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PROBLEM 1

An aeration system has been monitored to determine $K_L a$. The dissolved oxygen versus time is shown in the following table. The saturation dissolved oxygen concentration is 9.0 mg/l. Use the data to determine $K_L a$.

t, min	0	4	8	12	16	20	24	28
C, mg/l	1.2	2.4	3.7	4.3	5.0	5.6	6.0	6.6

PROBLEM 2

Given the following characteristics of an air stripping column to remove chloroform (CHCl_3) from ground water: Flow = 170 gpm, Column diameter = 3 ft, Packing = 2 in polypropylene ($\sigma_c = 0.033$) Tri-packs, $D_L = 6 \times 10^{-6} \text{ cm}^2/\text{s}$, $D_G = 0.09404 \text{ cm}^2/\text{s}$. Air-to-water ratio = 100:1. Determine the overall mass transfer coefficient $K_L a$ using the Onda correlation. Assume 20 °C. Henry's constant can be approximated using

the following expression: $H = \exp\left[A - \frac{B}{T}\right]$ with $A = 9.84$ and $B = 4.61 \cdot 10^3$.

PROBLEM 3

A ground water supply has been contaminated with ethylbenzene (EB). The maximum level of EB in the groundwater is 1.0 mg/l and this must be reduced to 35 $\mu\text{g/l}$ using an air stripping column. The following data are given: $K_L a = 0.016 \text{ s}^{-1}$, $Q_w = 7.13 \text{ l/s}$, Temperature = 20°C, $H = 6.44 \times 10^{-3} \text{ atm} \cdot \text{m}^3/\text{mol}$, Column diameter = 2.0 ft, Air-to-water ratio (Q_A/Q_W) = 20. Determine:

- The liquid loading rate, L , $\text{mol/s} \cdot \text{m}^2$
- The stripping factor, R , dimensionless
- HTU (m), NTU (dimensionless)
- The height of packing in column, m.

PROBLEM 4

The following data were obtained in a laboratory study conducted for the determination of the overall volumetric mass transfer coefficient in a packed bed air stripping unit with a diameter of 1 m and a height of 4m equipped with 4 equidistant sampling ports along its height. Contaminated groundwater containing an initial TCE concentration of 230 $\mu\text{g/l}$ was fed to the stripping column at $1 \text{ m}^3/\text{m}^2 \cdot \text{min}$. The air to liquid ratio was 100. Based on the data determine $K_L a$ (s^{-1}). Henry's constant for TCE is 0.428.

Depth, m	0	1	2	3	4
TCE, $\mu\text{g/l}$	230	140	80	50	30



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