

4.) Standard Enthalpies of Formation:

Standard enthalpies of formation, ΔH_f° , change in enthalpy that accompanies the formation of one mole of compound from its elements with all substances in its standard state. Degree symbol on a thermodynamic function indicates that it is carried out at standard conditions. *See App. 4*

Standard State: (common reference state) Remember we can only measure change in the property.

For a Compound:

Gases at 1 atm

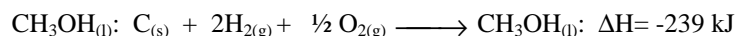
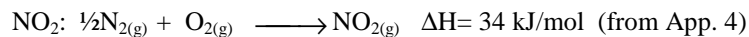
Condensed State: the pure liquid or solid

Solution at 1M concentration

For an Element:

Form that it exists at 25°C and 1 atm

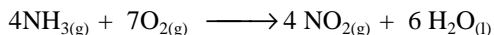
Write the equation for the standard state enthalpy formation for: (from elements for 1 mole)



Think of a reaction as breaking down all of the reactants into their atoms. This energy can be determined from the enthalpies of formation of the compounds. Then the formation of the products can be determined from the building up of the atoms into new compounds. Keep track of sign changes and what the definition of enthalpy of formation is.

$$\Delta H^\circ_{\text{reaction}} = \sum n_p \Delta H_f^\circ (\text{products}) - \sum n_r \Delta H_f^\circ (\text{reactants})$$

Example: Use the enthalpies of formation to calculate the change in enthalpy for:



$$\text{Answer: } \Delta H = (4(34) + 6(-286)) - (4(-46) + 0) = -1396 \text{ kJ}$$

Homework Practice: P.269, #66, 68, 70, 71, 73, 74, 77, 78, 91