Soluzioni della Prova Scritta del 17 luglio 2014

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ $\quad n^\circ_{CH_4} = x$

$C_2H_6 + \frac{7}{2}O_2 \rightarrow 2CO_2 + 3H_2O$ $\quad n^\circ_{C_2H_6} = y$

$n_{TOT} = \frac{P_{TOT} V}{RT} = \frac{(993/760) \times 58}{0,0821 \times 523,15} = 1,764$ mol

$16,05\,x + 30,08\,y = 10$

$3x + 5y = 1,764$

$\begin{cases} x = 0,3115 \text{ mol} = n^\circ_{CH_4} \\ y = 0,1662 \text{ mol} = n^\circ_{C_2H_6} \end{cases}$ $\quad \begin{cases} m^\circ_{CH_4} = 5,0 \text{ g} \\ m^\circ_{C_2H_6} = 5,0 \text{ g} \end{cases}$ $\quad \begin{cases} \%_{CH_4} = 50,0 \\ \%_{C_2H_6} = 50,0 \end{cases}$

$H_2 + I_2 \rightleftharpoons 2HI$

n°	n°	ϕ
$n^\circ - x$	$n^\circ - x$	$2x$
$n^\circ - 0,117$	$n^\circ - 0,117$	$0,234$

$\begin{cases} [HI] = \frac{2x}{V} = 7,20 \cdot 10^{-2} \text{ M} \rightarrow x = 0,117 \text{ mol} \\ V = 3,25 \text{ l} \end{cases} \rightarrow$

$\rightarrow K = \frac{[HI]^2}{[H_2][I_2]} = \frac{(0,234)^2}{(n^\circ - 0,117)^2} = 50,28 \rightarrow \frac{0,234}{n^\circ - 0,117} = \sqrt{50,28} \rightarrow$

$n^\circ = 0,117 + \frac{0,234}{\sqrt{50,28}} = 0,150 \text{ mol} = n^\circ_{H_2} = n^\circ_{I_2}$

$n_{CH_3COOH} = 0,4 \text{ l} \times 0,2 \text{ M} = 0,08 \text{ mol}$

$NaOH \rightarrow Na^+ + OH^- \rightarrow n_{OH^-} = n_{NaOH} = 0,6 \times 0,1 = 0,06 \text{ mol}$

(1:1)

Soluzione tampone con $K_a = 1,8 \cdot 10^{-5} > 10^{-7}$

$CH_3COOH + OH^- \rightarrow CH_3COO^- + H_2O$

0,08	0,06	ϕ	~
0,02	—	0,06	~

$pH = pK_a + \log \frac{[CH_3COO^-]}{[CH_3COOH]} =$

$= 4,74 + \log \frac{0,06}{0,02} = 5,22$

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

$n_{Cu^{2+}} = n_{CuSO_4} = 0,1 \text{ l} \times 0,15 \frac{\text{mol}}{\text{l}} = 0,015 \text{ mol}$

$Cu^{2+} + 2e^- \rightarrow Cu$ (2:1)

$n_{Cu} = \frac{1}{2} n_{e^-} = \frac{I \times t}{2F} \cdot \frac{90}{100} = \frac{0,2 \times 8400 \times 90}{2 \times 96486 \times 100} = 7,83 \cdot 10^{-3} \text{ mol}$

$(n_{Cu} < n_{Cu^{2+}})$

$m_{Cu} = n_{Cu} \cdot M_{Cu} = 7,83 \cdot 10^{-3} \times 63,55 =$

$\simeq 0,50 \text{ g} = 500 \text{ mg}$ (498 mg)