

Mastery Quiz 2 (LT 5.1d)-Calorimetry

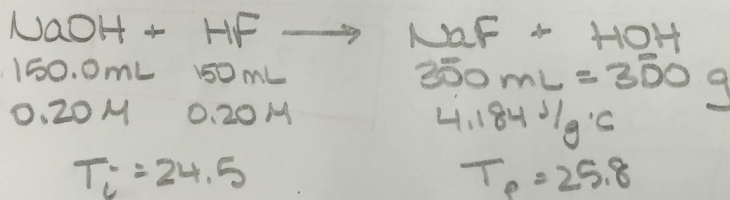
1. A 55.1 g piece of metal is heated to a temperature of 45.1°C, and placed into a cup containing 359 g of water at 20.0°C (specific heat of water is 4.184 J/g°C). The final temperature of the water and metal is 22.3°C. What is the specific heat of the metal?

	M	H ₂ O
m	55.1 g	359 g
C		4.184 J/g°C
T _i	45.1°C	20.0°C
T _f	22.3°C	22.3°C

$$-(55.1)(x)(-22.8) = + (359)(4.184)(2.3)$$

$$C = 2.7 \text{ J/g} \cdot \text{C}$$

2. A 150.0 mL sample of 0.20M NaOH solution is mixed with 150 mL of 0.20 M HF solution, both of which have a temperature of 24.5°C. The reaction below occurs, and the temperature of the resulting solution rises to 25.8°C. What is the ΔH of the reaction (in kJ/mol HF)? **Assume that volumes are additive and the resulting solution has a density of 1.00g/mL and specific heat of 4.184 J/g°C**



$$q_{\text{solution}} = (300 \text{ g})(4.184)(1.3^\circ\text{C}) = 1631.76 \text{ J}$$

$$\frac{-1.63176 \text{ kJ}}{0.030 \text{ mol HF}} = -54 \text{ kJ/mol HF}$$

$$(0.20)(0.15 \text{ L}) \rightarrow$$

Mastery Quiz 4 (LT 5.1f)-Enthalpies of Formation

Given the following reaction: $\text{C}_2\text{H}_5\text{OH}_{(l)} + 3\text{O}_{2(g)} \rightarrow 2\text{CO}_{2(g)} + 3\text{H}_2\text{O}_{(l)}$ $\Delta H = -1366.7 \text{ kJ}$

1. Calculate the change in enthalpy for the combustion reaction.

$$\Sigma P = 2(-393.5 \text{ kJ}) + 3(-285.8 \text{ kJ}) = -1644.4 \text{ kJ}$$

$$\Sigma R = 1(-277.7 \text{ kJ}) = -277.7 \text{ kJ}$$

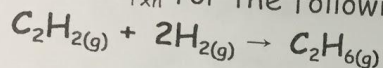
$$(-1644.4) - (-277.7) = \boxed{-1366.7 \text{ kJ}}$$

2. How much energy is released upon the burning of 2.5 kg of ethanol ($\text{C}_2\text{H}_5\text{OH}$)?

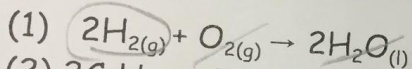
$$2500 \text{ g C}_2\text{H}_5\text{OH} \times \frac{1 \text{ mol}}{46.08 \text{ g}} \times \frac{-1366.7 \text{ kJ}}{1 \text{ mol}} = \boxed{-74000 \text{ kJ}}$$

Mastery Quiz 3 (LT 5.1e)-Hess's Law

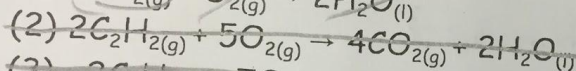
Find the $\Delta H^\circ_{\text{rxn}}$ for the following reaction:



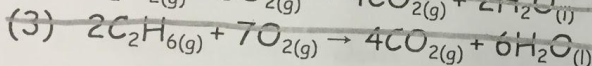
$$\Delta H^\circ_{\text{rxn}} = ???$$



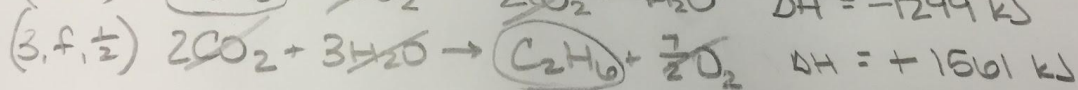
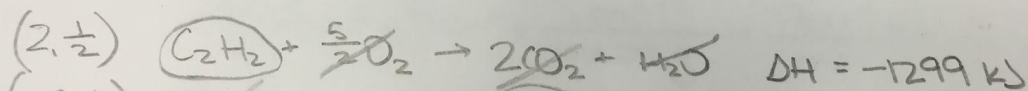
$$\Delta H^\circ_{\text{rxn}} = -572 \text{ kJ}$$



$$\Delta H^\circ_{\text{rxn}} = -2598 \text{ kJ}$$



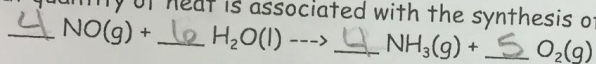
$$\Delta H^\circ_{\text{rxn}} = -3122 \text{ kJ}$$



$$\Delta H = \boxed{-310. \text{ kJ}}$$

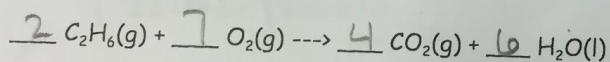
Mastery Quiz 1 (LT 5.1C): Thermochemistry

1. What quantity of heat is associated with the synthesis of 45.0 g of NH_3 according to the following equation?
 $\Delta H = +1170 \text{ kJ}$



$$45.0 \text{ g NH}_3 \times \frac{1 \text{ mol}}{17.04 \text{ g}} \times \frac{+1170 \text{ kJ}}{4 \text{ mol}} = \boxed{+772 \text{ kJ}}$$

2. Calculate the mass of ethane, C_2H_6 , which must be burned to produce 100.0 kJ of heat.



$$\Delta H = -3120 \text{ kJ}$$

$$-100.0 \text{ kJ} \times \frac{2 \text{ mol}}{-3120 \text{ kJ}} \times \frac{30.08 \text{ g}}{1 \text{ mol}} = \boxed{1.93 \text{ g}}$$