CHM151 Quiz#6a 25 Pts Spring 2010 Name: Key

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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?

$$\frac{34.8\ J}{10.0\ g \mid 25\ K} = 0.139 = \frac{0.14\ J}{g\ ^\circ C}$$

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.

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

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

$C_4H_{10}(g) + 13/2\ O_2(g) \rightarrow 4\ CO_2(g) + 5\ H_2O(g)$

* for Quiz "6b" -1238 kJ

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

$$15.00\ g\ C_4H_{10} \mid \frac{1\ mol}{58.12\ g} \mid \frac{-2877\ kJ}{mol\ C_4H_{10}} = -742.5\ kJ$$

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

$CaO(s) + CO_2(g) \rightarrow CaCO_3(s)$

given the enthalpies of the reactions below.

#1	$2\ Ca(s) + O_2(g) \rightarrow 2\ CaO(s)$	$\Delta H = -1270.2$ kJ
#2	$C(s) + O_2(g) \rightarrow CO_2(g)$	$\Delta H = -393.5$ kJ
#3	$2\ Ca(s) + 2\ C(s) + 3\ O_2(g) \rightarrow 2\ CaCO_3(s)$	$\Delta H = -2413.8$ kJ

CaO : reverse #1 ÷ 2 $CaO(s) \rightarrow Ca(s) + \frac{1}{2}O_2(g)$ +635.1 kJ

CO_2 : reverse #2 $CO_2(g) \rightarrow C(s) + O_2(g)$ +393.5 kJ

$CaCO_3(s)$: #3 ÷ 2 $Ca(s) + C(s) + \frac{3}{2}O_2(g) \rightarrow CaCO_3(s)$ −1206.9 kJ

$CaO(s) + CO_2(g) \rightarrow CaCO_3(s)$ $\Delta H = -178.3$

5. (5 Pts) Calculate the molar enthalpy of combustion of $C_3H_6(g)$,

$C_3H_6(g) + 9/2\ O_2(g) \rightarrow 3\ CO_2(g) + 3\ H_2O(\ell)$

using standard enthalpies of formation. {$C_3H_6(g)$ +53.3 kJ/mole; CO_2 -393.5 kJ/mole; H_2O -285.8 kJ/mol}

$$\Delta H^\circ_{RXN} = \sum n\Delta H_{products} - \sum n\Delta H_{reactants}$$

$$= \left(3(-393.5) + 3(-285.8)\right) - \left(53.3 + 0\right) = -2091.2\ kJ$$