Chemistry 141 Name

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Quiz 6a (20 points) October 13, 2009

All work must be show to receive credit. Remember, significant figures are important!

1. (8 points) Determine the enthalpy for the partial combustion of methane to carbon monoxide, 2 CH4(g) + 3 O2(g) 🡪 2 CO(g) + 4 H2O(l), from the heats of combustion of carbon monoxide and methane.

CO(g) + ½ O2(g) 🡪 CO2(g) ∆H = -283.0 kJ/mol

CH4(g) + 2 O2(g) 🡪 CO2(g) + 2 H2O ∆H = -890. kJ/mol

2 CH4(g) + 4 O2(g) 🡪 2 CO2(g) + 4 H2O ∆H = 2(-890.) kJ/mol = -1780 kJ

2 CO2(g) 🡪 2 CO(g) + O2(g) ∆H = -2(-283.0) kJ/mol = +566.0 kJ

2 CH4(g) + 3 O2(g) 🡪 2 CO(g) + 4 H2O(l) ∆H =-1214 kJ

1. (4 points) The heat of formation of TNT, C7H5N3O6 is -67kJ/mol. Write the chemical equation representing the heat of formation of TNT or trinitrotoluene.

7 C(s) + 5/2 H2(g) + 3/2 N2(g) + 3 O2(g) 🡪 C7H5N3O6(?)

1. (8 points) Calculate the heat of reaction for the final stage in the production of nitric acid using standard heats of formation.

3 NO2(g) + H2O(l) 🡪 2 HNO3(aq) + NO(g)

∆Hf, NO(g) + 90.25 kJ/mol ∆Hf NO2(g) + 33.18 kJ/mol

∆Hf HNO3(l) –174.10 kJ/mol ∆Hf HNO3(aq) –207.36 kJ/mol

∆Hf H2O(l) –285.83 kJ/mol ∆Hf H2O(g) –241.82 kJ/mol

Hrxn = 2(Hf, HNO3, aq) + (Hf, NO, g) – 3(Hf, NO2, g) – Hf, H2O, l)

= 2 mol(–207.36 kJ/mol) + 1 mol(+90.25 kJ/mol) – 3 mol(+33.18 kJ/mol) – 1 mol(–285.83 kJ/mol)

= –414.72 kJ + 90.25 kJ – 99.54 kJ + 285.83 kJ

= – 138.18 kJ