quad \text{Ca(OH)}_2 \text{ (aq)} \quad + \quad \text{PH}_3 \text{ (aq)}
\end{align*}
\]

2. (8 points) Answer each of the following. Show your work.

a. How many Br atoms are in 200 molecules of CBr₄?

b. What is the molar mass of Ni(NO₃)₂?

c. How many mol of PF₃ are in 210 g of PF₃?

d. How many molecules of PF₃ are in 210 g of PF₃?
3. (5 points) Consider the combustion of octane (similar to gasoline):

\[
2 \text{C}_8\text{H}_{18}(l) + 25 \text{O}_2(g) \rightarrow 16 \text{CO}_2(g) + 18 \text{H}_2\text{O}(g)
\]

Suppose 100 g of C\textsubscript{8}H\textsubscript{18} is burned.

a. How many mol of C\textsubscript{8}H\textsubscript{18} are in 100 g of C\textsubscript{8}H\textsubscript{18}?

b. How many mol of CO\textsubscript{2} could be formed?

c. What mass of CO\textsubscript{2} could be formed?

4. (6 points) First draw the Lewis structure for the following compounds. Then identify the intermolecular forces – dispersion, dipole-dipole, and/or H-bonding - that would exist between the following molecules. (I gave you the last Lewis structure.)

<table>
<thead>
<tr>
<th>Compound</th>
<th>Lewis structure</th>
<th>Types of intermolecular forces</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHF\textsubscript{3}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H\textsubscript{2}S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CH\textsubscript{3}OH</td>
<td></td>
<td></td>
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</tbody>
</table>