$\boxed{6.13}$

$$CH_3CH_2OH \longrightarrow H_3C-\overset{O}{\overset{\|}{C}}-H$$

em 49 min $\left(1{,}5\ g/cm^3 \rightarrow \frac{1{,}5\ g/cm^3}{2} \right)$

Para consumo de $CH_3CH_2OH = EtOH$

$V = k[EtOH]^x$ onde x pode ser igual a 0, 1 ou 2

$V = -\frac{d[EtOH]}{dt} \rightarrow$ consumo de etanol

Para $x=0$

$$-\frac{d[EtOH]}{dt} = k \Leftrightarrow \int_{[EtOH]_0}^{[EtOH]_t} d[EtOH] = -k\int_0^t dt \Leftrightarrow [EtOH]_t - [EtOH]_0 = -kt$$

$$[EtOH]_t = -kt + [EtOH]_0 \Leftrightarrow \frac{[EtOH]_0}{2} = -kt + [EtOH]$$

$$\cancel{-}0{,}5[EtOH] = \cancel{-}kt \Leftrightarrow \frac{0{,}5 \times 1{,}5}{49\ min} = 0{,}0153\ g/min.$$

—1—

$$-\frac{d[EtOH]}{dt} = k[EtOH] \Leftrightarrow \int_{[EtOH]_0}^{[EtOH]_t} \frac{1}{[EtOH]} d[EtOH] = -k\int_0^t dt.$$

$$\ln[EtOH]_t - \ln[EtOH]_0 = -kt$$

$$\ln\frac{[EtOH]_t}{[EtOH]_0} = -kt \Leftrightarrow \ln\frac{\cancel{[EtOH]_0}}{2\cancel{[EtOH]_0}} = -kt \Leftrightarrow \ln\frac{1}{2} = -kt$$

$$\frac{0{,}6934}{49} = k \Leftrightarrow k = 0{,}0141\ g/min$$

6.17

$NO(g) + \frac{1}{2} Cl_2 \rightarrow NOCl$

Segundo ordem

$P_{inicial} = 300\ Pa$

$P_{NOCl} \rightarrow 0 \rightarrow 100\ bar$ em $522\ s$

K.

$V = K[NO]$

$V = -\frac{d[NO]^2}{dt}$

Segue diminuição de Produto

REGRA INTEGRAL

$$\boxed{\int x^n dx = \frac{x^{n+1}}{1+n}}$$

$$\int x^{-2} dx = \frac{x^{-2+1}}{-2+1} = \frac{x^{-1}}{-1} = -\frac{1}{x}$$

$$\frac{d[NO]}{dt} = -K[NO]^2$$

$$\frac{d[NO]}{d[NO]^2} = -K\,dt \Leftrightarrow \int_{[NO]_0}^{[NO]_t} \frac{1}{[NO]^2} d[NO] = K \int_0^t t\,dt$$

$$\Leftrightarrow -\frac{1}{[NO]_t} + \frac{1}{[NO]_0} = -Kt \Leftrightarrow$$

$$\frac{1}{[NO]_t} - \frac{1}{[NO]} = -Kt$$

quero determinar K
então resolver a equação
em ordem a K

onde $t = 522$

$[NO]_0 = 300\ Pa$

$[NO] = 300 - 100\ Pa = 200\ Pa$

$$\frac{1}{522}\left(\frac{1}{200} - \frac{1}{300}\right) = K$$

$$K = 3{,}19 \times 10^{-6}\ Pa\,s^{-1}$$

6.23

$$\frac{d[A]}{dt} = -k[A]^3$$

$$\int_{[A]_0}^{[A]_t} [A]^{-3}\, d[A] = -kt$$

$$\left. \frac{[A]^{-3+1}}{-3+1} \right|_{[A]_0}^{[A]_t} = -kt$$

$$\left. \frac{[A]^{-2}}{-2} \right|_{[A]_0}^{[A]_t} = -kt$$

$$\left. [A]^{-2} \right|_{[A]_0}^{[A]_t} = 2kt$$

$$[A]_t^{-2} - [A]_0^{-2} = 2kt$$

$$\frac{1}{[A]_t^2} - \frac{1}{[A]_0^2} = 2kt$$

$$\frac{1}{[A]_t^2} = 2kt + \frac{1}{[A]_0^2}$$

6.35

$k_1 = k_{19} = 1{,}78 \times 10^{4}\ dm^{-3}\ mol^{-1}\ s^{-1} \longrightarrow T = 19\,°C$

$k_2 = k_{37} = 1{,}38 \times 10^{-3}\ dm^{-3}\ mol^{-1}\ s^{-1} \longrightarrow T = 37\,°C$

$$k_1 = e^{-\frac{Ea}{RT_1}} \quad e \quad k_2 = e^{-\frac{Ea}{RT_2}}.$$

$$\ln(k_1) = \left(-\frac{Ea}{RT_1}\right) \quad / \quad \ln(k_2) = \left(-\frac{Ea}{RT_2}\right).$$

Subtraindo as duas equações

$$\ln(k_2) - \ln(k_1) = \left(-\frac{Ea}{RT_2}\right) - \left(-\frac{Ea}{RT_1}\right)$$

$$\ln\left(\frac{k_2}{k_1}\right) = \frac{Ea}{R}\left(-\frac{1}{T_2} + \frac{1}{T_1}\right)$$

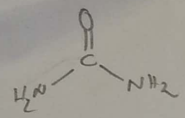
$$\boxed{\ln\left(\frac{k_2}{k_1}\right) = \frac{Ea}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)}$$

Substituir

$$\ln\left(\frac{1{,}38 \times 10^{-3}}{1{,}78 \times 10^{-4}}\right) = \frac{Ea}{8{,}314}\left(\frac{1}{292} - \frac{1}{310}\right)$$

$$Ea = 85{,}6\ kJ/mol$$

6.41



$$\boxed{2\, t_{1/2}(10°) = t_{1/2}(20°C)} \rightarrow T_{1/2}(1)$$

$t_{1/2}(2)$ cinetica 1ª ordem

$$-\frac{dA}{dt} = k[A]^1 \qquad \int_{[A]_0}^{[A]_t} \frac{1}{[A]}\, d[A] = -k\int_0^t dt$$

$$\ln[A]_t - \ln[A]_0 = -kt.$$

$$\ln[A]_t = -kt + \ln[A]_0$$

$$\boxed{y = -mx + b.}$$

tempo de meia vida

$$\ln\frac{[A]_0}{2} - \ln[A]_0 = -k\,t_{1/2}$$

$$\ln\left(\frac{1}{2}\right) = -k\,t_{1/2}$$

Regras dos logaritmos.

$$\boxed{t_{1/2} = -\frac{1}{k}\ln\left(\frac{1}{2}\right)}$$

tempo de meia vida

São constantes então o tempo de vida é inversamente proporcional à constante de velocidade

do exercício 6.35 sabemos que:

$$\ln\left(\frac{K_2}{K_1}\right) = \frac{Ea}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

Substituindo $K = \frac{1}{T_{1/2}}$

$$\ln\left(\frac{T_{1/2}(1)}{T_{1/2}(2)}\right) = \frac{Ea}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

$$\ln\left(\frac{2T_{1/2}(1)}{T_{1/2}(2)}\right) = \frac{Ea}{8{,}314} = \left(\frac{1}{293} - \frac{1}{283}\right) \Leftrightarrow Ea = 47{,}8\ kJ/mol$$