

**Vernetzungen in der Experimentalphysik
(Quantum Physics and Modern Physics)**

SAMPLE QUESTIONS

Oral exam: 20–30 Minutes

Typical questions asked at the oral exam of Quantum and Modern Physics

1. What is the connection between black-body radiation and phononic heat-capacity? What are the main ideas of the derivation of the Stefan-Boltzmann law and the heat capacity, and why is there a cutoff in the phonon case?
2. Why do solids exhibit electronic bands?
3. How can one change linearly polarized light to circularly polarized?
4. How does one get from the time dependent Schrödinger equation to the stationary one? What is special about the energy eigenstates of a quantum problem?
5. Eigenstates (of e.g. an atom) are stationary. Why then can excited states decay by emitting a photon?
6. Explain the spectrum of the hydrogen atom.
7. What observations can be used to verify the Hubble's law?
8. Why are metals shiny? Why do they have a high reflectivity in spite of a strong absorption?
9. How can one explain a $1/r$ Coulomb potential in a field-theoretical framework? What changes for massive exchange-bosons?