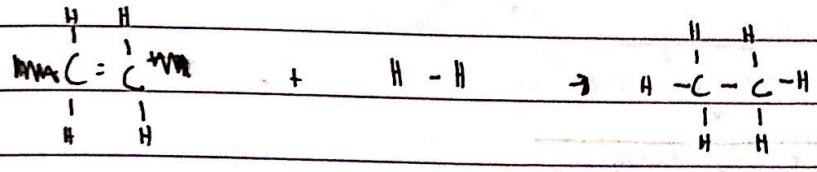
1a) $C_2H_{4(g)} + H_{2(g)} \rightarrow C_2H_{6(g)}$

calculate value of ~~average bond enthalpies~~ enthalpy of hydrogenation of ethene



(Bond breaking) (Bond forming)

$\Delta H = \overbrace{(4(413)) + (612) + (436)}^{} + \overbrace{6(-413) + (-347)}^{}$

$= -125\,kJ$

16) $\Delta H_{rxn} = \Sigma \Delta H_{comb\ (reactant)} - \Sigma \Delta H_{comb.\ (products)}$

$= [(-1411) + (-286)] - [(-1560)] = -137\ kJ/mol$

4) Enthalpy of hydrogenation of cyclohexene:

$$C_6H_{10} + H_2 \rightarrow C_6H_{12}$$

$\Delta H = (614) + 5(346) + 10(414) + 6(-346) + 12(-414)$

$= 6484 - 7044 = -560\ kJ$