

Übungen zur Vorlesung Festkörperphysik 2 WS 2020/21

Serie 5

Frage 1 A rough sketch of the absorption coefficient for electromagnetic radiation is given for a nonmagnetic pure solid substance. The substance absorbs light in a narrow range in the infrared (0.15 eV) and then does not absorb light until the photon energy is 2.3 eV. Briefly explain this pattern of absorption and answer the following. (*Wisconsin*)

- (a) Is this material a metal or an insulator? Why?
 (b) Is there more than one atom per unit cell in the crystal structure of this material? Why?



Die folgenden Fragen sollten Sie schriftlich beantworten. Formulieren Sie gut gewählte Sätze. Zu rechnen ist nichts.

Frage 2 Was besagt das Curie-Gesetz?

Frage 3 Wie funktioniert Kühlung durch adiabatische Entmagnetisierung?

Frage 4 When a metal enters the superconducting state it becomes more ordered and its free energy decreases. What is the nature of the new ordering? Consider a superconducting ring carrying a circulating persistent current. Suppose that at some instant thermal fluctuations cause a small decrease in this current. In terms of your answer above, explain why the system will restore the current to its previous value. Explain why there is an energy gap when one tries to add energy to a superconductor by shining light on it, but not when one adds energy by applying a DC current. (SUNY, Buffalo)

Frage 5 What is ...
 a Josephson junction,
 the DC Josephson effect,
 the AC Josephson effect? (Columbia)