**Enthalpies of Reaction**

**Hess’s Law of Heat Summation:**

 **The enthalpy changes of a physical or chemical process depend only on the beginning conditions (reactants) and the end conditions (products).**

 **The enthalpy change is independent of the pathway of the process and the number of intermediate steps in the process.**

**Hess’s Law allows you to calculate enthalpy changes without directly measuring it.**

**Method 1:**

**Combining Chemical Equations Algebraically**

* **add equations for reactions with known enthalpy changes, so that the net result is the reaction you are interested in**
* **may require reversing or multiplying the equations**

**Example 1:**

**What is the enthalpy for the formation of one mol of diamond from one mol of carbon?**

**Target: C(s,graphite) 🡪 C(s,diamond)  ΔH0 =?**

**Known equations:**

**1. C(s,graphite) + O2 🡪 CO2 ΔH = -394kJ**

**2. C(s,diamond) + O2 🡪 CO2 ΔH = -396 kJ**

**Reverse equation #2**

 **CO2 🡪 C(s,diamond) + O2 ΔH = 396kJ**

**Note – the sign on the enthalpy is also reversed**

**Net equation**

**C(s,graphite) + O2 + CO2 🡪 CO2 + C(s,diamond) + O2**

 **ΔH0 = (-394 kJ) + (+396 kJ)**

**Can cancel terms that are common to both sides.**

**Therefore:**

 **C(s,graphite) 🡪 C(s,diamond)  ΔH0 = +2 kJ**

**Note: additional examples are outlined on pages 324-326.**