

15-12

$$M_A = 400 \text{ g/mol}$$

$$V = 40 \text{ dm}^3$$

$$c_{\text{min}} = 0,4 \text{ mg/dm}^3$$

$$c_{\text{door}} = 1,0 \text{ mg/dm}^3$$

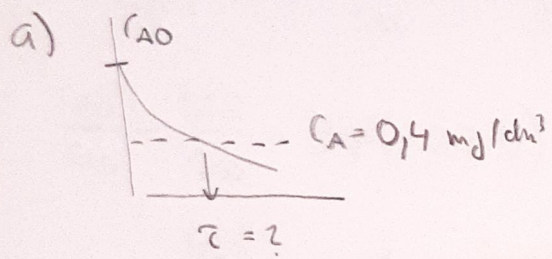
$$c_{\text{max}} = 2,5 \text{ mg/dm}^3$$



$$r = k c_A$$

$$k = 0,2 \text{ h}^{-1}$$

$$m_0 = 50 \text{ mg}$$



$$\frac{dn_A}{d\tau} = -k \cdot c_A \cdot V \quad c_A = \frac{m_A}{V}$$

$$\int_{m_{A0}}^{m_A} \frac{dn_A}{d\tau} = \int_0^{\tau} -k n_A$$

$$\ln\left(\frac{n_A}{n_{A0}}\right) = \ln\left(\frac{c_A}{c_{A0}}\right) = -k\tau$$

$$c_{A0} = \frac{50 \text{ mg}}{40 \text{ dm}^3} = 1,25 \text{ mg/dm}^3$$

$$\tau = -\frac{1}{k} \ln\left(\frac{c_A}{c_{A0}}\right)$$

$$\tau = -\frac{1}{0,2} \ln\left(\frac{0,4}{1,25}\right)$$

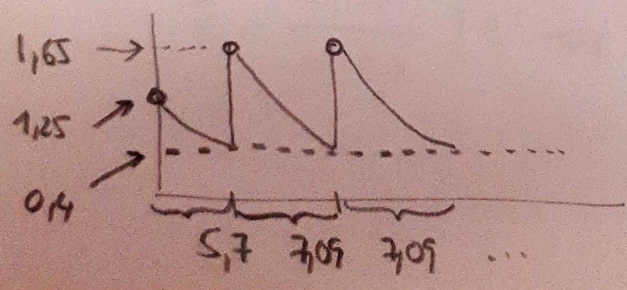
$$\tau = 5,70 \text{ h}$$

odpověď a

t/h	$c_A / \text{mg/dm}^3$
0	1,25
5,7	$0,4 + 1,25 = 1,65$

$$\tau = -\frac{1}{0,2} \ln\left(\frac{0,4}{1,65}\right) = 7,08 \text{ h}$$

odpověď b



c) ~~střední koncentrace~~

v ustálenem stavu: C_{A0} v čase 0, 4, 8, 12

$C_A + 1,25 = C_{A0}$ v čase 4, 8, 12, 16, ...

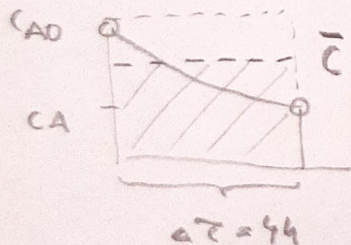
$$\ln\left(\frac{C_A}{C_{A0}}\right) = \ln\left(\frac{C_{A0} - 1,25}{C_{A0}}\right) = -0,2 \cdot 4$$

$$\frac{C_{A0} - 1,25}{C_{A0}} = \exp(-0,2 \cdot 4)$$

$$-\frac{1,25}{C_{A0}} = \exp(-0,8) - 1$$

$$C_{A0} = 1,25 \cdot \frac{1}{1 - \exp(-0,8)} = \underline{\underline{2,27 \text{ mg/dm}^3}}$$

$$(C_A = 2,27 - 1,25 = 1,02 \text{ mg/dm}^3)$$



$$\int_0^{\tau} C_A d\tau = \bar{C} \cdot \tau \Rightarrow \bar{C} = \frac{1}{\tau} \int_0^{\tau} C_A d\tau$$

střední koncentrace

$$C_A = C_{A0} \exp(-k\tau)$$

$$\bar{C} = \frac{1}{\tau} C_{A0} \cdot \frac{1}{k} \left[-\exp(-k\tau) \right]_0^{\tau} = \frac{C_{A0}}{\tau \cdot k} (1 - \exp(-k\tau))$$

$$\bar{C} = \frac{2,27}{4 \cdot 0,2} (1 - \exp(-4 \cdot 0,2)) = \underline{\underline{1,562 \text{ mg/dm}^3}}$$

střední koncentrace
odpověď c