

Latihan Soal

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Materi : KPA

3-1 Berapakah nilai minimum K_D yang memungkinkan ekstraksi 99,9% zat terlarut dari 50 ml air dengan lima bagian 50 ml eter berturut-turut?

Jawab :

Diketahui : $V_{aq} = 50 \text{ ml}$ (5 kali ekstraksi) % E = 99,9% $V_{eter} = 50 \text{ ml}$ Ditanya : K_D berapa = 99,9% ? $W_0 = 1 \text{ gram}$

$$W_A = 100\% - 99,9\% = \frac{0,1\%}{100} \times 1 \text{ gram} = 0,001 \text{ gram}$$

$$W_A = W_0 \left(\frac{V_A}{V_A + K_D V_E} \right)^n$$

$$0,001 \text{ gram} = 1 \text{ gram} \left(\frac{50 \text{ ml}}{50 \text{ ml} + 50 \text{ ml} \cdot K_D} \right)^5$$

$$\left(0,001 \text{ gram} = 1 \text{ gram} \left(\frac{1}{1 + K_D} \right)^5 \right)^{1/5}$$

$$0,25 (1 + K_D) = 1$$

$$0,25 + 0,25 K_D = 1$$

$$0,25 K_D = 1 - 0,25$$

$$= 0,75$$

$$K_D = 3$$

3-2.

Jika lama ekstraksi dengan 100 ml bagian ekstrak eter 90%
 zat terlarut dari larutan berat, berapa fraksi zat terlarut
 yang akan dihilangkan dengan 10 kali ekstraksi yang senapa?

Jawab:

$$E \% = 90 \%$$

$$V_A = 100 \text{ ml}$$

$$n = 5$$

$$V_0 = 90 \text{ ml}$$

$$W_0 = 1 \text{ gram}$$

$$W_A = W_0 \left(\frac{V_A}{V_A + V_0 K_D} \right)^n$$

$$(W_A)^{1/n} = 1 \left(\frac{V_A}{V_A + V_0 K_D} \right)$$

$$(V_A + V_O K_D) = \frac{V_A}{W_A^{1/n}}$$

$$K_D = \left(\frac{\left(\frac{V_A}{W_A^{1/n}} - V_A \right)}{V_A} \right)$$

$$\bullet \% E = 90\%$$

$$K_D = \frac{\frac{100}{0,1175} - 100}{90}$$

$$K_D = \frac{\frac{100}{0,631} - 100}{90}$$

$$K_D = \frac{158,47 - 100}{90}$$

$$K_D = 0,65$$

$$\bullet \% E \text{ (10 kali)}$$

$$100\% - X\% = 0,01 \text{ gram}$$

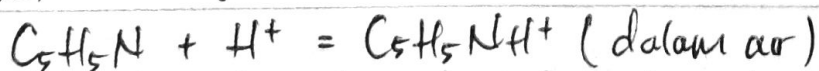
$$\frac{100}{100} - X\% = 0,01 \text{ gram}$$

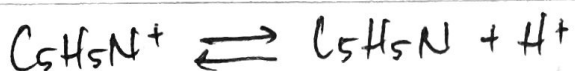
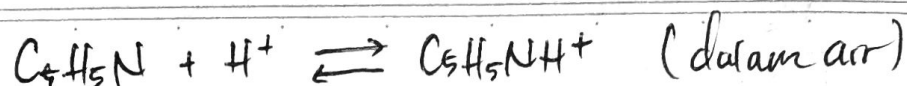
$$X\% = 1 - 0,01 \text{ gram}$$

$$X\% = 0,99$$

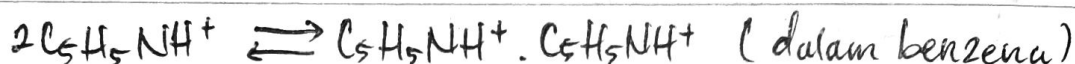
$$X = 99\%$$

33 Terangkan ekspresi yang mirip dengan persamaan 3-10 untuk distribusi protein antara air dan benzena.





$$K_a = \frac{[C_5H_5N][H^+]}{[C_5H_5N^+]} \rightarrow [C_5H_5N] = K_a \frac{[C_5H_5N^+]}{[H^+]} \dots (1)$$



$$K_d = \frac{[C_5H_5NH^+ \cdot C_5H_5NH^+]}{[C_5H_5NH^+]^2} \rightarrow [C_5H_5NH^+ \cdot C_5H_5NH^+] = K_d [C_5H_5NH^+]^2 \dots (2)$$

$$D = \frac{\text{konsentrasi total piridin dalam pelarut benzena}}{\text{konsentrasi total piridin dalam pel. air}}$$

$$= \frac{[C_5H_5NH^+]_{\text{benz}} + 2[C_5H_5NH^+ \cdot C_5H_5NH^+]_{\text{benz}}}{[C_5H_5NH^+]_{\text{air}} + [C_5H_5N]_{\text{air}}}$$

Dari persamaan 1 dan 2 diatas didistribusikan ke persamaan D

$$D = \frac{[C_5H_5NH^+]_{\text{benz}} + 2K_d [C_5H_5NH^+]^2_{\text{benz}}}{[C_5H_5NH^+]_{\text{air}} + K_a \frac{[C_5H_5N^+]}{[H^+]}}$$

$$D = \frac{[C_5H_5NH^+]_{\text{benz}} (1 + 2K_d [C_5H_5NH^+])}{[C_5H_5NH^+]_{\text{air}} (1 + K_a/[H^+])}$$

$$D = \frac{K_D (1 + 2K_d [C_5H_5NH^+])}{1 + K_a/[H^+]}$$