Actividad: Cinética Química

13.6)

a) $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$

$$-\frac{1}{2}\frac{\Delta[H_2]}{\Delta T} = -\frac{\Delta[O_2]}{\Delta T} = \frac{1}{2}\frac{\Delta[H_2O]}{\Delta T}$$

b) $4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$

$$-\frac{1}{4}\frac{\Delta[NH_3]}{\Delta T} = -\frac{1}{5}\frac{\Delta[O_2]}{\Delta T} = \frac{1}{4}\frac{\Delta[NO]}{\Delta T} = \frac{1}{6}\frac{\Delta[H_2O]}{\Delta T}$$

13.8)

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

a) $$\frac{1}{2}\frac{\Delta[NH_3]}{\Delta T} = -\frac{1}{3}\frac{\Delta[H_2]}{\Delta T}$$

$$\frac{\Delta[NH_3]}{\Delta T} = -\frac{2}{3}\frac{\Delta[H_2]}{\Delta T}$$

$$\frac{\Delta[NH_3]}{\Delta T} = -\frac{2}{3}(-0{,}074\ M/s) = 0{,}049\ M/s$$

b) $$\frac{\Delta[N_2]}{\Delta T} = \frac{1}{3}\frac{\Delta[H_2]}{\Delta T} = \frac{1}{3}(-0{,}074\ M/s) = -0{,}025\ M/s$$

13.13)

$$NH_4^+(ac) + NO_2^-(ac) \rightarrow N_2(g) + 2H_2O(l)$$

$V = K[NH_4^+][NO_2^-] = (3,0 \times 10^{-4})(0,26)(0,080) = 6,2 \times 10^{-6} M/s$

$K = 3,0 \times 10^{-4} / M \cdot s$

$[NH_4^+] = 0,26 M$

$[NO_2^-] = 0,080 M$

13.14)

$V_a = K[F_2][ClO_2]$

$[F_2] = 0,010 M$

$[ClO_2] = 0,020 M$

$K = \frac{V_x}{[F_2][ClO_2]} = \frac{4,8 \times 10^{-3} M/s}{(0,10M)(0,040M)}$

$= 1,2 / M \cdot s$

* $V_a = K[F_2][ClO_2] = (1,2/M \cdot s)(0,010 M)(0,020M) = 2,4 \times 10^{-4} M/s$

13.15)

$A + B \Rightarrow$ productos

[A] (M)	[B] (M)	Rapidez (M/s)
1,50	1,50	$3,20 \times 10^{-1}$
1,50	2,50	$3,20 \times 10^{-1}$
3,00	1,50	$6,40 \times 10^{-1}$

* $V = K[A]$

$3,20 \times 10^{-1} M/s = K(1,50 M) \Rightarrow K = 0,213/s$

13.16)

$$X + Y \rightarrow Z$$

rapidez inicial de desaparición de X (M/s)	[X] (M)	[Y] (M)
0,053	0,10	0,50
0,127	0,20	0,30
1,02	0,40	0,60
0,254	0,20	0,60
0,509	0,40	0,30

a) $x=4$, $\frac{V_5}{V_2} = \frac{0,509\ M/s}{0,127\ M/s} \approx 4 = \frac{K(0,40)^x(0,30)^y}{K(0,20)^x(0,30)^y}$

$$\frac{(0,40)^x}{(0,20)^x} = 2^x = 4$$

$x=2$, $\frac{V_4}{V_2} = \frac{0,254\ M/s}{0,127\ M/s} = 2 = \frac{K(0,20)^x(0,60)^y}{K(0,20)^x(0,30)^y}$

$$\frac{(0,60)^y}{(0,30)^y} = 2^y = 2$$

$Y=1$, la reacción es de primer orden en Y, por lo tanto la velocidad es

$$V = K[X][Y]$$

El orden de la reacción es $(2+1) = 3$

b)

$$K = \frac{V}{[X]^2[Y]} = \frac{0,053\ M/s}{(0,10M)(0,50M)} = 10,6/M^2 s$$

* $V_i = (10,6/M^2 s)(0,30\ M)^2(0,40M) = 0,38\ M/s$

3.17)

a) $K[NO_2]^2$: segundo orden

b) K : 0 orden

c) $\frac{K[H_2][Br_2]}{2}$: 1,5 orden

d) $K[NO]^2[O_2]$: tercer orden

3.18)

a) primer orden en A

$$V = K[A]$$

$$1,6 \times 10^{-2} M/s = K(0,35M)$$

$$K = 0,046/s$$

b) segundo orden en A

$$V = K[A]^2$$

$$1,6 \times 10^{-2} M/s = K(0,35\ M)^2$$

$$K = 0,13\ /M.s$$

13. 19)

$$C_4H_{8(g)} \rightarrow 2C_2H_{4(g)}$$

Tiempo (s)	$P_{C_4H_8}$ (mmHg)
0	400
2000	316
4000	248
6000	196
8000	155
10000	122

$K = 1,19 \times 10^{-4}/s$

13. 20)

$$ClCO_2CCl_{3(g)} \rightarrow 2COCl_{2(g)}$$

Tiempo (s)	P (mmHg)
0	15,76
181	18,88
513	22,79
1164	27,08

Es de primer orden y $K = 1,08 \times 10^{-3}/s$

13.27)

$$2\,NOBr(g) \rightarrow 2NO(g) + Br_2(g)$$

a)

$$\frac{1}{[NOBr]_T} = KT + \frac{1}{[NOBr]_0}$$

$$\frac{1}{[NOBr]_T} = (0{,}80/M.1)(22\,1) + \frac{1}{0{,}086M}$$

$$\frac{1}{[NOBr]_T} = 29/M$$

$$[NOBr] = 0{,}034M$$

b)

* $T_{\frac{1}{2}} = \frac{1}{K[A]_0}$

$$T_{\frac{1}{2}} = \frac{1}{(0{,}80/M.1)(0{,}072M)}$$

$$T_{\frac{1}{2}} = 17\,1$$

$$T_{\frac{1}{2}} = \frac{1}{K[B]_0}$$

$$T_{\frac{1}{2}} = \frac{1}{(0{,}0/M\,1)(0{,}054M)}$$

$$T_{\frac{1}{2}} = 23\,1$$

13.28)

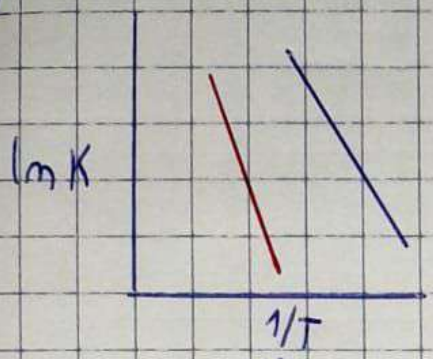
$$2NO_2(g) \rightarrow 2NO(g) + O_2(g)$$

$$\frac{1}{[A]} = \frac{1}{[A]_0} + KT$$

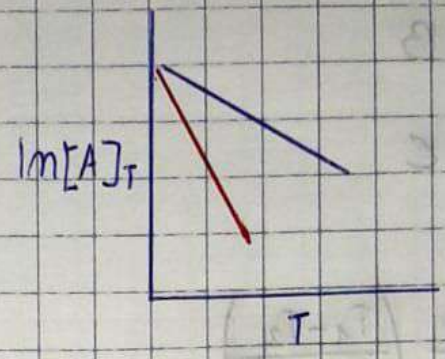
$$\frac{1}{0{,}28} = \frac{1}{0{,}62} + 0{,}5T$$

$$T = 3{,}6\,1$$

13.37)



a)



b)

Corresponde la grafica a

13.38)

$$CO_{(g)} + Cl_{2\,(g)} \rightarrow COCl_{2\,(g)}$$

$T_1 = 250°C = 523K$

$T_2 = 150°C = 423K$

$\frac{K_1}{K_2} = 1,50 \times 10^3$

$$\ln \frac{K_1}{K_2} = \frac{Ea}{R}\left(\frac{T_1 - T_2}{T_1 T_2}\right)$$

$$\ln (1,50 \times 10^3) = \frac{Ea}{8,314\ J/mol.K}\left(\frac{523K - 423K}{(523K)(423K)}\right)$$

$$7,31 = \frac{Ea}{8,314\ \frac{J}{mol.K}}\left(4,52 \times 10^{-4}\ \frac{1}{K}\right)$$

$$Ea = 1,35 \times 10^5\ J/mol = 135\ KJ/mol$$