

3-1 What is the minimum value of K_D which would allow the extraction of 99.9% of a solute from 50 mL of water with five successive 50 mL portions of ether?

Answer:

Diketahui

$$\% E = 99.9\%$$

$$V_o = 50 \text{ mL}$$

$$V_a = 50 \text{ mL}$$

$$n = 5$$

$$W_A = 100\% - 99.9\% = \frac{0.1\%}{100} \times 1 \text{ gram} = 0.001 \text{ gr}$$

Jawab:

$$W_A = W_o \left(\frac{V_a}{V_a + K_D \cdot V_o} \right)^n$$

$$0.001 \text{ gr} = 1 \text{ gr} \left(\frac{50 \text{ mL}}{50 \text{ mL} + 50 \text{ mL} \cdot K_D} \right)^5$$

$$\left(0.001 \text{ gr} = 1 \text{ gr} \left(\frac{1}{1 + K_D} \right)^5 \right)^{1/5}$$

$$(0.001 \text{ gr})^{1/5} = \left(\frac{1}{1 + K_D} \right)^1$$

$$0.2511 (1 + K_D) = 1$$

$$0.2511 + 0.2511 K_D = 1$$

$$0.2511 K_D = 1 - 0.2511$$

$$0.2511 K_D = 0.7489$$

$$K_D = 2.98 \approx 3$$

3-2 Diketahui :

$$\% E = 90\%$$

$$V_a = 100 \text{ mL}$$

$$V_o = 90 \text{ mL}$$

$$n = 5$$

$$W_o = 1 \text{ gram}$$

$$W_a = 100\% - 90\% = 10\% \times 1 \text{ gr} = 0.1 \text{ gr}$$

Jawab :

$$\left[W_a = W_o \left(\frac{V_a}{V_a + V_o K_D} \right)^n \right] \times 1/n$$

$$W_o = 1 \text{ gram}$$

$$(W_a)^{1/n} = 1 \left(\frac{V_a}{V_a + V_o K_D} \right)$$

$$(V_a + V_o K_D) = \frac{V_a}{W_a^{1/n}}$$

$$K_D = \frac{\left(\frac{V_a}{W_a^{1/n}} - V_a \right)}{V_o}$$

$$\% E = 90\% \Rightarrow K_D = \frac{\frac{100}{0.1^{1/5}} - 100}{90}$$

$$K_D = \frac{\frac{100}{0.631} - 100}{90}$$

$$K_D = \frac{158.47 - 100}{90}$$

$$K_D = 0.64966$$

No
Date

% E untuk 10 kali

$$(100\% - x\%) \text{ gr} = 0,01 \text{ gr}$$

$$\frac{100}{100} - x\% = 0,01 \text{ gr}$$

$$x\% = 1 - 0,01 \text{ gr}$$

$$x\% = 0,99$$

$$x = 99\%$$