**Dougherty Valley HS AP Chemistry**

**WORKSHEET #1**

**Thermochemistry – Hess’s Law**

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

Show all work

1. Calculate the standard enthalpy change, ΔHo, for the formation of 1 mol of strontium carbonate (the material that gives

the red color in fireworks) from its elements. (–1220 KJ)

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| **Sr (s) C(graphite)** $\frac{3}{2}$**O (g) → SrCO (s)** |
| (1) Sr (s) + $\frac{1}{2}$O2 (g) → SrO (s) ΔH° = - 592 kJ |  |
| (2) SrO (s) + CO2 (g) → SrCO (s) ΔH° = - 234 kJ |
| (3) C(graphite) O2 (g) → CO (g) ΔH° = - 394 kJ |

2. The combination of coke and steam produces a mixture called coal gas, which can be used as a fuel or as a starting

material for other reactions. If we assume coke can be represented by graphite, the equation for the production of coal

gas is (+15.3 kJ)

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| **2 C (s) + 2 H2O (g) → CH4 (g) + CO2 (g)** |
| (1) C(s) + H2O (g) → CO (g) + H2 (g) ΔH° = 131.3 kJ |  |
| (2) CO (g) + H2O (g) → CO2 (g) + H2 (g) ΔH° = - 41.2 kJ |
| (3) CH4 (g) + H2O (g) → 3 H2 (g) + CO (g) ΔH° = 206.1 kJ |

3. One reaction involved in the conversion of iron ore to the metal is (– 11 kJ)

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| **FeO (s) + CO (g) → Fe (s) + CO (g)** |
| (1) 3 Fe2O3 (s) + CO (g) → 2 Fe3O4 (s) + CO2 (g) ΔH° = -47 kJ |  |
| (2) Fe2O3 (s) + 3 CO (g) → 2 Fe (s) + 3 CO2 (g) ΔH° = -25 kJ |
| (3) Fe3O4 (s) + CO (g) → 3 FeO (s) + CO2 (g) ΔH° = 19 kJ |

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

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| **PCl5 (g) → PCl3 (g) + Cl2 (g)** | Answer = 249.8 kJ |
| P4 (s) + 6Cl2 (g) → 4PCl3 (g) ΔH = −2439 kJ |
| 4PCl5 (g) → P4 (s) + 10Cl2 (g) ΔH = 3438 kJ |

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

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| **2CO2 (g) + H2O(g) → C2H2 (g) +** $\frac{5}{2}$**O2 (g)** | Answer = 235 kJ |
| C2H2 (g) + 2H2 (g) → C2H6 (g) ΔH = −94.5 kJ |
| H2O(g) → H2 (g) + $\frac{1}{2}$O2 (g) ΔH = 71.2 kJ |
| C2H6 (g) + O2 (g) → 2CO2 (g) + 3H2O(g) ΔH = −283 kJ |

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

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| **N2H4 (*l*) + H2 (g) → 2NH3 (g)** | Answer = −18 kJ |
| N2H4 (*l*) + CH4O (*l*) → CH2O (g) + N2 (g) + 3H2 (g) ΔH = −37 kJ |
| N2 (g) + 3H2 (g) → 2NH3 (g) ΔH = −46 kJ |
| CH4O(l) → CH2O(g) + H2 (g) ΔH = −65 kJ |

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

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| **H2SO4 (*l*) → SO3 (g) + H2O(g)** | Answer = 72 kJ |
| H2S(g) + 2O2 (g) → H2SO4 (*l*) ΔH = −235.5 kJ |
| H2S(g) + 2O2 (g) → SO3 (g) + H2O(*l*) ΔH = −207 kJ |
| H2O(*l*) → H2O(g) ΔH = 44 kJ |

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

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| **2C2H4O(*l*) + 2H2O(*l*) → 2C2H6O(*l*) + O2 (g)** | Answer = 204.0 kJ |
| C2H6O(*l*) + 3O2 (g) → 2CO2 (g) + 3H2O(*l*) ΔH = −685.5 kJ |
| C2H4O(*l*) + O2 (g) → 2CO2 (g) + 2H2O(*l*) ΔH = −583.5 kJ |