

ELEC-E3230 Nanotechnology (5 cr)

Exam 17.4.2024, 13:00-16:00 in AS1

The exam consists of 8 questions, with 80 points in total. Answer in either English or Finnish briefly enough by considering the exam duration. Also use drawings if helpful. Please write very clearly! No study materials or calculators are allowed.

1. Why are high-k dielectric gate materials necessary in modern microelectronics?
2. Break-junction technique in molecular electronics.
3. List benefits and drawbacks of graphene as a transistor material in microelectronics as compared to silicon.
4. Compare contact mode and non-contact mode in atomic force microscopy
5. Why colloidal quantum dots made from the same material can emit different colors?

Also list applications of colloidal quantum dots.
6. What is giant magnetoresistance (GMR) and where is it used?
7. Explain the operation of a qubit and describe two possible qubit structures.
8. Explain biomimetics and give three examples.