# EJERCICIOS - UNIDAD 3

**(1)** Asumamos "n" moles de HI y un volumen "V": $[HI]_0 = \frac{n}{V}$

$$HI \rightleftarrows \tfrac{1}{2}H_{2(g)} + \tfrac{1}{2}I_{2(g)}$$

$$n - x \qquad \frac{x}{2} \qquad \frac{x}{2}$$

Pero $\frac{x}{n} = 0{,}214$ $\quad x = (0{,}214)(n)$ → REEMPLAZAMOS

$$K_C = \frac{[H_2]^{1/2}[I_2]^{1/2}}{[HI]} = \frac{\left(\frac{0{,}107n}{V}\right)^{1/2}\left(\frac{0{,}107n}{V}\right)^{1/2}}{\frac{0{,}786n}{V}} = \frac{\frac{0{,}107n}{V}}{\frac{0{,}786n}{V}} = 0{,}136$$

**(2)** $N_{2(g)} + 3H_{2(g)} \rightleftarrows 2NH_{3(g)}$ $\quad \Delta n = -2$

$$K_C = \frac{K_P}{(RT)^{\Delta n}} = \frac{1{,}44\times10^{-5}}{(0{,}082 \cdot 773)^{-2}} = 0{,}058$$

**(3)** $PCl_{5(g)} \rightleftarrows PCl_{3(g)} + Cl_{2(g)}$

$0{,}557\,atm - x \qquad x \qquad x$

$$27{,}1\,g\left(\frac{1\,mol}{208{,}15\,g}\right) = 0{,}13\,mol$$

$$P_{INICIAL} = \frac{nRT}{V} = \frac{(0{,}13)(0{,}082)(523)}{10}$$

$P_{INICIAL} = 0{,}557\,atm$

y $(0{,}557 - x) + x + x = 1\,atm$

$x = 0{,}443\,atm$

$$K_P = \frac{P_{PCl_3} \cdot P_{Cl_2}}{P_{PCl_5}} = \frac{(0{,}443)(0{,}443)}{0{,}114} = 1{,}72$$

$$\alpha = \frac{0{,}443}{0{,}557} = 0{,}795 = 79{,}5\,\%$$

④

$$C_2H_5CO_2H_{(ac)} + C_2H_5OH_{(ac)} \rightleftarrows C_2H_5CO_2C_2H_{5(ac)} + H_2O_{(l)}$$

$\frac{1\,mol}{1L} = 1M - x_1$ $\quad 1M - x_1$ $\quad x_1$ $\quad Q = 1$

$x_1 = 0{,}173\,\frac{mol}{1L} = 0{,}173\,M$

$$K_c = \frac{(0{,}173M)}{(1-0{,}173)^2} = \underline{10}$$

AHORA HAY MÁS ÁCIDO $C_2H_5CO_2H$:

$2M - x_2$ $\quad 1M - x_2$ $\quad x_2$

$$\frac{x_2}{(2-x_2)(1-x_2)} = 10 \rightarrow x_2 = \underline{0{,}915\,M}$$ SE FORMA MÁS ÉSTER

LÓGICO, HEMOS PUESTO MÁS CANTIDAD DE UN REACTIVO: SE FAVORECE EL SENTIDO DIRECTO.

⑤

BASES CONJUGADAS: $HF \rightarrow F^-$

$NH_4^+ \rightarrow NH_3$

$H_2O \rightarrow OH^-$

$H_2S \rightarrow HS^-$

$HS^- \rightarrow S^{2-}$

ÁCIDOS CONJUGADOS: $F^- \rightarrow HF$

$NH_3 \rightarrow NH_4^+$

$H_2O \rightarrow H_3O^+$

$PO_4^{3-} \rightarrow HPO_4^{2-}$

$HCO_3^- \rightarrow H_2CO_3$

⑥

$$F^-_{(ac)} + H_2O_{(l)} \rightleftarrows HF_{(ac)} + OH^-_{(ac)} \quad K_b$$

PERO PARA PARES CONJUGADOS SE CUMPLE: $K_a \times K_b = K_w = 10^{-14}$

$$K_b = \frac{10^{-14}}{7{,}1\times10^{-4}} = \underline{1{,}41\times10^{-11}}$$

(7) $HCN_{(ac)} + H_2O_{(l)} \rightleftarrows CN^-_{(ac)} + H_3O^+_{(ac)}$ $K_a = 4{,}93\times10^{-10}$

$0{,}1M - x$ $\quad x \quad x$

$$\frac{x^2}{0{,}1-x} = 4{,}93\times10^{-10} \qquad x = \underline{7{,}02\times10^{-6}M} \qquad \frac{7{,}02\times10^{-6}}{0{,}1}\times100 = \underline{0{,}007\%}$$

(8) $NaNO_2 \xrightarrow{H_2O} Na^+_{(ac)} + NO_2^-{}_{(ac)}$

$Na^+$ ↓ DE $NaOH$ (BF)

$NO_2^-$ ↓ DE $HNO_2$ (AD) → SE HIDROLIZA

$NO_2^-{}_{(ac)} + H_2O_{(l)} \rightleftarrows HNO_2{}_{(ac)} + OH^-_{(ac)}$ $K_b$

$$K_b = \frac{10^{-14}}{K_a} = \frac{10^{-14}}{4{,}5\times10^{-4}} = \underline{2{,}22\times10^{-11}}$$

$0{,}1 - x$ $\quad x \quad x$

$$\frac{x^2}{0{,}1-x} = 2{,}22\times10^{-11} \qquad x = 1{,}49\times10^{-6}M$$

$pOH = -\log x = 5{,}82 \rightarrow pH = \underline{8{,}18}$

(9) $H_2CO_3{}_{(ac)} + H_2O_{(l)} \rightleftarrows HCO_3^-{}_{(ac)} + H_3O^+_{(ac)}$ $K_a = 7{,}94\times10^{-7}$ (del $pK_a$)

$1{,}25\times10^{-3}M - x$ $\quad 2{,}5\times10^{-2}M + x \quad x$

$$\frac{(x)(2{,}5\times10^{-2}+x)}{1{,}25\times10^{-3}-x} = 7{,}94\times10^{-7} \rightarrow x = 3{,}97\times10^{-8}M$$

$$pH = -\log x = \underline{7{,}40}$$

(10) $CH_3CO_2H_{(ac)} + NaOH_{(ac)} \rightarrow CH_3CO_2Na_{(ac)} + H_2O_{(l)}$

$\frac{0{,}022\,mol}{0{,}0245L}$ $\quad 0{,}48M$ $\quad 0{,}0461\,mL$ → $0{,}022\,mol$ → Se forman $0{,}022\,mol$

$[CH_3CO_2H] = \underline{0{,}9M}$