Exam MOL3014
Nanomedicine I - bioanalysis

Wednesday May 30th 2012, 9.00 - 13.00

ECTS credits: 7.5
Number of pages (included front-page): 2
Aids: C: dictionary/wordbook
Answers in both Norwegian and English acceptable

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Exam results: June 20th 2012
Examination results are announced on http://studweb.ntnu.no/
Question 1) (10points, 1 page)
Describe the nanopore technologies aiming for single molecule realtime DNA/RNA sequencing.

Question 2) (20points, 2 pages)
   a) How large is a typical globular protein? (2.5pts)
   b) What amino acids can be used for conjugation? (2.5pts)
   c) A rule-changing advancement in medicine using nanotechnology will come from the ability to immobilize multiple protein-species on the same surface with high spatial resolution. Can you describe process steps needed to make a glass surface with two different proteins patterned? (15pts)

Question 3) (20points, 2 pages)
Atomic force microscopy (AFM) can be a useful tool in molecular medicine.
   a) Describe the working principle of the AFM apparatus (5pts)
   b) What can the AFM be used for in molecular and cell biology? (5pts)
   c) What are the procedural steps needed for spatial mapping of proteins on a cell surface by use of AFM? (10pts)

Question 4) (15points, 2 page)
You want to study a cellular process that is highly variable between individual cells, so bulk research is not an option. Even though you have taken the NTNU-course «Mol3010 animal cell cultures» you are unable to synchronize the cellular events, so you need to rely on single cell observations in massive parallel. Describe three strategies one can use to immobilize or trap mammalian cells.

Question 5) (10pts, 1page)
How does the focused ion-beam - scanning electron microscope (FIB-SEM) work and what can it be used for in cell biology?

Exam 75pts + 25pts semester paper = 100pts total.

Good luck!