Chemistry 141 Name -

Dr. Cary Willard

Quiz 7A (20 points) March 15, 2011

1. (8 points) A 45.0 gram sample of ice at -10.0oC is dropped into 150.0 grams of water at 75.5oC. Determine the final temperature of the mixture. Assume that no heat is transferred in or out of the system.

specific heat of ice 2.06 J/goC 37.1 J/moloC

specific heat of water 4.184 J/goC 75.4 J/moloC

specific heat of steam 2.0 J/goC 36 J/moloC

heat of fusion 333 J/g 6.01 kJ/mol

heat of vaporization 2260 J/g 40.7 kJ/mol

$$q\_{ice-10.0℃\rightarrow 0℃}+q\_{ice 0℃\rightarrow water 0℃}+q\_{water 0℃\rightarrow ?℃}=q\_{water 75.5℃\rightarrow ?℃}$$

$$\left(45.0 g\right)\left(\frac{2.06 J}{g ℃}\right)\left(10.0℃\right) + \left(45.0 g\right)\left(\frac{333 J}{g}\right)+\left(45.0 g\right)\left(\frac{4.184 J}{g ℃}\right)\left(T-0℃\right)=\left(450.0 g\right)\left(\frac{4.184 J}{g ℃}\right)(75.5℃-T)$$

$$927 J + 15000 J+\left(\frac{188 J}{ ℃}\right)\left(T\right)=\left(\frac{628 J}{ ℃}\right)(75.5℃-T)$$

$$ 15900 J+\left(\frac{188 J}{ ℃}\right)\left(T\right)=47400 J-\left(\frac{628 J}{ ℃}\right)(T)$$

$$-31500 J=-\left(\frac{816 J}{ ℃}\right)(T)$$

$$T=36.6℃$$

1. (6 points) Consider the following generic reaction

4A + 6B 🡪 4C + 12D H =+ 100 kJ

Determine the value of H for each of the following related reactions

2A + 3B 🡪 2C + 12D H = + 50 kJ

8C + 24D 🡪 8A + 12B H = −200 kJ

1. (6 points) Calculate the Hrxn for the following reaction using Hess Law

CaO(s) + CO2(g) 🡪 CaCO3(s)

Given

Ca(s) + CO2(g) + ½ O2(g) 🡪 CaCO3(s) H = -812.8 kJ

2Ca(s) + O2(g) 🡪 2 CaO(s) H = -1269.8 kJ

 CaO(s) 🡪 Ca(s) + ½ O2(g) H = +1269.8 kJ/2 = + 634.9 kJ

Ca(s) + CO2(g) + ½ O2(g) 🡪 CaCO3(s) H = -812.8 kJ

CaO(s) + CO2(g) 🡪 CaCO3(s) H = -177.9 kJ

Chemistry 141 Name -

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Quiz 7B (20 points) March 15, 2011

1. (8 points) A 45.0 gram sample of ice at -10.0oC is dropped into 250.0 grams of water at 75.5oC. Determine the final temperature of the mixture. Assume that no heat is transferred in or out of the system.

specific heat of ice 2.06 J/goC 37.1 J/moloC

specific heat of water 4.184 J/goC 75.4 J/moloC

specific heat of steam 2.0 J/goC 36 J/moloC

heat of fusion 333 J/g 6.01 kJ/mol

heat of vaporization 2260 J/g 40.7 kJ/mol

$$q\_{ice-10.0℃\rightarrow 0℃}+q\_{ice 0℃\rightarrow water 0℃}+q\_{water 0℃\rightarrow ?℃}=q\_{water 75.5℃\rightarrow ?℃}$$

$$\left(45.0 g\right)\left(\frac{2.06 J}{g ℃}\right)\left(10.0℃\right) + \left(45.0 g\right)\left(\frac{333 J}{g}\right)+\left(45.0 g\right)\left(\frac{4.184 J}{g ℃}\right)\left(T-0℃\right)=\left(250.0 g\right)\left(\frac{4.184 J}{g ℃}\right)(75.5℃-T)$$

$$927 J + 15000 J+\left(\frac{188 J}{ ℃}\right)\left(T\right)=\left(\frac{1050 J}{ ℃}\right)(75.5℃-T)$$

$$ 15900 J+\left(\frac{188 J}{ ℃}\right)\left(T\right)=79000 J-\left(\frac{1050 J}{ ℃}\right)(T)$$

$$-63100 J=-\left(\frac{1240 J}{ ℃}\right)(T)$$

$$T=50.9℃$$

1. (6 points) Consider the following generic reaction

4A + 6B 🡪 4C + 12D H =+ 200 kJ

Determine the value of H for each of the following related reactions

2A + 3B 🡪 2C + 12D H = + 100 kJ

8C + 24D 🡪 8A + 12B H = −400 kJ

1. (6 points) Calculate the Hrxn for the following reaction using Hess Law

CaO(s) + CO2(g) 🡪 CaCO3(s)

Given

Ca(s) + CO2(g) + ½ O2(g) 🡪 CaCO3(s) H = -812.8 kJ

2Ca(s) + O2(g) 🡪 2 CaO(s) H = -1269.8 kJ

CaO(s) 🡪 Ca(s) + ½ O2(g) H = +1269.8 kJ/2 = + 634.9 kJ

Ca(s) + CO2(g) + ½ O2(g) 🡪 CaCO3(s) H = -812.8 kJ

CaO(s) + CO2(g) 🡪 CaCO3(s) H = -177.9 kJ