

No calculator allowed.

Write to each of your answering sheets

- course name, date, number of the sheet / total number of the sheets
- family name, given name, student id, signature

You can answer either in English or in Finnish. You are permitted to take this problem sheet with you when you leave the exam.

1. **Describe briefly the steps of a microarray experiment, from the lab to the results. (6p)**
2. **a) What is hierarchical clustering? How is it computed and how are the results visualized? (3p)**
b) In the stochastic simulation algorithm (SSA), what are the things simulated? What information is obtained from the algorithm at each iteration? Note: you don't have to explain how the algorithm works, only the basic elements of the simulation. (2p)
3. **a) What is multiple sequence alignment? Why is it used? (3p)**
b) Which are the two main ways of searching for information in a sequence database? (2p)
4. **Explain briefly the following:**
 - a) Attractor in a Boolean network (1p)**
 - b) Steady-state assumption in metabolic modeling (2p)**
 - c) Polymerase Chain Reaction (1p)**
5. **What advantages are there in using sequencing-based methods instead of microarrays for RNA measurements? (4p)**