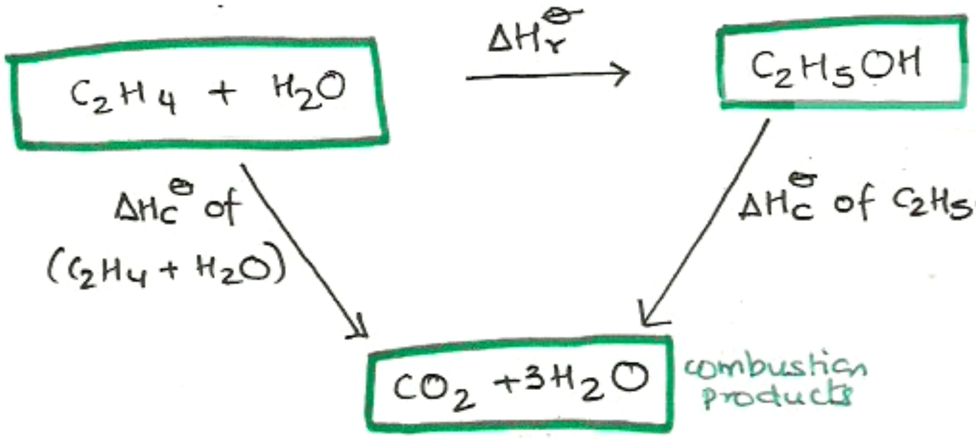
Hess' Law

- The enthalpy change for a chemical reaction is independent of the route by which the chemical change occurs.

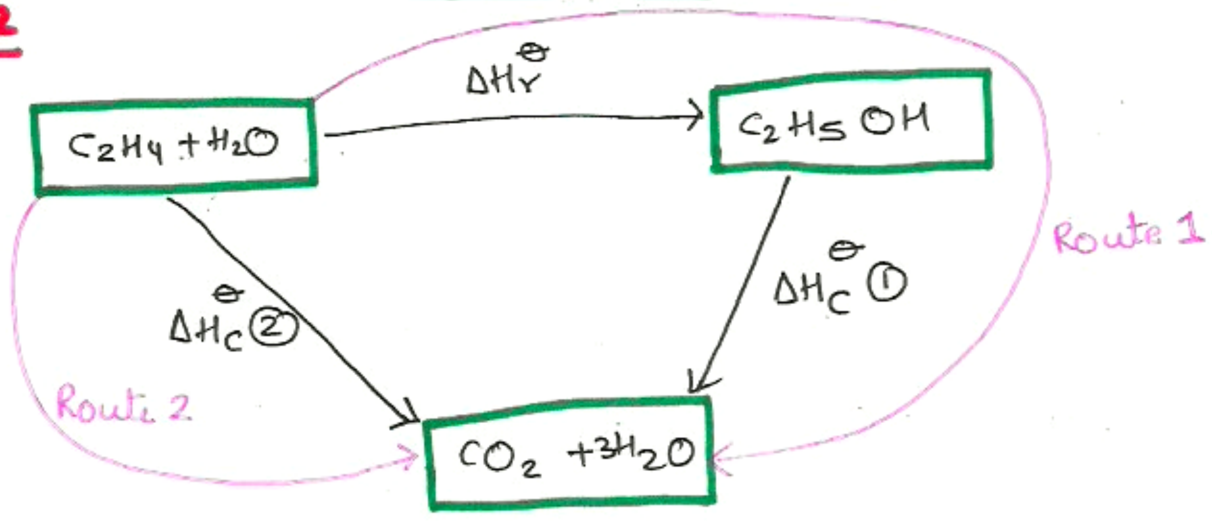
Example 1:

Calculating enthalpy change of a reaction ($\Delta H_r^\ominus$) using enthalpies of combustion ($\Delta H_c^\ominus$) $\ominus$ = standard conditions

Step 1



Step 2



Step 3

$\Delta H_r^\ominus + \Delta H_c^\ominus$ ① $=$ $\Delta H_c^\ominus$ ② [values of $\Delta H_c^\ominus$ given]

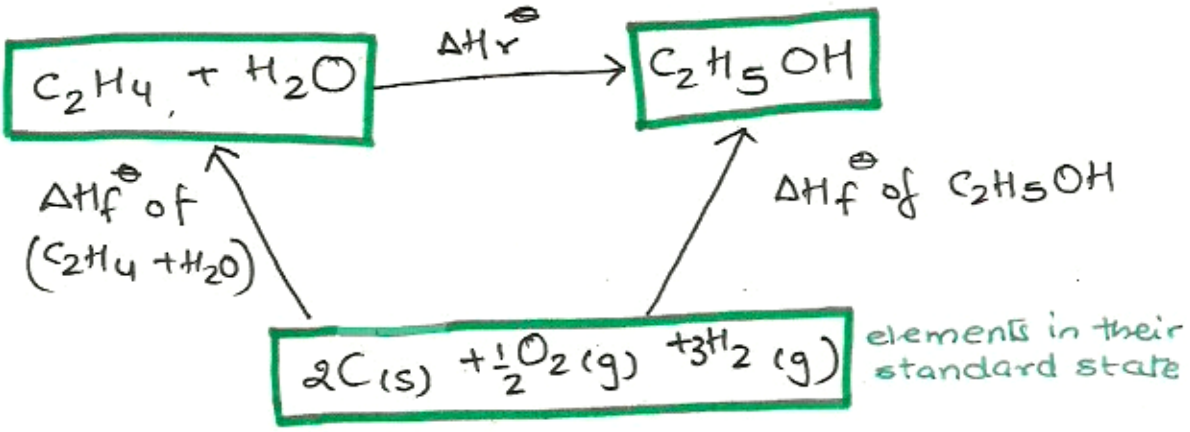
$\therefore \Delta H_r^\ominus = \Delta H_c^\ominus$ ② $- \Delta H_c^\ominus$ ①

Hess' Law

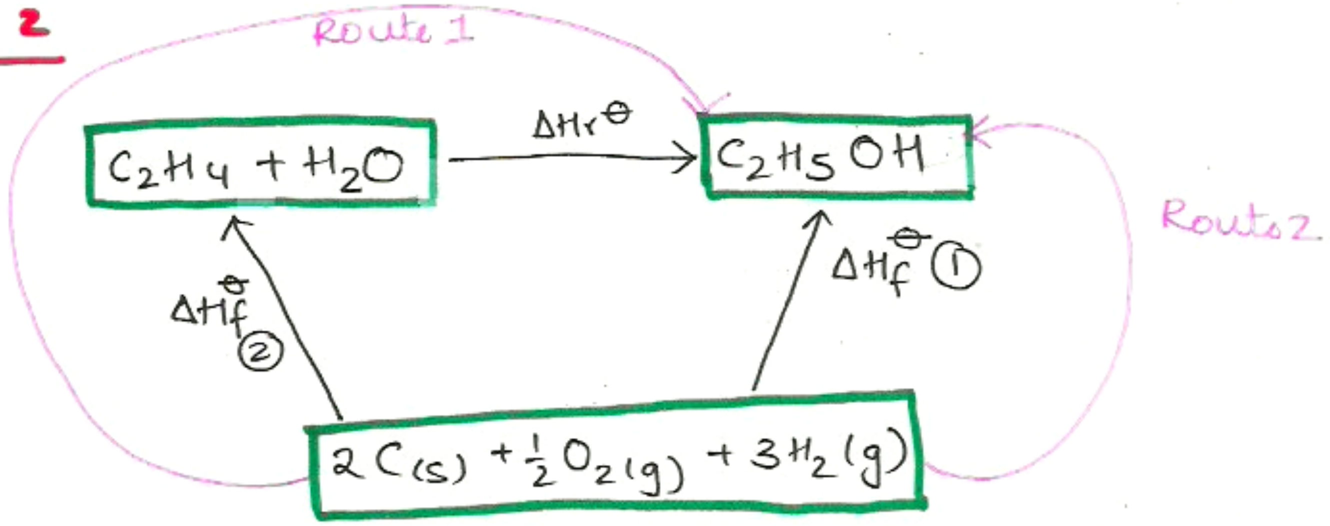
Example 2:

Calculating the enthalpy change of a reaction ($\Delta H_r^\ominus$) using enthalpies of formation ($\Delta H_f^\ominus$)

Step 1



Step 2



Step 3

$\Delta H_f^\ominus$ ② + $\Delta H_r^\ominus$ = $\Delta H_f^\ominus$ ① [values of $\Delta H_f^\ominus$ given]

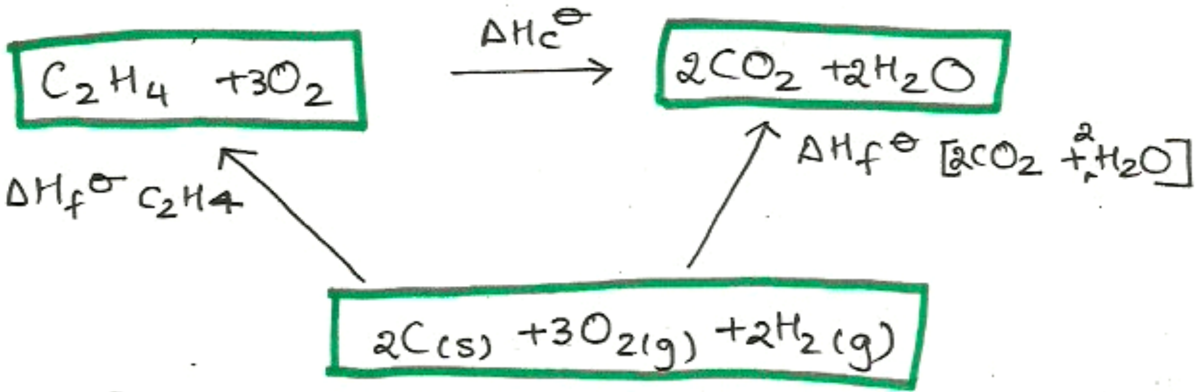
$\therefore \Delta H_r^\ominus = \Delta H_f^\ominus$ ① $- \Delta H_f^\ominus$ ②

Hess' Law

Example 3:

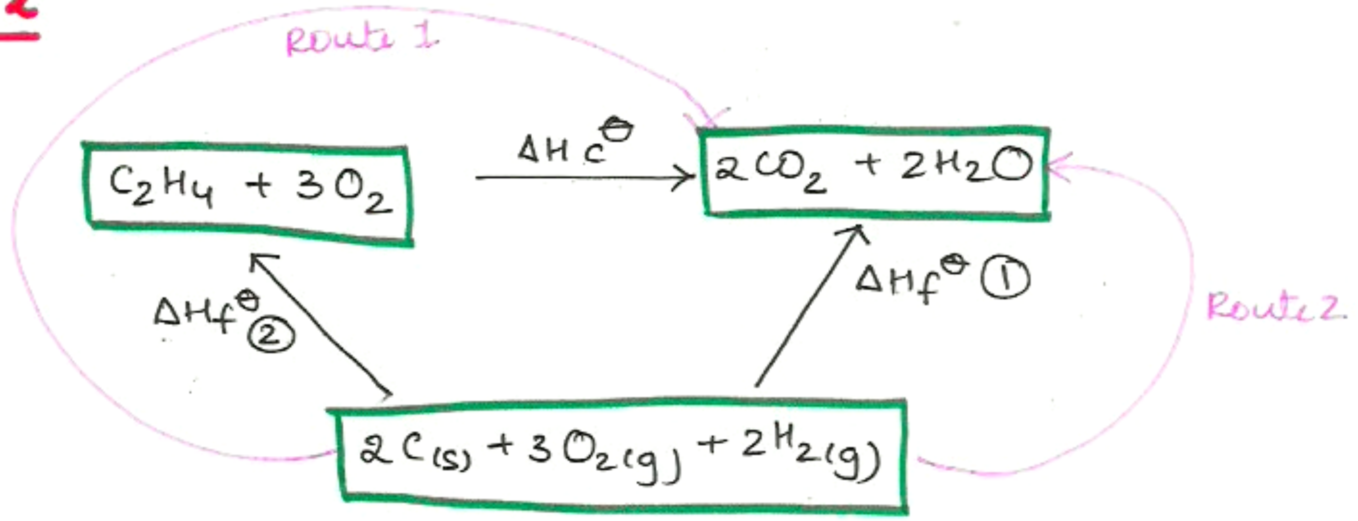
Calculating the enthalpy change of combustion ($\Delta H_c^\ominus$) using the enthalpies of formation ($\Delta H_f^\ominus$)

Step 1



Note: $\Delta H_f^\ominus$ $O_2 = 0$; multiply $\Delta H_f^\ominus CO_2 \times 2$ and $\Delta H_f^\ominus H_2O \times 2$ where 2 = number of moles

Step 2



$\Delta H_f^\ominus$ ② + $\Delta H_c^\ominus$ = ΔH_f ① [values of $\Delta H_f^\ominus$ given]

∴ $\Delta H_c^\ominus$ = $\Delta H_f^\ominus$ ① − $\Delta H_f^\ominus$ ②