Chemistry 141 Name key

Dr. Cary Willard

Quiz 6A (20 points) March 17, 2009

1. (12 points) 2.91 g of isooctane (C8H18) were placed into a calorimeter containing 200 g of water at 28.4 oC and burned in the presence of oxygen. After the completion of the reaction, 21.5 g of the water had been evaporated. The calorimeter constant for the calorimeter was 0.423 kJ/oC, for water specific heat = 4.184 J/goC and ΔH vaporization = 2260 J/g.
	1. What is the final temperature of the system?

 100oC

* 1. What is the q of the reaction (remember sign conventions)

 $q\_{lost reaction} =q\_{gained calorimeter} +q\_{gained water warming} +q\_{gained water boiling} $

$$q\_{lost reaction} =\left(71.6℃\right)\left(\frac{423 J}{℃}\right)+\left(71.6℃\right)\left(\frac{4.184 J}{g℃}\right)\left(200 g\right)+\left(21.5 g\right)\left(\frac{2260 J}{g}\right)$$

$$q\_{lost reaction} =30300 J+59900 J +48600 J=138800 J$$

$$so q=-138.3 kJ/mol$$

* 1. What is the q of the reaction in kJ/g

$$q=\frac{-138.3 kJ}{2.91 g}=-47.7 kJ/g$$

* 1. What is the ΔH of the reaction in kJ/mol?

$$q=\frac{-47.7 kJ}{1 g}×\frac{114.2 g isooctane}{1 mol}=\frac{-5450 kJ}{mol isooctane}$$

1. (8 points)Calculate ΔHrxn for 2 NOCl(g) 🡪 N2(g) + O2(g) + Cl2(g) using Hess’s Law.

Given the following equations

 ½ N2(g) + ½ O2(g) 🡪 NO(g) ΔH = + 90.3 kJ

 NO(g) + ½ Cl2(g) 🡪 NOCl(g) ΔH = −38.6 kJ

 2 NOCl(g) 🡪 2 NO(g) + Cl2(g) −-2(−38.6 kJ) = + 77.2 kJ

 2 NO 🡪 N2(g) + O2(g) −2(+90.3 kJ) = −180.6 kJ

 2 NOCl(g) 🡪 N2(g) + O2(g) + Cl2(g) −103.4 kJ

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Quiz 6B (20 points) March 17, 2009

1. (12 points) 4.49 g of isooctane (C8H18) were placed into a calorimeter containing 300 g of water at 28.4 oC and burned in the presence of oxygen. After the completion of the reaction, 41.5 g of the water had been evaporated. The calorimeter constant for the calorimeter was 0.423 kJ/oC, for water specific heat = 4.184 J/goC and ΔH vaporization = 2260 J/g.
	1. What is the final temperature of the system?

 100oC

* 1. What is the q of the reaction (remember sign conventions)

 $q\_{lost reaction} =q\_{gained calorimeter} +q\_{gained water warming} +q\_{gained water boiling} $

$$q\_{lost reaction} =\left(71.6℃\right)\left(\frac{423 J}{℃}\right)+\left(71.6℃\right)\left(\frac{4.184 J}{g℃}\right)\left(300 g\right)+\left(41.5 g\right)\left(\frac{2260 J}{g}\right)$$

$$q\_{lost reaction} =30300 J+89900 J +93800 J=214000 J$$

$$so q=-214.0 kJ/mol$$

* 1. What is the q of the reaction in kJ/g

$$q=\frac{-214.0 kJ}{4.49 g}=-47.7 kJ/g$$

* 1. What is the ΔH of the reaction in kJ/mol?

$$q=\frac{-47.7 kJ}{1 g}×\frac{114.2 g isooctane}{1 mol}=\frac{-5450 kJ}{mol isooctane}$$

1. (8 points)Calculate ΔHrxn for 2 NOCl(g) 🡪 N2(g) + O2(g) + Cl2(g) using Hess’s Law.

Given the following equations

 ½ N2(g) + ½ O2(g) 🡪 NO(g) ΔH = + 90.3 kJ

 NO(g) + ½ Cl2(g) 🡪 NOCl(g) ΔH = −38.6 kJ

 2 NOCl(g) 🡪 2 NO(g) + Cl2(g) −-2(−38.6 kJ) = + 77.2 kJ

 2 NO 🡪 N2(g) + O2(g) −2(+90.3 kJ) = −180.6 kJ

 2 NOCl(g) 🡪 N2(g) + O2(g) + Cl2(g) −103.4 kJ