Dougherty Valley HS Chemistry - AP
Thermochemistry – Hess's Law

Worksheet #1

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

Directions: Show all work in a way that would earn you credit on the AP Test! This is always the rule! Some answers are provided at the end in italics and underlined. If you need more space, use binder paper and staple to your worksheet.

1) Calculate the standard enthalpy change, ΔH^o, for the formation of 1 mol of strontium carbonate (the material that gives the red color in fireworks) from its elements.

$Sr\ (s) + C(graphite) + \frac{3}{2}O_2\ (g) \rightarrow SrCO_3\ (s)$

(1) $Sr\ (s) + \frac{1}{2}O_2\ (g) \rightarrow SrO\ (s)$ $\Delta H° = -592$ kJ

(2) $SrO\ (s) + CO_2\ (g) \rightarrow SrCO_3\ (s)$ $\Delta H° = -234$ kJ

(3) $C(graphite) + O_2\ (g) \rightarrow CO_2\ (g)$ $\Delta H° = -394$ kJ

–1220 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 rxns. If we assume coke can be represented by graphite, the eq. for the production of coal gas is

$2\ C\ (s) + 2\ H_2O\ (g) \rightarrow CH_4\ (g) + CO_2\ (g)$

(1) $C(s) + H_2O\ (g) \rightarrow CO\ (g) + H_2\ (g)$ $\Delta H° = 131.3$ kJ

(2) $CO\ (g) + H_2O\ (g) \rightarrow CO_2\ (g) + H_2\ (g)$ $\Delta H° = -41.2$ kJ

(3) $CH_4\ (g) + H_2O\ (g) \rightarrow 3\ H_2\ (g) + CO\ (g)$ $\Delta H° = 206.1$ kJ

+15.3 kJ

3) One reaction involved in the conversion of iron ore to the metal is

$FeO\ (s) + CO\ (g) \rightarrow Fe\ (s) + CO\ (g)$

(1) $3\ Fe_2O_3\ (s) + CO\ (g) \rightarrow 2\ Fe_3O_4\ (s) + CO_2\ (g)$ $\Delta H° = -47$ kJ

(2) $Fe_2O_3\ (s) + 3\ CO\ (g) \rightarrow 2\ Fe\ (s) + 3\ CO_2\ (g)$ $\Delta H° = -25$ kJ

(3) $Fe_3O_4\ (s) + CO\ (g) \rightarrow 3\ FeO\ (s) + CO_2\ (g)$ $\Delta H° = 19$ kJ

– 11 kJ

4) Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:.

$PCl_5\ (g) \rightarrow PCl_3\ (g) + Cl_2\ (g)$

$P_4\ (s) + 6Cl_2\ (g) \rightarrow 4PCl_3\ (g)$ $\Delta H = -2439$ kJ

$4PCl_5\ (g) \rightarrow P_4\ (s) + 10Cl_2\ (g)$ $\Delta H = 3438$ kJ

249.8 kJ

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

$2CO_2\,(g) + H_2O(g) \rightarrow C_2H_2\,(g) + \frac{5}{2}O_2\,(g)$

$C_2H_2\,(g) + 2H_2\,(g) \rightarrow C_2H_6\,(g)$	$\Delta H = -94.5$ kJ
$H_2O(g) \rightarrow H_2\,(g) + \frac{1}{2}O2\,(g)$	$\Delta H = 71.2$ kJ
$C_2H_6\,(g) + \frac{7}{2}O_2\,(g) \rightarrow 2CO_2\,(g) + 3H_2O(g)$	$\Delta H = -283$ kJ

235 kJ

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

$N_2H_4\,(l) + H_2\,(g) \rightarrow 2NH_3\,(g)$

$N_2H_4\,(l) + CH_4O\,(l) \rightarrow CH_2O\,(g) + N_2\,(g) + 3H_2\,(g)$	$\Delta H = -37$ kJ
$N_2\,(g) + 3H_2\,(g) \rightarrow 2NH_3\,(g)$	$\Delta H = -46$ kJ
$CH_4O(l) \rightarrow CH_2O(g) + H_2\,(g)$	$\Delta H = -65$ kJ

–18 kJ

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

$H_2SO_4\,(l) \rightarrow SO_3\,(g) + H_2O(g)$

$H_2S(g) + 2O_2\,(g) \rightarrow H_2SO_4\,(l)$	$\Delta H = -235.5$ kJ
$H_2S(g) + 2O_2\,(g) \rightarrow SO_3\,(g) + H_2O(l)$	$\Delta H = -207$ kJ
$H_2O(l) \rightarrow H_2O(g)$	$\Delta H = 44$ kJ

72 kJ

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

$2C_2H_4O(l) + 2H_2O(l) \rightarrow 2C_2H_6O(l) + O_2\,(g)$

$C_2H_6O(l) + 3O_2\,(g) \rightarrow 2CO_2\,(g) + 3H_2O(l)$	$\Delta H = -685.5$ kJ
$C_2H_4O(l) + O_2\,(g) \rightarrow 2CO_2\,(g) + 2H_2O(l)$	$\Delta H = -583.5$ kJ

204.0 kJ