

Klausur

1. Explain how Bohr's model of the atom is based on the concept of energy quanta.
(3 points)
2. A plane in a lattice with primitive vectors \mathbf{a} , \mathbf{b} , and \mathbf{c} has intercepts at $2\mathbf{a}$, $-\mathbf{b}$, and \mathbf{c} . Use Miller indices to label the plane and the direction perpendicular to the plane.
(3 points)
3. Define the term Brillouin zone!
(3 points)
4. Give an interpretation of the cleaning effect of crystals by float-zone melting in terms of a phase diagram of two completely miscible components.
(5 points)
5. Given that the yield stress of glass is considerably higher than that of steel, explain why glass cables are not used in load-bearing applications.
(4 points)
6. What is a phonon?
(3 points)
7. Show that the microscopic form of Ohm's law $\mathbf{J} = \sigma \mathcal{E}$ is equivalent to the more familiar form $U = RI$ (J magnitude of the current density, σ conductivity, \mathcal{E} magnitude of the electric field vector, U voltage, R resistance, I current).
(3 points)
8. Explain possible polarization mechanisms in crystals.
(4 points)
9. What is the physical meaning of luminescence?
(3 points)
10. A small magnet is placed on the surface of a disc of normal material. Explain what happens when the disc is cooled down so that it becomes superconducting.
(3 points)