

AALTO YLIOPISTO
TEKNILLINEN KORKEAKOULU
Kemian tekniikan laitos
KE-42.4110 Yksikköoperaatioiden erikoiskurssi, syyslukukausi 2010
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TENTTI 17.12.2010

LASKUT

SIVU 1/1

HUOM! Tutustu tenttiohjeeseen! Kysymyksiin voi vastata suomen kielellä.

1. You need to purify 200 L of wastewater, containing 100 mg/L benzoic acid. pH during adsorption can be controlled. Which pH value of the wastewater (3 or 7 or 9) is better for adsorption if the final concentration of benzoic acid should be 5 mg/L? The needed coefficients are presented in lectures, Ch. 4.

Hint: Less activated carbon, better pH value.

2. An aqueous solution of a polymer is ultrafiltered by tubular modules. The concentration of the polymer in the feed solution is 20 kg/m^3 and the observed rejection is 0.90. Find the minimum flow velocity (m/s) in the tubes, if the concentration at the membrane surface is not allowed to exceed 50 kg/m^3 . The pressure difference across the membrane is 5 bar. Estimate also the permeate flux ($\text{dm}^3/(\text{m}^2 \text{ h})$). The diameter of the tube is 12.5 mm, viscosity of the solution is 5.0 mPas, and the permeability coefficient of the membrane is $8.0 \times 10^{-11} \text{ m}^3/(\text{Ns})$. Diffusivity (in water) and molar mass of the polymer are $2.0 \times 10^{-10} \text{ m}^2/\text{s}$ and 20000 g/mol, respectively. Assume constant physical properties of the compounds.
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