Return by tue 19.10. by 2 pm.

1. *Cooper problem* (Elliot, problem 6.15 on p. 531) Note a misprint in Eq (1): "Z" should be "2". Note also that in Eq (4) the density of states is

$$g(\varepsilon) = \int \frac{\mathrm{d}S_\varepsilon}{4\pi^3 |\nabla_k \varepsilon(k)|},$$

which may well be approximated by its value at Fermi-level, $g \approx g(\varepsilon_F)$. The Cooper problem is also discussed in Kittel, Appendix H. **(3 points)**

2. *High-T_c superconductors* Write a short essay (max. 2 pages) on the basic properties of high-T_c superconductors. As reference material you can use e.g. Elliot, pages 485-489 or Kittel, pages 371-374. **(2 points)**

3. *The Meissner effect* Explain why a small supercoducting object can "levitate" on top of a permanent magnet (see Elliot pages 525-526). Derive and discuss the formula 6.269 on p. 526. If you would like to get an object made out of Niobium (Nb) to levitate 1 cm above a magnet of thickness of 2 cm, how strong has the magnetic field to be at the top surface of the magnet (see Elliot figure 6.69)? **(1 point)**