Condensed Matter Physics 2023
Quiz 1 (Week 8)

1. Briefly describe Drude's model and the assumption made. Give examples where Drude's theory succeeds and where it fails, and the reasons for it.

2. Copper has a thermal conductivity at 300 K of $\kappa = 460.8$ W/(Km). Calculate its electrical conductivity (the Lorenz number is $L = 2.4 \times 10^{-8}$ WΩ/K^2).

3. Sodium atoms occupy a volume of 4×10^{-29} m^3. Each atom contributes one free conduction electron. Calculate the Fermi velocity v_F of sodium, and compare it to the drift velocity v_d in an electric field of 1 V/m. The scattering time is $\tau = 2 \times 10^{-14}$ s.