

Tfy-3.461 Materiaalifysiikka II
Midterm exam, 25.10.2004

Please, answer shortly but remember always to give the reasons and the consequences of the phenomenon or your statement in question!

1. a) You are studying experimentally defects in metals. Explain how would you intentionally create point defects and dislocations into you samples. Why you choose these methods? What kind of temperatures are required? (4 p)
b) What are the main physical phenomena related to screw and edge dislocations? (2 p)
2. a) Explain the metal-insulator transition on the basis of the Mott and the Hubbard models. (4 p)
b) What is the Wigner lattice of an electron gas? Why it is formed? (2 p)
3. a) What is the reason for the existence of metallic and semiconducting carbon nanotubes? (3 p)
b) Explain the basic principles of the Coulomb-blockade. (3 p)
c) Explain the integral quantum Hall effect in terms of the 2D behaviour of the Landau levels. (4 p)