Chemistry 141 Name

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Quiz 6 (20 points) March 26, 2008

All work must be shown to receive credit.

1. (8 points) Propane is often used as a home fuel in areas where natural gas is not available. When 3.00 g of propane, C3H8, is burned in a calorimeter whose heat capacity is 32.7 kJ/K, the temperature of the calorimeter increases by 4.25oC. Calculate the heat of combustion in kJ/g and kJ/mol of propane.

q reaction = q absorbed by calorimeter

= (4.25oC)(32.7 kJ/K)

= 139 kJ

-139 kJ/3.00 g propane = -46.3 kJ/g propane

3.00 g propane (1 mol propane/44.09 g propane) = 0.0680 mol propane

-139 kJ/0.0680 mol propane = -2040 kJ/mol propane

|  |  |
| --- | --- |
|  | Δ*H*º*f*(kJ/ mol) |
| C51H88O6 (*l*) | –1310 |
| CO2 (*g*) | –393.5 |
| H2O (*g*) | –241.8 |
| H2O (*l*) | –285.8 |

1. (8 points) One possible use for the cooking fat left over after making French fries is to burn it as fuel. Write a balanced equation (what do you think the state of the water will be?), and use the following data to calculate the amount on energy released in kJ from the combustion of 1.00 g of cooking fat (C51H88O6).

C51H88O6 (l) + 70 O2(g) 🡪 44 H2O(g) + 51 CO2(g)

Hreaction = 44 (Hf, H2O, g) + 51 (Hf, CO2, g) – (Hf, C51H88O6, l)

= 44 (-241.8 kJ) + 51 (-393.5 kJ) – (-1310 kJ)

= - 10639.2 kJ + - 20068.5 kJ – (-1310 kJ)

= -29398 kJ

(1.00 g fat)(1 mol fat/797 g fat)(-29398 kJ/1 mol fat) = -36.9 kJ or 36.9 kJ released

WOW!! A great energy source!!!

1. (4 points) The heat of formation of cooking fat is shown above. Write out the equation for this reaction.

51 C(s) + 44 H2(g) + 3 O2(g) 🡪 C51H88O6 (l)