Exercises Condensed Matter Physics (Experimentalphysik 5c), WS16/17

1) **Charge carrier density in an intrinsic semiconductor** (3 credits)

   Plot (e. g. with Origin) the temperature dependence (T = 150 – 300K) of the charge carrier density of an intrinsic semiconductor with E_g = 1eV and 1.2eV and $m_n = m_p = m_e$.

2) **Position of the Fermi level (chemical potential) of an intrinsic semiconductor** (3 credits)

   Plot (e. g. with Origin) the temperature dependence (T = 1 – 300K) of the position of the Fermi level (in eV with E_F(0K)=0) inside the gap of an intrinsic semiconductor with E_g = 1eV and m_p / m_n = 1, =2, =3, respectively.

3) **Probing the Brillouin zone by photoemission spectroscopy** (3 credits)

   The band structure of a (001)-oriented epitaxial thin film with cubic crystal symmetry (lattice constant a = 0.4nm) is probed by angular resolved photoemission spectroscopy using UV-light with a photon energy of 21.2eV. The spectrometer accepts photoelectrons emitted within a cone of 20° opening. Which partition of the 1st Brillouin zone can be investigated ($k_{\parallel}$ along (010))?