Soluzione della Prova Scritta del 12/06/2018

COMPITO A

1) $\frac{\Delta p}{p^\circ_A} = \frac{p^\circ_A - p_{tot}}{p^\circ_A} = \frac{\frac{m_x}{M_x}}{\frac{m_x}{M_x} + \frac{m_A}{M_A}} \rightarrow \frac{55,3 - 53,3}{55,3} = \frac{\frac{3,17}{x}}{\frac{3,17}{x} + \frac{20}{18,02}}$

$x = M_x = 76,12$ g/mol ; $n_{CO_2} = n_C = \frac{5,50\,g}{44,01\,g/mol} = 0,125$ mol ; $n_{H_2O} = \frac{1}{2} n_H = \frac{3\,g}{18,02\,g/mol} =$

$= 0,166$ mol ; $n_H = 0,166 \times 2 = 0,333$ mol ; $n_{C_xH_yO_z} = \frac{3,17\,g}{76,12\,g/mol} = 0,0416$ mol

$C_xH_yO_z$: $x : y = 1 : 3 : 8$; $m_O = M - (M_C + M_H) = 76,12 - (3 \cdot 12,01 + 8 \cdot 1,00P) =$

$\frac{0,125}{0,0416}$ $\frac{0,333}{0,0416}$ $= 32,0$ g

$z = \frac{m_O}{M_O} = \frac{32\,g}{16\,g/mol} = 2$ mol $\rightarrow C_3H_8O_2$

MOLECOLARE = MINIMA

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2) $C_2H_2 + H_2 \longrightarrow C_2H_6$

(-1476) (-286) $-(-1540)$

$2CO_2 + 2H_2O + (H_2O)$

$x = \Delta H^\circ_R = -1476 - 286 + 1540 = -222$ kJ

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3) $2SO_{3(g)} \rightleftharpoons 2SO_{2(g)} + O_{2(g)}$

x	$p^\circ_{SO_3}$		ϕ	ϕ
eq	$p^\circ_{SO_3} - 0,6\,p^\circ_{SO_3}$		$0,6\,p^\circ_{SO_3}$	$0,3\,p^\circ_{SO_3}$
	(0,421 atm)		(0,632 atm)	(0,316 atm)
	= 320 torr		= 480 torr	= 240 torr

$p^\circ_{SO_3} = \left(\frac{800}{760}\right)$ atm $= 1,053$ atm

$p_{SO_3} = 0,4\,p^\circ_{SO_3} = 0,421$ atm

$p_{SO_2} = 0,6\,p^\circ_{SO_3} = 0,632$ atm ; $p_{O_2} = 0,316$ atm

$K_p = \frac{p^2_{SO_2}\,p_{O_2}}{p^2_{SO_3}} = \frac{(0,632)^2(0,316)}{(0,421)^2} = 0,71$

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4) Sinistra $CuSO_4 \xrightarrow{H_2O} Cu^{2+} + SO_4^{2-}$

$Cu^{2+} + 2e^- \rightarrow Cu$

$E = 0,34 + \frac{0,0592}{2} \log(0,1) = 0,310$ V $\oplus$

$\Delta E = E_{sx} - E_{dx} = 0,310 - (-0,285) =$

$= 0,595$ V $\simeq 0,60$ V

$HCN + H_2O \rightleftharpoons H_3O^+ + CN^-$: destra

$2H_3O^+ + 2e^- \rightarrow H_2 + 2H_2O$

$E = 0 + \frac{0,0592}{2} \log \frac{(1,565 \cdot 10^{-5})^2}{1} = -0,285$ V $\ominus$

$K_a = 4,9 \cdot 10^{-10} \ll 10^{-7} \rightarrow [H_3O^+]^2 - K_w - CK_a = 0$

$[H_3O^+] = \sqrt{K_w + CK_a} \simeq 1,565 \cdot 10^{-5}$ M