Chemistry 141 Name Key

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Quiz 7A (20 points) March 19, 2009

1. (4 points) The heat of formation of liquid ethanol CH3CH2OH is -277.69 kJ. Write the reaction described by this heat of formation.

3 H2(g) + 2 C(s) + ½ O2(g) 🡪 CH3CH2OH(l)

1. (10 points) In photosynthesis, the sun’s energy brings about the combination of CO2 and H2O to form O2 and a carbon-containing compounds such as a sugar. In its simplest form the reaction could be written

6 CO2*(g)* + 6 H2O*(l)* 🡪 6 O2*(g)* + C6H12O6*(s)*

H = 6 Hf O2,g + Hf C6H12O6, s – 6 Hf CO2, g – 6 Hf H2O, l

( 0 kJ) + (– 1274.4 kJ) – 6(–393.5 kJ) – 6(–285.8 kJ)

 = 0 kJ + (– 1274.4 kJ) + 2361.0 kJ + 1714.8 kJ

 = + 2801.4 kJ

What is the energy change for the formation of 100.0 g of sugar?

$$?energy required=100.0 g C\_{6}H\_{12}O\_{6}×\frac{1 molC\_{6}H\_{12}O\_{6}}{180.16 gC\_{6}H\_{12}O\_{6} }×\frac{2801.4}{1 molC\_{6}H\_{12}O\_{6}}=$$

1. (6 points) Estimate the H for the conversion of 2 mol of ammonia from molecular nitrogen and molecular hydrogen. Is this reaction endothermic or exothermic?

3 H2 + N2 🡪 2 NH3

|  |  |  |  |
| --- | --- | --- | --- |
| Bonds broken  |  | Bonds formed |  |
| 3 H−H  | 3(436 kJ) | 6 N−H | 6(−390 kJ) |
| 1 N≡N | 945 kJ |  |  |
|  |  |  |  |
| total | 2253 |  | −-2340  |

The energy of the reaction is −87 kJ/reaction. This is an exothermic reaction



Heats of formation

|  |  |
| --- | --- |
| compound | Hof (kJ/mol) |
| CO2(g) | -393.5 |
| H2O(l) | -285.8 |
| H2O(g) | -241.8 |
| C6H12O6(s) | -1274.4 |
|  |  |