Soluzioni della I^ Esercitazione Maggio 2014

1) $pV = nRT = \frac{m}{M}RT \rightarrow M = \frac{mRT}{pV} = \frac{18 \times 0{,}0821 \times 428{,}15}{\frac{740}{760} \times 7{,}22} = 90{,}0\ g/mol$

100 g composto:

$n_C = \frac{26{,}68}{12{,}01} = 2{,}22\ mol$; $n_H = \frac{2{,}24}{1{,}01} = 2{,}22\ mol$; $n_O = \frac{71{,}07}{16{,}00} = 4{,}44\ mol$

f. MINIMA $CHO_2 \rightarrow M_{CHO_2} = 45{,}0\ g/mol \rightarrow$ f. MOLECOLARE $C_2H_2O_4$

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2) $I_{2(g)} \rightleftharpoons 2\,I_{(g)}$

	I_2	I
i	1,0	1,0
Δ	$1+x$	$1-2x$
eq	(1,437)	(0,126)

$n_{tot} = 2 - x$ (1,563)

$X_I(eq) = 0{,}081 < \frac{1}{2}(X_I(i))$ → indica che I si consuma, per cui la reazione procede da destra verso sinistra.

$\frac{1-2x}{2-x} = 0{,}081$

$1 - 2x = 0{,}162 - 0{,}081x \rightarrow 1{,}919x = 0{,}838 \rightarrow x = 0{,}437$

$V = 1{,}0\ l$

$K_C = \frac{n_I^2}{n_{I_2}} \cdot \frac{1}{1} = \frac{(0{,}126)^2}{1{,}437} = 1{,}105 \cdot 10^{-2}$

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3) $HA + H_2O \rightleftharpoons A^- + H_3O^+$ $\quad \pi = M \cdot RT(1+\alpha) \rightarrow \alpha = \frac{\pi}{MRT} - 1 = \frac{0{,}452}{0{,}0163 \cdot 0{,}0821 \cdot 298{,}15} - 1 = 0{,}1133$

$[H_3O^+] = C\alpha = 0{,}0163 \times 0{,}1133 = 2{,}165 \cdot 10^{-3}\ M \rightarrow pH = 2{,}66$

$NaA \xrightarrow{H_2O} Na^+ + A^-$

$A^- + H_2O \rightleftharpoons HA + OH^-$ $\rightarrow K_b = \frac{K_w}{K_a} = \frac{10 \cdot 10^{-15}}{3{,}32 \cdot 10^{-4}} = 3{,}01 \cdot 10^{-11} < 10^{-7}$

$K_a = \frac{[H_3O^+]^2}{C - [H_3O^+]} = \frac{(2{,}165 \cdot 10^{-3})^2}{0{,}0163 - 2{,}165 \cdot 10^{-3}} = 3{,}32 \cdot 10^{-4} \gg 10^{-7}$

$cK_b = 3{,}01 \cdot 10^{-12} \gg 10^{-14}$ $\quad [OH^-]^2 - K_w - cK_b = 0$

$[OH^-] = \sqrt{K_w + cK_b} = 1{,}74 \cdot 10^{-6} \rightarrow pOH = 5{,}76 \rightarrow pH = 8{,}24$

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4) $CuSO_4 \rightarrow Cu^{2+} + SO_4^{2-}$ $\quad Cu^{2+} + 2e^- \rightarrow Cu$ (1:1, 2:1)

$n_{Cu} = n_{CuSO_4} = \frac{2{,}0}{159{,}60} = 0{,}125\ mol$

$n_{Cu(effett.)} = 0{,}125 \times \frac{75}{1000} = 9{,}40 \cdot 10^{-3}\ mol$

$n_{eq} = \frac{Q}{F} = \frac{I \times t}{F}$ $\quad n_{Cu} = \frac{I \times t}{2F} \cdot \frac{95}{100}$ $\rightarrow t = \frac{n_{Cu} \cdot 2F}{I} \cdot \frac{100}{95} = \frac{9{,}40 \cdot 10^{-3} \times 2 \times 96486}{0{,}5} \cdot \frac{100}{95} =$

$t = 3818{,}2\ s \rightarrow \underbrace{3600''}_{1h} + \underbrace{180''}_{3'} + 38'' \rightarrow t = 1h\ 3'\ 38''$