CHM151 Quiz 7 25 Pts Fall 2009 Name: Key

SHOW ALL WORK TO RECEIVE CREDIT.

Atomic Masses: N 14.01; H 1.008

1. (8 Pts) Use Hess's Law and and the reactions below to determine the ΔH of:

$C_2H_4O(g) + H_2O(l) \rightarrow HOCH_2CH_2OH(l)$

Reaction 1: $2C_2H_4O(g) + 5O_2(g) \rightarrow 4CO_2(g) + 4H_2O(l)$ $\Delta H = -2612.2$ kJ

Reaction 2: $HOCH_2CH_2OH(l) + 5/2O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$ $\Delta H = -1189.8$ kJ

÷2 $C_2H_4O + \frac{5}{2}O_2 \rightarrow 2CO_2 + 2H_2O$ $\Delta H = -1306.1$ kJ

reverse $2CO_2 + 3H_2O \rightarrow HOCH_2CH_2OH + \frac{5}{2}O_2$ $\Delta H = +1189.8$ kJ

$C_2H_4O(g) + H_2O(l) \rightarrow HOCH_2CH_2OH(l)$ $\Delta H = -116.3$ kJ

2. (5 Pts) How much heat would be given off if 48.5 grams of ammonia are burned according to the following reaction carried out in the presence of a copper catalyst?

$4NH_3(g) + 3O_2(g) \rightarrow 2N_2(g) + 6H_2O(g)$ $\Delta H = -1267$ kJ

$$\frac{48.5\ g\ NH_3}{17.034\ g} \left| \frac{1\ mol}{4\ mol\ NH_3} \right| \frac{1267\ kJ}{} = 901.9 \approx 902\ kJ$$

3. (4 Pts) Calculate the amount of heat needed to raise the temperature of 100 grams of ethanol from 25.0°C to 55.0°C. The specific heat of ethanol is 2.42 J/g·°C.

$$\frac{2.42\ J}{g \cdot °C} \left| 100\ g \right| (55.0 - 25.0)\ °C = 7260\ J$$

4. (4 Pts) Determine the specific heat of a metal, if it takes 62.3 kJ to raise the temperature of a 165 gram metal sample from 298 K to 398 K.

$$62.3 \times 10^3\ J \left| 165\ g \right| 100\ K = \frac{3.78\ J}{g \cdot K}$$

5. (4 Pts) Determine the heat of the following reaction:

$SO_2Cl_2(g) + 2H_2O(l) \rightarrow 2HCl(g) + H_2SO_4(l)$

compound	ΔH kJ/mole
$SO_2Cl_2(g)$	-364
$H_2O(l)$	-286
$HCl(g)$	-92
$H_2SO_4(l)$	-814

$\Delta H_{RXN} = \sum \Delta H_{prod} - \sum \Delta H_{react.}$

$[2(-92) + -814] - [-364 + 2(-286)]$

$-998 - -936$

$\Delta H_{RXN} = -62$ kJ