SINCE the enthalpy change does NOT depend on path, this means that we can use standard values for enthalpy to predict the heat change in reactions that we have not tested in a calorimeter.

THERMOCHEMICAL EQUATIONS

- is like a regular chemical equation, except that phase labels are REQUIRED and the enthalpy for the reaction is given along with the equation.

$$CH_3COCH_3(l) + 4O_2(g) \rightarrow 3CO_2(g) + 3H_2O(l) \; ; \Delta H = -1800 \text{ kJ}$$

- Why are phase labels required? Because phase changes either absorb or release energy.

$\Delta H = -1800$ kJ ... what does this mean?

1 mol CH_3COCH_3 = -1800 kJ

4 mol O_2 = -1800 kJ

3 mol CO_2 = -1800 kJ

3 mol H_2O = -1800 kJ

We treat the enthalpy change as if it's another product of the reaction!

$$CH_3COCH_3(l) + 4O_2(g) \rightarrow 3CO_2(g) + 3H_2O(l)\ ;\ \Delta H = -1800\ kJ$$

What would be the enthapy change when 25 g of water are produced by the reaction?

1 - Convert mass water to moles using formula weight.
2 - Convert moles water to enthalpy change using thermochemical equation.

$18.016\ g\ H_2O = mol\ H_2O$ | $3\ mol\ H_2O = -1800\ kJ$

$$25\ g\ H_2O \times \overset{①}{\frac{mol\ H_2O}{18.016\ g\ H_2O}} \times \overset{②}{\frac{-1800\ kJ}{3\ mol\ H_2O}} = \boxed{-830\ kJ}$$

- This reaction is EXOTHERMIC, and it will release energy to the surroundings (making them warmer) - just like every other combustion reaction!
- If this reaction is done at constant pressure, the enthalpy change should equal the observed Q.

A few more terms related to enthalpy:

- Enthalpy of vaporization / heat of vaporization: The enthalpy change on vaporizing one mole of a substance. (from liquid to vapor)

- Enthalpy of fusion / heat of fusion: The enthalpy change when a mole of liquid changes to the solid state.

Phase changes require energy, too!