

SHOW ALL WORK TO RECEIVE CREDIT

Molar Masses: C 12.01, H 1.008

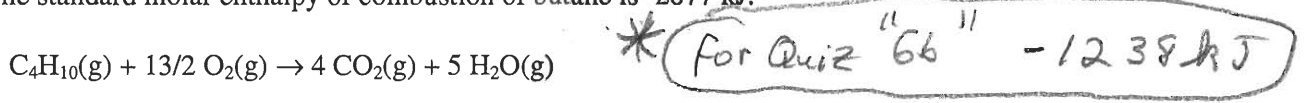
1. (5 Pts) If 34.8 J is required to change the temperature of 10.0 g of mercury by 25 K, what is the specific heat of mercury?

$$\frac{34.8 \text{ J}}{10.0 \text{ g} \cdot 25 \text{ K}} = 0.139 = \frac{0.14 \text{ J}}{\text{g} \cdot \text{K}}$$

2. (5 Pts) How much energy is required to change the temperature of 15.0 g Fe from 18.5°C to 56.8°C? The specific heat of iron is 0.451 J/g·K.

$$\frac{0.451 \text{ J}}{\text{g} \cdot \text{K}} \cdot 15.0 \text{ g} \cdot 38.3 \text{ K} = 259 \text{ J}$$

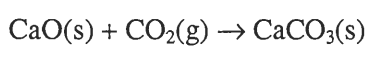
3. (5 Pts) The standard molar enthalpy of combustion of butane is -2877 kJ.



What is the enthalpy change for the combustion of 15.00 g C_4H_{10} ?

$$\frac{15.00 \text{ g } \text{C}_4\text{H}_{10}}{58.12 \text{ g}} \cdot \frac{-2877 \text{ kJ}}{\text{mol } \text{C}_4\text{H}_{10}} = -742.5 \text{ kJ}$$

4. (5 Pts) Calculate the enthalpy for the formation of calcium carbonate from calcium oxide and carbon dioxide,



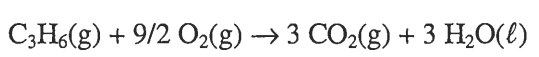
given the enthalpies of the reactions below.

- #1 $2 \text{Ca}(\text{s}) + \text{O}_2(\text{g}) \rightarrow 2 \text{CaO}(\text{s})$ $\Delta H = -1270.2 \text{ kJ}$
- #2 $\text{C}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$ $\Delta H = -393.5 \text{ kJ}$
- #3 $2 \text{Ca}(\text{s}) + 2 \text{C}(\text{s}) + 3 \text{O}_2(\text{g}) \rightarrow 2 \text{CaCO}_3(\text{s})$ $\Delta H = -2413.8 \text{ kJ}$

$\text{CaO} : \text{reverse \#1} \div 2 \quad \text{CaO}(\text{s}) \rightarrow \text{Ca}(\text{s}) + \frac{1}{2} \text{O}_2(\text{g}) \quad +635.1 \text{ kJ}$
 $\text{CO}_2 : \text{reverse \#2} \quad \text{CO}_2(\text{g}) \rightarrow \text{C}(\text{s}) + \text{O}_2(\text{g}) \quad +393.5 \text{ kJ}$
 $\text{CaCO}_3(\text{s}) : \#3 \div 2 \quad \text{Ca}(\text{s}) + \text{C}(\text{s}) + \frac{3}{2} \text{O}_2(\text{g}) \rightarrow \text{CaCO}_3(\text{s}) \quad -1206.9 \text{ kJ}$

$\text{CaO}(\text{s}) + \text{CO}_2(\text{g}) \rightarrow \text{CaCO}_3(\text{s}) \quad \Delta H = -178.3$

5. (5 Pts) Calculate the molar enthalpy of combustion of $\text{C}_3\text{H}_6(\text{g})$,



using standard enthalpies of formation. { $\text{C}_3\text{H}_6(\text{g})$ +53.3 kJ/mole; CO_2 -393.5 kJ/mole; H_2O -285.8 kJ/mol}

$$\Delta H_{\text{rxn}} = \sum n \Delta H_{\text{products}} - \sum n \Delta H_{\text{reactants}}$$

$$= (3(-393.5) + 3(-285.8)) - (53.3 + 0) = -2091.2 \text{ kJ}$$