

Homework - Worksheet

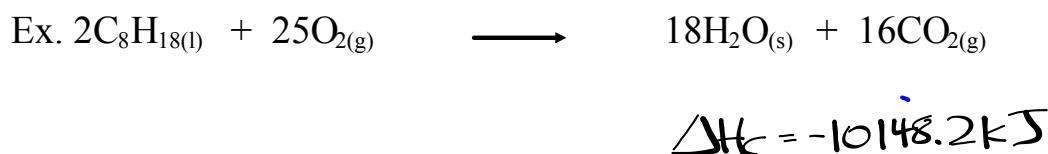
Multi-Step Energy Calculations can be used when energy produced in one chemical reaction is used to heat another substance. These calculations are very similar to calorimetry calculations.

total enthalpy change = quantity of heat

$$\Delta H_r = -q$$

Sample Problem

What mass of octane is completely burned during the heating of 20.L of aqueous ethylene glycol automobile coolant from -10°C to 70°C ? The volumetric heat capacity of aqueous ethylene glycol is $3.7 \text{ kJ/L}^{\circ}\text{C}$.



Step 1: H_r (general)

$$\Delta H_r = n H_r$$

$$H_r = \frac{\Delta H_r}{n} = \frac{-10148.2 \text{ kJ}}{2 \text{ mol}} = -5074.1 \text{ kJ/mol}$$

Step 2: n (specific)

$$\overset{\text{octane}}{\Delta H_r} = -q \quad \leftarrow \text{coolant}$$

$$n H_r = -v C \Delta T$$

$$n (-5074.1 \frac{\text{kJ}}{\text{mol}}) = -(20.\text{L})(3.7 \frac{\text{kJ}}{\text{L}^{\circ}\text{C}})(80.^{\circ}\text{C})$$

$$n = 1.1667 \text{ mol}$$

Step 3: mass

$$1.1667 \text{ mol C}_8\text{H}_{18} \times \frac{114.26 \text{ g C}_8\text{H}_{18}}{1 \text{ mol C}_8\text{H}_{18}} = \boxed{130 \text{ g C}_8\text{H}_{18}}$$

Worksheet #1-5

