**Dougherty Valley HS AP Chemistry**

**WORKSHEET #2\***

**Thermochemistry – Extra Practice Hess’s Law**

**Name: Date: Period: Seat #:**

Show all work

[1] Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

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| --- |
| **N2 (g) + 2O2 (g) → 2NO2 (g)** |
| N2 (g) + 3H2 (g) → 2NH3 (g) ΔH = − 115 kJ |
| 2NH3 (g) + 4H2O (*l*) → 2NO2 (g) + 7H2 (g) ΔH = −142.5 kJ |
| H2O(*l*) → H2 (g) + O2 (g) ΔH = −43.7 kJ |
| Answer = −83 kJ |

[2] Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

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| **CO2 (g) → C(s) + O2 (g)** |
| H2O (*l*) → H2 (g) + $\frac{1}{2}$O2 (g) ΔH = 643 kJ |
| C2H6 (g) → 2C (s) + 3H2 (g) ΔH = 190.6 kJ |
| 2CO2 (g) + 3H2O (*l*) → C2H6 (g) + $\frac{7}{2}$O2 (g) ΔH = 3511.1 kJ |
| Answer = 886 kJ |

[3] Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

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| **N2H4 (*l*) + CH4O(*l*) → CH2O(g) + N2 (g) + 3H2 (g)** |
| 2NH3 (g) → N2H4 (l) + H2 (g) ΔH = 22.5 kJ |
| 2NH3 (g) → N2 (g) + 3H2 (g) ΔH = 57.5 kJ |
| CH2O (g) + H2 (g) → CH4O (*l*) ΔH = 81.2 kJ |
| Answer = − 46.2 kJ |

[4] Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

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| $\frac{1}{2}$**H2 (g) +** $\frac{1}{2}$**Cl2 (g) → HCl(g)** |
| COCl2 (g) + H2O (*l*) → CH2Cl2 (*l*) + O2 (g) ΔH = 47.5 kJ |
| 2HCl (g) + $\frac{1}{2}$O2 (g) → H2O (l) + Cl2 (g) ΔH = 105 kJ |
| CH2Cl2 (*l*) + H2 (g) + $\frac{3}{2}$O2 (g) → COCl2 (g) + 2H2O (*l*) ΔH = −402.5 kJ |
| Answer = − 230 kJ |

[5] Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

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| **C2H2 (g) +** $\frac{5}{2}$**O2 (g) → 2CO2 (g) + H2O(g)** |
| C2H6 (g) → C2H2 (g) + 2H2 (g) ΔH = 283.5 kJ |
| H2 (g) + $\frac{1}{2}$O2 (g) → H2O (g) ΔH = −213.7 kJ |
| 2CO2 (g) + 3H2O (g) → C2H6 (g) + $\frac{7}{2}$O2 (g) ΔH = 849 kJ |
| Answer = −705 kJ |

[6] Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

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| **HCl (g) + NaNO2 (s) → HNO2 (*l*) + NaCl (s)** |
| 2NaCl (s) + H2O (*l*) → 2HCl (g) + Na2O (s) ΔH = 507 kJ |
| NO (g) + NO2 (g) + Na2O (s) → 2NaNO2 (s) ΔH = −427 kJ |
| NO (g) + NO2 (g) → N2O (g) + O2 (g) ΔH = −43 kJ |
| 2HNO2 (*l*) → N2O (g) + O2 (g) + H2O (*l*) ΔH = 34 kJ |
| Answer = −78 kJ |

[7] Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

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| **Zn(s) +** $\frac{1}{8}$**S8 (s) + 2O2 (g) → ZnSO4 (s)** |
| Zn(s) + $\frac{1}{8}$S8 (s) → ZnS(s) ΔH = −183.92 kJ |
| 2ZnS(s) + 3O2 (g) → 2ZnO(s) + 2SO2 (g) ΔH = −927.54 kJ |
| 2SO2 (g) + O2 (g) → 2SO3 (g) ΔH = −196.04 kJ |
| ZnO(s) + SO3 (g) → ZnSO4 (s) ΔH = −230.32 kJ |
| Answer = −976.03 kJ |

**These problems involve using heat of formation values that are found in the appendix of your textbook**

[8] What is the enthalpy of the following reactions? Use equation from Equation Sheet – [Products minus reactants]

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| (a) SiF4 (g) → Si (s) + 2F2 (g) | SiF4 - ΔHf = −1615.0 KJ/mol |
| (b) SiF4 (g) → Si (g) + 2F2 (g) | FeCl2 - ΔHf = −341.8 KJ/mol |
| (c) SO3 (g) + H2O (g) → H2SO4 (aq) | FeCl3 - ΔHf = −399.5 KJ/mol |
| (d) 3K2O2 (s) + 3H2O (*l*) → 6KOH(aq) + O3 (g) | Fe3O4 - ΔHf = −1118.4 KJ/mol |
| (e) Fe3O4 (s) + 8HCl (g) → 2FeCl3 (s) + FeCl2 (s) + 4H2O (g) | SO3 - ΔHf = −454.5 KJ/mol |
|  | Si(g) - ΔHf = 450 KJ/mol |