**Hess's Law Worksheet** Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Calculate H for the reaction 4 NH3 (g) + 5 O2 (g) 🡪 4 NO (g) + 6 H2O (g), from the following data.

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| N2 (g) + O2 (g) 2 NO (g) | H = -180.5 kJ |
| N2 (g) + 3 H2 (g) 2 NH3 (g) | H = -91.8 kJ |
| 2 H2 (g) + O2 (g) 2 H2O (g)  | H = -483.6 kJ |

1. Find H° for the reaction 2H2(g) + 2C(s) + O2(g) 🡪 C2H5OH(l), using the following thermochemical data.

|  |  |
| --- | --- |
| C2H5OH (l) + 2 O2 (g) 2 CO2 (g) + 2 H2O (l) | H = -875 kJ |
| C (s) + O2 (g) CO2 (g) | H = -394.51 kJ |
| H2 (g) + ½ O2 (g) H2O (l) | H = -285.8 kJ |

1. Calculate H for the reaction CH4 (g) + NH3 (g) 🡪 HCN (g) + 3 H2 (g), given:

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| N2 (g) + 3 H2 (g) 2 NH3 (g) | H = -91.8 kJ |
| C (s) + 2 H2 (g) CH4 (g) | H = -74.9 kJ |
| H2 (g) + 2 C (s) + N2 (g) 2 HCN (g) | H = +270.3 kJ |

# Heat of Formation Worksheet

Use a standard enthalpies of formation table to determine the change in enthalpy for each of these reactions.

 a) NaOH(s) + HCl(g) ----> NaCl(s) + H2O(g)

1. 2 CO(g) + O2(g) ---> 2 CO2(g)
2. CH4(g) + 2 O2(g) ---> CO2(g) + 2 H2O(l)
3. 2 H2S(g) + 3 O2(g) ---> 2 H2O(l) + 2 SO2(g)

e) 2 NO(g) + O2(g) ---> 2 NO2(g)

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| --- | --- | --- | --- |
| Compound  | Hf (kJ/mol)  | Compound  | ΔHf (kJ/mol)  |
| CH4(g)  | -74.8  | HCl(g)  | -92.3  |
| CO2(g)  | -393.5  | H2O(g)  | -241.8  |
| NaCl(s)  | -411.0  | SO2(g)  | -296.1  |
| H2O(l)  | -285.8  | NH4Cl(s)  | -315.4  |
| H2S(g)  | -20.1  | NO(g)  | +90.4  |
| H2SO4(l)  | -811.3  | NO2(g)  | +33.9  |
| MgSO4(s)  | -1278.2  | SnCl4(l)  | -545.2  |
| MnO(s)  | -384.9  | SnO(s)  | -286.2  |
| MnO2(s)  | -519.7  | SnO2(s)  | -580.7  |
| NaCl(s)  | -411.0  | SO2(g)  | -296.1  |
| NaF(s)  | -569.0  | SO3(g)  | -395.2  |
| NaOH(s)  | -426.7  | ZnO(s)  | -348.0  |
| NH3(g)  | -46.2  | ZnS(s)  | -202.9  |