

LAPPEENRANTA UNIVERSITY OF TECHNOLOGY  
Department of Chemical Technology  
Laboratory of Separation Technology  
BJ20A0500 Chemical Engineering Unit Operations II  
Juha Kallas, Harri Niemi

## **EXAMINATION 5.12.2008**

### **THEORY**

The examination consists of two successive parts, namely theory and calculations. The duration of the examination is 3 hours. In the theory part only writing tools (pens, erasers, rulers) are allowed. The problems of the calculation part will be given to the examiner, while she/he assigns the answers of the theory part. In the calculation part scientific pocket calculators and literature is allowed, except the handout of exercises or similar type of literature containing mainly solutions of examples or problems.

### **QUESTIONS**

1. Adsorption equilibria. Experimental. Equilibrium equations. Experimental evaluation of coefficients into equilibrium equations.
2. Derive the mass balance for fixed-bed adsorber with continuous water flow.
3. Mass transfer resistances in membrane separation.
4. Hollow fiber modules. Structure, operation, advantages, disadvantages.

\*\*\*\*\*