وبتطبيق قانون Hess نستنتج:

$$\Delta H_1^\circ = \Delta H_2^\circ + \Delta H_3^\circ + \Delta H_4 + \Delta H_5^\circ$$

$$\Delta H_4^\circ = \Delta H_1^\circ - \Delta H_2^\circ - \Delta H_3^\circ - \Delta H_5^\circ$$

$\Delta H_1^\circ = 3265\ KJ$

$$-\Delta H_2^\circ = \left[m C_{p(C_6H_6)liq} + m' C_{p(O_2,g)}\right]\Delta T$$

$$= [78 \times 1,9 + 240 \times 29,3](353-293)$$

$\Delta H_2^\circ = 430812\ KJ$

$m_{C_6H_6} = \frac{m}{M} \Rightarrow m = n.M = 1 \times 78$

$m = 78\ g$

$m'_{O_2} = \frac{15}{2} \times 32 = 240\ g$

$$-\Delta H_3^\circ = m.\Delta H_{vap}^\circ = 78 \times 395,4^{(g)} \quad J.g^{-1} = 30841,2\ J$$

$\Delta H_3^\circ = 30,8412\ Kg$

$$-\Delta H_5^\circ = \left[m C_{p(CO_2)g} + m' C_{p(H_2O)liq}\right]\Delta T$$

$$\Delta H_5^\circ = [264 \times 29,3 + 54 \times 4,2](293-353)$$

$\Delta H_5^\circ = -477720\ KJ$

$m_{CO_2} = n.M' = 6 \times 44 = 264\ g$

$m'_{H_2O} = n'.M' = 3 \times 18 = 54\ g$

$$\Delta H_4^\circ = -430812 - 30,8418 + 477720 + 3265$$

$\Delta H_4^\circ = 50142,158\ KJ$

تمرين 5 حساب أنثالبية التشكيل لحمض الخل CH_3COOH غاز:

معادلة تكوين حمض الخل انطلاقا من ذراته في الحالة الحرة

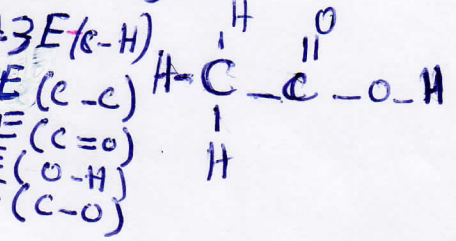
$$2C(s) + 2H_2(g) + O_2(g) \xrightarrow{\Delta H_f^\circ} CH_3COOH(g)$$

$2C(s) \xrightarrow{2.\Delta H_{sub}^\circ (C)} 2C(g)$

$2H_2(g) \xrightarrow{2E(H-H)} 4H(g)$

$O_2(g) \xrightarrow{E(O=O)} 2O(g)$

$2C(g) + 4H(g) + 2O(g) \xrightarrow{-3E(C-H) - E(C-C) - E(C=O) - E(O-H) - E(C-O)} CH_3COOH(g)$



$$\Delta H_1^\circ = 2\Delta H_{sub(C)}^\circ + 2E(H-H) + E(O=O) = 2 \times 170 + 2 \times 104 + 118 = 666\ Kcal$$

$$\Delta H_2^\circ = -3E(C-H) - E(C-C) - E(C=O) - E(O-H) - E(C-O)$$

$\Delta H_2^\circ = -297 - 80 - 173 - 101 - 79 = -730\ Kcal$

$\Delta H_f^\circ(CH_3COOH) = \Delta H_1^\circ + \Delta H_2 = -64\ Kcal \Rightarrow \Delta H_f^\circ = -64\ Kcal$