Soluzione della Prova Scritta del 9 Febbraio 2018

1) $2\,LiOH + CO_2 \rightarrow Li_2CO_3 + H_2O$ (2:1)

$n_{LiOH} = \frac{1000\,g}{23,95\,g/mol} = 41,754\,mol$

$n_{CO_2} = \frac{1}{2} n_{LiOH} = 20,877\,mol \rightarrow V_{CO_2} = \frac{nRT}{P} = \frac{20,877 \cdot 0,0821 \cdot 299,05}{754/760} = 518,7\,l$

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2) $C_{12}H_{22}O_{11} + (H_2O) \xrightarrow{x} C_6H_{12}O_6$ (glucosio, s) $+ C_6H_{12}O_6$ (fruttosio, s)

$-5639,7$; $-(-2802,5)$; $-(-2810,2)$

$12\,CO_2 + 11\,H_2O + (H_2O)_1$

$6\,CO_2 + 6\,H_2O + 6\,CO_2 + 6\,H_2O$

$x = -5639,7 + 2802,5 + 2810,2 = -27,0\,kJ$

$C_6H_{12}O_6$ (glucosio, s) $\xrightarrow{y} C_6H_{12}O_6$ (fruttosio, s)

$-2802,5$; $-(-2810,2)$

$3\,CO_2 + 6\,H_2O$

$y = -2802,5 + 2810,2 = +7,7\,kJ$

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3) $COCl_2 \rightleftharpoons CO + Cl_2$ $\quad \Delta n = 1$; $n_{tot} = 2 + x$; $0 < x < 2$

i	2	ϕ	ϕ
eq	$2-x$	x	x
	(0,599)	(1,401)	(1,401)

$K_c = \frac{[CO][Cl_2]}{[COCl_2]} = 0,329 = \frac{x^2}{2-x} \cdot \frac{1}{10} \rightarrow$

$\rightarrow 3,29 = \frac{x^2}{2-x} \rightarrow x^2 + 3,29x - 6,58 = 0 \rightarrow x = \frac{-3,29 + \sqrt{(3,29)^2 + 26,32}}{2} = 1,402\,mol$

$[CO] = [Cl_2] = \frac{1,401\,mol}{10\,l} = 1,401\,mol/l$

$[COCl_2] = \frac{0,599}{10\,l} = 0,599\,mol/l$

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4) sin: $Cl_2 + 2e^- \rightarrow 2Cl^-$

$KCl \xrightarrow{H_2O} K^+ + Cl^-$ (1:1)

$[Cl^-] = C = 0,05\,M$

$E_{sin} = 1,36 + \frac{0,0592}{2} \log \frac{1}{(0,05)^2} = 1,437\,V$ (⊕)

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

$KCl \xrightarrow{H_2O} \underset{ADP}{K^+} + \underset{BDO}{Cl^-} \rightarrow [H_3O^+] = 10^{-7}\,M$

$E_{dx} = 0 + \frac{0,0592}{2} \log \frac{(10^{-7})^2}{1} = -0,414\,V$ (⊖)

$\Delta E = E^{\oplus} - E^{\ominus} = 1,437 - (-0,414) = 1,851\,V$