Chemistry 141 - Name key .

Dr. Cary Willard

Quiz 5A (20 points) October 5, 2010

* specific heat of ice 2.06 J/goC 0.91 kJ/moloC
* specific heat of water 4.184 J/goC 7.54 kJ/moloC
* specific heat of steam 2.0 J/goC 0.92 kJ/moloC
* heat of fusion 333 J/g 6.01 kJ/mol
* heat of vaporization 2226 J/g 40.67 kJ/mol
1. (7 points) Steam at 100.0oC was bubbled through 350.0 g of water in a beaker originally at 15.4oC. What mass of steam condensed into the water if the final temperature of the sample was 85.3oC?

Heat lost = heat gained

qsteam→water at 100oC + qwater at 100oC →water at 83.3oC = qwater at 25.4oC →water at 83.3oC

$$\left(\frac{2226 J}{g}\right)\left(m\right)+\left(14.7℃\right)\left(\frac{4.184 J}{g ℃}\right)\left(m\right)=\left(69.9℃\right)\left(\frac{4.184 J}{g ℃}\right)\left(350.0g\right)$$

$$\left(\frac{2226J}{g}\right)\left(m\right)+\left(\frac{61.9 J}{g }\right)\left(m\right)=102000 J$$

$$\left(\frac{2288J}{g}\right)\left(m\right)=102000 J$$

$$\left(m\right)=44.6 g steam$$

1. (7 points) A 1.500 gram sample of a ketone with the molecular formula C12H26O is burned in a bomb calorimeter that has a heat capacity of 45.06 kJ/oC. The temperature of the calorimeter increases by 3.413oC. Calculate the energy of combustion of the ketone per gram and per mole.

Heat Rxn = heat absorbed by calorimeter

$$heat reaction= \left(\frac{45.06 kJ}{℃}\right)\left(3.413℃\right)=153.8 kJ and this will be a negative value!$$

$$\frac{-153.8 kJ}{1.500 g}=$$

$$\frac{-102.5 kJ}{g}×\frac{186 g}{1 mol}=$$

1. (6 points) Calculate Hrxn for the following reaction:.

CaO(s) + CO2(g) 🡪 CaCO3(s)

Use the following reactions and given H’s

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

2 Ca(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 key .

Dr. Cary Willard

Quiz 5B (20 points) October 5, 2010

* specific heat of ice 2.06 J/goC 0.91 kJ/moloC
* specific heat of water 4.184 J/goC 7.54 kJ/moloC
* specific heat of steam 2.0 J/goC 0.92 kJ/moloC
* heat of fusion 333 J/g 6.01 kJ/mol
* heat of vaporization 2226 J/g 40.67 kJ/mol
1. (10 points) Steam at 100.0oC was bubbled through 450.0 g of water in a beaker originally at 15.4oC. What mass of steam condensed into the water if the final temperature of the sample was 85.3oC?

Heat lost = heat gained

qsteam→water at 100oC + qwater at 100oC →water at 83.3oC = qwater at 25.4oC →water at 83.3oC

$$\left(\frac{2226 J}{g}\right)\left(m\right)+\left(14.7℃\right)\left(\frac{4.184 J}{g ℃}\right)\left(m\right)=\left(69.9℃\right)\left(\frac{4.184 J}{g ℃}\right)\left(450.0g\right)$$

$$\left(\frac{2226J}{g}\right)\left(m\right)+\left(\frac{61.6 J}{g }\right)\left(m\right)=132000 J$$

$$\left(\frac{2288J}{g}\right)\left(m\right)=132000 J$$

$$\left(m\right)=57.5 g steam$$

1. (10 points) A 1.500 gram sample of toluene (C7H8) is burned in a bomb calorimeter that has a heat capacity of 45.06 kJ/oC. The temperature of the calorimeter increases by 1.648oC. Calculate the energy of combustion of toluene per gram and per mole.

Heat Rxn = heat absorbed by calorimeter

$$heat reaction= \left(\frac{45.06 kJ}{℃}\right)\left(1.648℃\right)=74.26 kJ and this will be a negative value!$$

$$\frac{-74.26 kJ}{1.500 g}=$$

$$\frac{-49.51 kJ}{g}×\frac{92.15 g}{1 mol}=$$

1. (7 points) Calculate Hrxn for the following reaction:.

N2O(g) + NO2(g) 🡪 3 NO(g)

Use the following reactions and given H’s

N2(g) + O2(g) 🡪 2 NO(g) H = +180.7 kJ

2 NO(g) + O2(g) 🡪 2 NO2(g) H = −113.1 kJ

2 N2O(g) 🡪 2 N2(g) + O2(g) H = −163.2 kJ

N2O(g) 🡪 N2(g) + ½ O2(g) H = −163.2 kJ/2 = −81.6 kJ

NO2(g) 🡪 NO(g) + ½ O2(g) H = −113.1 kJ/-2 = +56.55 kJ

N2(g) + O2(g) 🡪 2 NO(g) H = +180.7 kJ

N2O(g) + NO2(g) 🡪 3 NO(g) H = +155.6 kJ