Question 1 of 7

Calculate the heat of combustion for octane (C₈H₁₈). The standard enthalpy of formation for octane is −249.9 kJ/mol.

\[ C_8H_{18}(l) + 25/2 O_2(g) \rightarrow 8CO_2(g) + 9H_2O(l) \]

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

Question 2 of 7

Calcium oxide (CaO) is used to remove sulfur dioxide generated by coal-burning power stations:

\[ 2CaO(s) + 2SO_2(g) + O_2(g) \rightarrow 2CaSO_4(s) \]

Calculate the enthalpy change for this if 6.60 × 10⁵ g of SO₂ 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.

\[ 4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g) \]

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

\[ N_2(g) + O_2(g) \rightarrow 2NO(g) \quad \Delta H_{rxn}^\circ = +180.8 \text{ kJ/mol} \]

\[ N_2(g) + 3H_2(g) \rightarrow 2NH_3(g) \quad \Delta H_{rxn}^\circ = -92.6 \text{ kJ/mol} \]

\[ 2H_2(g) + O_2(g) \rightarrow 2H_2O(g) \quad \Delta H_{rxn}^\circ = -483.6 \text{ kJ/mol} \]

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

Question 4 of 7

Oxidation of gaseous CIF by F₂ yields liquid CIF₃, an important fluorinating agent. Use the following thermochemical equations to calculate \( \Delta H_{rxn}^\circ \) for the production of CIF₃:

1. \[ 2 \text{ CIF}(g) + O_2(g) \rightarrow Cl_2O(g) + OF_2(g) \quad \Delta H^\circ = 167.5 \text{ kJ} \]

2. \[ 2 \text{ F}_2(g) + O_2(g) \rightarrow 2 \text{ OF}_2(g) \quad \Delta H^\circ = -43.5 \text{ kJ} \]

3. \[ 2 \text{ CIF}_3(l) + 2 \text{ O}_2(g) \rightarrow Cl_2O(g) + 3 \text{ OF}_2(g) \quad \Delta H^\circ = 394.1 \text{ kJ} \]
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?

Number

[Blank]
kJ

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?

Number

[Blank]
kJ

Question 7 of 7

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

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

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?

Number

[Blank]
kJ/mol