ΑΣΚΗΣΗ 9.54

α) $4C_{(s,\ γραφίτης)} + 5H_{2(g)} \rightarrow C_4H_{10(g)}$ $\Delta H^o_f = -125,6$ kJ

β) $H_{2(g)} + S_{(s,\ ρομβικό)} + 2O_{2(g)} \rightarrow H_2SO_{4(l)}$ $\Delta H^o_f = -125,6$ kJ

γ) $Mg_{(s)} + C_{(s,\ γραφίτης)} + 3/2\ O_{2(g)} \rightarrow MgCO_{3(s)}$ $\Delta H^o_f = -1111,7$ kJ

δ) $N_{2(g)} + 2H_{2(g)} + 3/2O_{2(g)} \rightarrow NH_4NO_{3(s)}$ $\Delta H^o_f = -365,6$ kJ

ε) $C_{(s,\ γραφίτης)} \rightarrow C_{(s,\ διαμάντι)}$ $\Delta H^o_f = -125,6$ kJ

στ) $2C_{(s,\ γραφίτης)} + 2H_{2(g)} + ½\ O_{2(g)} \rightarrow CH_3CH{=}O_{(l)}$ $\Delta H^o_f = -191,8$ kJ

ζ) $Br_{2(l)} \rightarrow Br_{2(g)}$ $\Delta H^o_f = 30,9$ kJ/mol

η) $K_{(s)} \rightarrow K_{(g)}$ $\Delta H^o_f = 89$ kJ

θ) $3/2\ O_{2(g)} \rightarrow O_{3(g)}$ $\Delta H^o_f = 142,7$ kJ/mol

ΑΣΚΗΣΗ 9.55

(α), (β), (δ), (θ), (ι)

ΑΣΚΗΣΗ 9.56

α)

i. $½\ N_{2(g)} + \frac{3}{2} H_{2(g)} \rightarrow NH_{3(g)}$ $\Delta H^o_f = -45,9$ kJ

ii. $N_{2(g)} + 2H_{2(g)} \rightarrow N_2H_{4(g)}$ $\Delta H^o_f = +95,4$ kJ

iii. $C_{(s,\ γραφίτης)} + 2S_{(s,\ ρομβικό)} \rightarrow CS_{2(l)}$ $\Delta H^o_f = +89,7$ kJ

iv. $C_{(s,\ γραφίτης)} + 2F_{2(g)} \rightarrow CF_{4(g)}$ $\Delta H^o_f = -933,2$ kJ

v. $6C_{(s,\ γραγίτης)} + 3H_{2(g)} \rightarrow C_6H_{6(l)}$ $\Delta H^o_f = +49$kJ

vi. $C_{(s,\ γραφίτης)} + H_{2(g)} + O_{2(g)} \rightarrow HCOOH_{(l)}$ $\Delta H^o_f = -424,7$ kJ

β) Αυτό συμβαίνει στις εξώθερμες αντιδράσεις, δηλ. στις i, iv, vi.

ΑΣΚΗΣΗ 9.57

α) $C_4H_{10(g)} + \frac{13}{2} O_{2(g)} \rightarrow 4CO_{2(g)} + 5H_2O_{(l)}$ $\Delta H^o_c = -2880$ kJ/mol

β) $C_6H_{12}O_{6(s)} + 6O_{2(g)} \rightarrow 6CO_{2(g)} + 6H_2O_{(l)}$ $\Delta H^o_c = -2803$ kJ/mol

γ) $CS_{2(l)} + 3O_2 \rightarrow CO_{2(g)} + 2SO_2$ $\Delta H^o_c = -1072$ kJ/mol

δ) $C_2H_5NO_{2(l)} + 9/4\ O_{2(g)} \rightarrow 2CO_{2(g)} + 5/2\ H_2O_{(l)} + ½\ N_{2(g)}$ $\Delta H^o_c = -1368$ kJ/mol

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ΑΣΚΗΣΗ 9.58

(α), (β), (ε), (στ), (ζ)

ΑΣΚΗΣΗ 9.59

α) $2NO_{(g)} + O_{2(g)} \rightarrow 2NO_{2(g)}$

$\Delta H_{\alpha\nu\tau} = 2\Delta H_{f(NO_2)} - 2\Delta H_{f(NO)} - \Delta H^{0}_{f(O_2)} = 2\Delta H_{f(NO_2)} - 2\Delta H_{f(NO)}$

β) $C_3H_{8(g)} + 5O_{2(g)} \rightarrow 3CO_{2(g)} + 4H_2O_{(l)}$

$\Delta H_{\alpha\nu\tau} = 3\Delta H_{f(CO_2)} + 4\Delta H_{f(H_2O)} - \Delta H_{f(C_3H_8)} - 5\Delta H^{0}_{f(O_2)} = 2\Delta H_{f(NO_2)} - 2\Delta H_{f(NO)}$

γ) $3C_2H_{2(g)} \rightarrow C_6H_{6(l)}$

$\Delta H_{\alpha\nu\tau} = \Delta H_{f(C_6H_6)} - 3\Delta H_{f(C_2H_2)}$

δ) $Fe_2O_{3(s)} + 3CO_{(g)} \rightarrow 2Fe_{(s)} + 3CO_{2(g)}$

$\Delta H_{\alpha\nu\tau} = 3\Delta H_{f(CO_2)} + 2\Delta H^{0}_{f(Fe)} - \Delta H_{f(Fe_2O_3)} - 3\Delta H_{f(CO)}$

ε) $4NH_{3(g)} + O_{2(g)} \rightarrow 2N_2H_{4(l)} + 2H_2O_{(l)}$

$\Delta H_{\alpha\nu\tau} = 2\Delta H_{f(N_2H_4)} + 2\Delta H_{f(H_2O)} - 4\Delta H_{f(NH_3)} - \Delta H^{0}_{f(O_2)}$

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