Heat absorbed at constant volume is equal to change in internal energy, ΔU and heat absorbed at constant pressure is equal to change in enthalpy, ΔH. Change in internal energy is measured using a bomb calorimeter. A steel vessel, generally called a bomb is immersed into water bath to prevent any kind of heat loss. The calorimeter is sealed and a combustible matter is placed inside the vessel and reaction is happening at constant volume. The heat evolved is monitored and this is the ΔU.

Enthalpy of a reaction:

$aA + bB \longrightarrow cC + dD$

$\Delta_{rxn}H = \sum a_j H_{products} - \sum a_i H_{reactants}$

$= cH_C + dH_D - (aH_A + bH_B)$

Standard condition:

The standard state of a substance at a specified temperature is its' pure form at 1 bar pressure. Usually, the specified temperature is taken as 298K (or 25 ˚C).

The standard enthalpy of a reaction is the enthalpy change when all reactants and products are at their pure state.

Unit of standard heat of reaction: J/mol. Even if the unit is in per mole basis, this depends on the stoichiometry of the balanced chemical equation.

Example:

At 298 K;

$2H_2 (g) + O_2 (g) \longrightarrow 2H_2O (l)$ $\quad \Delta_{rxn}H^\circ = -572$ KJ/mol

$H_2 (g) + O_2 (g) \longrightarrow H_2O (l)$ $\quad \Delta_{rxn}H^\circ = -286$ KJ/mol