13.6

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

$$R = \frac{-\Delta[H_2]}{2\Delta t} = \frac{-\Delta[O_2]}{\Delta t} = \frac{\Delta[H_2O]}{2\Delta t}$$

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

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

13.8

a) $R(NH_3) = \frac{2\,mol\,NH_3}{1\,mol\,de\,N_2} \times 0,074\ m/s$

$Ra(NH_3) = 0,148\ m/s$

b) Rapidez $N_2 = \frac{1\,mol\,N_2}{3\,mol\,H_2} \times 0,074\ m/s$

Rápidez $N_2 = 0,02467\ m/s$

13.13

Rápidez $= k[NH_4^+][NO_2^{2-}]$

Rápidez $= (3 \times 10^{-24}\ M^{-1}s^{-1} \times 0,26M \times 0,080M$

Rapidez $= 6,24 \times 10^{-26} M/s$

13.14

$1,2 \times 10^{-23}\ m/s = k(0,10M)(0,010M)$

$k = \frac{1,2 \times 10^{-23}\ m/s}{(0,10M)(0,010M)}$

$k = 1,2 \times 10^{-20} M^{-2}s^{-1}$

Rápidez $= 1,2 \times 10^{-20} M^{-2}s^{-1}(0,010)(0,020)$

Rapidez $= 2,4 \times 10^{-24} m/s$

13,19)

Rapidez = $k[P(C_4H_8)]$

400 mmHg = k [400 mmHg]

$k = 1\,s^{-1}$

13,20)

Entre(0s, 181s)

Rapidez promedio = $\frac{18,88\ mmHg - 15,76\ mmHg}{181s - 0s} = 0,017\ mmHg/s$

Entre(181s, 513s)

Rapidez promedio = $\frac{22,79\ mmHg - 18,88\ mmHg}{513s - 181s} = 0,011\ mmHg/s$

Entre(513s, 1164s)

Rapidez promedio = $\frac{27,08\ mmHg - 22,79\ mmHg}{1164s - 513} = 0,010\ mmHg/s$

$0,017\ mmHg/s = k(15,76\ mmHg)$

$k = \frac{0,017\ mmHg}{15,76\ mmHg} = 0,00108\ s^{-1}$

13,27)

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

$// = 11,63 + 17,6$

$// = 29,23$

$[NOBr]_t = \frac{1}{29,23}$

$// = 0,0342M$

$t_{\frac{1}{2}} = \frac{1}{k[NOBr]_0}$

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

$t_{\frac{1}{2}} = \frac{1}{0,0576\ Ms^{-1}}$

$T_{\frac{1}{2}} = 17,36s$

$$\tau_{\frac{1}{2}} = \frac{1}{(0{,}80\,l/ms)(0{,}054\,M)}$$

$$\tau_{\frac{1}{2}} = \frac{1}{0{,}0432\,Ms^{-1}}$$

$$\tau_{\frac{1}{2}} = 23{,}15\,s$$

13,28)

$$\frac{1}{0{,}28M} = \frac{1}{0{,}62M} + (0{,}54\,l/ms)\,\tau$$

$$\frac{1}{0{,}28M} - \frac{1}{0{,}62M} = (0{,}54\,l/ms)\,\tau$$

$$\frac{1}{0{,}28M} - \frac{1}{0{,}62M} = \frac{1}{0{,}28M} - \frac{1}{0{,}62M}$$

$$// = \frac{0{,}62M - 0{,}28M}{0{,}28M \cdot 0{,}62M}$$

$$// = \frac{0{,}34M}{0{,}28M \cdot 0{,}62M}$$

$$// = \frac{0{,}34M}{0{,}1736M}$$

$$\tau = \frac{0{,}34}{0{,}1736} \cdot \frac{1}{0{,}54\,l/ms} \longrightarrow \tau = 3{,}30\,s$$

13,37)

a) $\ln k = \frac{-Ea}{R}\left(\frac{1}{T}\right) + \ln A$

b) $\ln k = \ln A - \frac{Ea}{RT} + \ln [A]0$

13,38)

$$\ln(1,50\times10^{3}) = \frac{Ea}{R}\left(\frac{1}{423K} - \frac{1}{523K}\right)$$

$$\ln(1,50\times10^{3} = \frac{Ea}{R}\left(\frac{1}{423K} - \frac{1}{523K}\right)$$

$$Ea = R\left(\frac{\ln(1,50\times10^{3})}{\frac{1}{423K} - \frac{1}{523K}}\right)$$

$$Ea = 59078,28 J/mol$$

13,39)

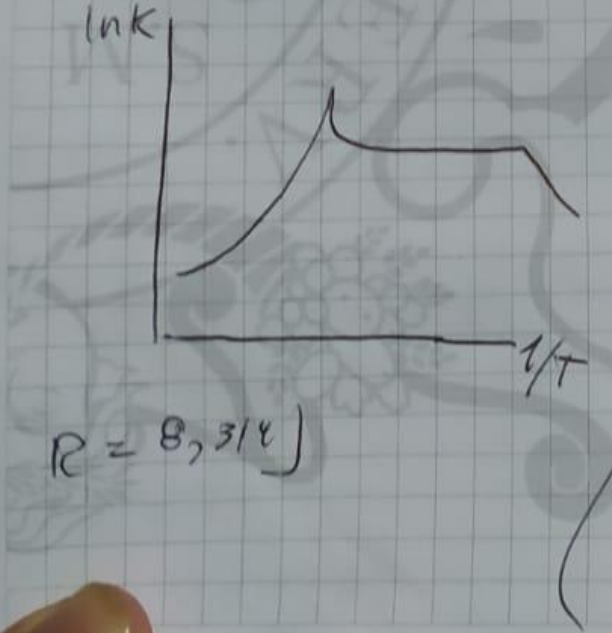
$$\ln(2,00) = \frac{24,5 kJ/mol}{RT}$$

$$T = \frac{24,5 kJ/mol}{R\ln(2,00)}$$

$$T = \frac{24,500 J/mol}{8,314 J/mol\,K)\ln(2,00}$$

$$T = 866 K$$

13,40)



$$R = 8,314 J$$

$$\text{Pendiente} = \frac{-2,56}{\frac{10000}{164000\times159000}}$$

$$// = 2,30\times10^{4}$$

$$Ea = -\text{Pendiente} \times R$$

$$Ea = -2,30\times10^{4}\times8,314)$$

$$Ea = -191932 J/mol$$

13,15)

$3,20 \times 10^{-1}\ m/s = k(1,50M)$

$k = \frac{3,20 \times 10^{-1}\ (M/s)}{1,50M}$

$k = 2,13 \times 10^{-1}\ M^{-1}s^{-1}$

13,16)

$0,127\ m/s = k(0,20M)^2\ (0,30M)^1$

$0,127\ m/s = 0,012k$

$k = 10,58\ M^{-1}s^{-1}$

Rapidez $= k[x]^2$

Rapidez $= 10,58\ M^{-1}s^{-1}\ (0,50M)^2$

Rapidez $= 0,286\ m/s$

13,17)

a) rapidez $= k[NO_2]^2 \longrightarrow 2$

b) rapidez $= k \longrightarrow 0$

c) rapidez $= k[H_2][Br_2]^{\frac{1}{2}} \longrightarrow 1,5$

d) rapidez $= k[NO]^2[O_2] \longrightarrow 3$

13,18)

a) $1,6 \times 10^{22}\ m/s = k(0,35M)$

$k = \frac{1,6 \times 10^{22}\ m/s}{0,35M}$

$k = 4,5714 \times 10^{22}\ M^{-1}s^{-1}$

b) $1,6 \times 10^{22}\ m/s = k(0,35M)^2$

$k = \frac{1,6 \times 10^{22}\ m/s}{(0,35M)^2}$

$k = 2,1224 \times 10^{23}\ M^{-1}s^{-1}$

13,41

$E_a = 63\ kJ/mol = 63,000\ J/mol$

$t = 75°C + 273,15 = 348,15\ K$

$k = A e^{-\frac{E_a}{RT}}$

$k = (8,7 \times 10^{12}\ s^{-1}) e^{-\frac{63,000\ J/mol}{(8,314)(348,15\ K)}}$

$k = 8,7 \times 10^{12}\ s^{-1}) e^{-\frac{63,000}{2,903,346}}$

$k = 8,2 \times 10^{12}\ s^{-1}) e^{-0,02108}$

$k = 8,7 \times 10^{12}\ s^{-1} \times 0,97848$

$k = 8,51316 \times 10^{12}\ s^{-1}$

13,55)

a) El orden es 2 por rapidez $= k[NO][Cl_2]$

b) No es valido no coincide debes reflejar reacción

13,57)

rapidez global $= k_1[O][O_3] - k_2[O_2]$

13,59)

Mec I:

$E_1 = H_2 + NO \rightarrow H_2O + N$

$E_2 = N + NO \rightarrow N_2 + O$

$E_3 = O + H_2 \rightarrow H_2O$

Mec II:

$E_1 = H_2 + 2NO \rightarrow N_2O + H_2O$

$E_2 = N_2O + H_2 \rightarrow N_2 + H_2O$

Mec III

E_2 $2NO \rightleftharpoons N_2O_2$

E_1 $N_2O_2 + H_2 \rightarrow N_2O + H_2O$

E_3 $N_2O + H_2 \rightarrow N_2 + H_2O$