

1. Octane ( $C_8H_{18}$ ) is a main component of gasoline used in cars.

A) Write a balanced chemical equation for the combustion of octane with oxygen.

B) Using the following standard enthalpies of formation, determine the standard change in enthalpy ( $\Delta H_{rxn}^\circ$ ) for the combustion reaction of octane.

$$\Delta H_f^\circ[C_8H_{18}(l)] = -249.9 \frac{\text{kJ}}{\text{mol}} \quad \Delta H_f^\circ[CO_2(g)] = -393.5 \frac{\text{kJ}}{\text{mol}} \quad \Delta H_f^\circ[H_2O(g)] = -241.8 \frac{\text{kJ}}{\text{mol}}$$

C) How much  $CO_2$  gas is produced if 1.25 L of octane (density 0.703 g/mL) are combusted?

2. A total of 1411 kJ of heat is applied to 500. mL of liquid water, originally 25.0 °C, to convert it all to water vapor. What is the final temperature of the gaseous water?

$$c_p[H_2O(s)] = 37.1 \frac{\text{J}}{\text{mol} \cdot ^\circ\text{C}}$$

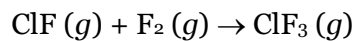
$$\Delta H_{fus}[H_2O] = 6.01 \frac{\text{kJ}}{\text{mol}}$$

$$c_p[H_2O(l)] = 75.3 \frac{\text{J}}{\text{mol} \cdot ^\circ\text{C}}$$

$$\Delta H_{vap}[H_2O] = 40.67 \frac{\text{kJ}}{\text{mol}}$$

$$c_p[H_2O(g)] = 33.6 \frac{\text{J}}{\text{mol} \cdot ^\circ\text{C}}$$

3. Consider the following reaction:



Calculate  $\Delta H_{\text{rxn}}$  for the above reaction given the following reactions.

