

**S-104.3610 Nanotechnology (5 cr)**

**Exam 12.12.2013**

*Please answer either in English or Finnish.*

1. Explain briefly (max. 2 pages altogether, draw schematics if needed):
  - a) EUV lithography
  - b) dip-pen nanolithography
  - c) role of thiols in molecular electronics
  - d) photoluminescence
  - e) Q-factor of a resonator
  - f) electrophoresis(each 1 p)
  
2. a) Resolution enhancement techniques in optical lithography (3 p)  
b) Operation of piezoelectric scanners in SPM (3 p)
  
3. a) Compare so called “top-down” and “bottom-up” methodologies. What are the advantages and difficulties in each approach? (3 p)  
b) Three examples of biomimetics (3 p)
  
4. Properties, fabrication and applications of graphene (6 p)
  
5. a) Explain how to estimate the weight of a single molecule (3 p)  
b) Explain how to achieve superhydrophobic surface using surface structure, contact angle and interfacial energy (3 p)