Question 1 of 7
Calculate the heat of combustion for octane \((C_8H_{18})\). The standard enthalpy of formation for octane is \(-249.9\text{ kJ/mol}\).

\[
\text{C}_8\text{H}_{18}(l) + 25/2 \text{O}_2(g) \rightarrow 8\text{CO}_2(g) + 9\text{H}_2\text{O}(l)
\]

\[
\text{Number} \quad \text{kJ/mol}
\]

Question 2 of 7
Calcium oxide \((\text{CaO})\) is used to remove sulfur dioxide generated by coal-burning power stations:

\[
2\text{CaO}(s) + 2\text{SO}_2(g) + \text{O}_2(g) \rightarrow 2\text{CaSO}_4(s)
\]

Calculate the enthalpy change for this if \(6.60 \times 10^5\) g of \(\text{SO}_2\) are removed by this process every day.

\[
\text{Number} \quad \text{kJ}
\]

Question 3 of 7
Ammonia can be oxidized to nitric oxide in the following reaction.

\[
4\text{NH}_3(g) + 5\text{O}_2(g) \xrightleftharpoons[\text{Pt}_{\text{catalyst}}]{\text{\longrightarrow}} 4\text{NO}(g) + 6\text{H}_2\text{O}(g)
\]

Find the enthalpy change for this oxidation process using the following three thermochemical equations.

\[
\text{N}_2(g) + \text{O}_2(g) \rightarrow 2\text{NO}(g) \quad \Delta H_{\text{rxn}}^\circ = +180.8\text{ kJ/mol}
\]

\[
\text{N}_2(g) + 3\text{H}_2(g) \rightarrow 2\text{NH}_3(g) \quad \Delta H_{\text{rxn}}^\circ = -92.6\text{ kJ/mol}
\]

\[
2\text{H}_2(g) + \text{O}_2(g) \rightarrow 2\text{H}_2\text{O}(g) \quad \Delta H_{\text{rxn}}^\circ = -483.6\text{ kJ/mol}
\]

\[
\text{Number} \quad \text{kJ/mol}
\]

Question 4 of 7
Oxidation of gaseous \(\text{Cl}_2\) by \(\text{F}_2\) yields liquid \(\text{ClF}_3\), an important fluorinating agent. Use the following thermochemical equations to calculate \(\Delta H_{\text{rxn}}^\circ\) for the production of \(\text{ClF}_3\):

\[
\begin{align*}
[1] & \quad 2\text{ClF}(g) + \text{O}_2(g) \rightarrow \text{Cl}_2\text{O}(g) + \text{OF}_2(g) \quad \Delta H^\circ = 167.5\text{ kJ} \\
[2] & \quad 2\text{F}_2(g) + \text{O}_2(g) \rightarrow 2\text{OF}_2(g) \quad \Delta H^\circ = -43.5\text{ kJ} \\
[3] & \quad 2\text{ClF}_3(l) + 3\text{O}_2(g) \rightarrow \text{Cl}_2\text{O}(g) + 3\text{OF}_2(g) \quad \Delta H^\circ = 394.1\text{ kJ}
\end{align*}
\]
Question 5 of 7
How much heat (in kJ) would be required to raise the temperature of 805 g of water from 29.6 °C to 97.5 °C?

Question 6 of 7
When 100.0 mL of a silver nitrate solution and 50.0 mL of a sodium chloride solution were mixed in a constant-pressure calorimeter, the temperature of the mixture rose from 21.15°C to 25.60°C. If the density of the solution is 1.0 g/mL and its specific heat is 4.18 J/g °C, how much heat is evolved by this reaction?

Question 7 of 7
Silver chloride, AgCl, precipitates when solutions of silver nitrate, AgNO₃, and sodium chloride, NaCl are mixed.

\[ \text{AgNO}_3(aq) + \text{NaCl}(aq) \rightarrow \text{AgCl(s)} + \text{NaNO}_3(aq) \]

To determine the molar heat of reaction for this precipitation, 100.0 mL of 0.400 M silver nitrate and 50.0 mL of 0.800 M sodium chloride were mixed in a constant-pressure calorimeter, which has a negligible heat capacity. The temperature of the mixture rose from 21.15 °C to 25.55 °C. If the density of the solution is 1.0 g/mL and its specific heat is 4.18 J/g °C, what is the molar heat of reaction for this precipitation?