

Solid State Physics

*Neil W. Ashcroft
N. David Mermin
Cornell University*

 **BROOKS/COLE**
CENGAGE Learning™

Australia • Brazil • Japan • Korea • Mexico • Singapore • Spain • United Kingdom • United States

Contents

<i>Preface</i>	vii
<i>Important Tables</i>	xiv
<i>Suggestions for Using the Book</i>	xviii

1.	<i>The Drude Theory of Metals</i>	1
2.	<i>The Sommerfeld Theory of Metals</i>	29
3.	<i>Failures of the Free Electron Model</i>	57
4.	<i>Crystal Lattices</i>	63
5.	<i>The Reciprocal Lattice</i>	85
6.	<i>Determination of Crystal Structures by X-Ray Diffraction</i>	95
7.	<i>Classification of Bravais Lattices and Crystal Structures</i>	111
8.	<i>Electron Levels in a Periodic Potential: General Properties</i>	131
9.	<i>Electrons in a Weak Periodic Potential</i>	151
10.	<i>The Tight-Binding Method</i>	175
11.	<i>Other Methods for Calculating Band Structure</i>	191
12.	<i>The Semiclassical Model of Electron Dynamics</i>	213
13.	<i>The Semiclassical Theory of Conduction in Metals</i>	243
14.	<i>Measuring the Fermi Surface</i>	263
15.	<i>Band Structure of Selected Metals</i>	283
16.	<i>Beyond the Relaxation-Time Approximation</i>	313
17.	<i>Beyond the Independent Electron Approximation</i>	329
18.	<i>Surface Effects</i>	353

19.	<i>Classification of Solids</i>	373
20.	<i>Cohesive Energy</i>	395
21.	<i>Failures of the Static Lattice Model</i>	415
22.	<i>Classical Theory of the Harmonic Crystal</i>	421
23.	<i>Quantum Theory of the Harmonic Crystal</i>	451
24.	<i>Measuring Phonon Dispersion Relations</i>	469
25.	<i>Anharmonic Effects in Crystals</i>	487
26.	<i>Phonons in Metals</i>	511
27.	<i>Dielectric Properties of Insulators</i>	533
28.	<i>Homogeneous Semiconductors</i>	561
29.	<i>Inhomogeneous Semiconductors</i>	589
30.	<i>Defects in Crystals</i>	615
31.	<i>Diamagnetism and Paramagnetism</i>	643
32.	<i>Electron Interactions and Magnetic Structure</i>	671
33.	<i>Magnetic Ordering</i>	693
34.	<i>Superconductivity</i>	725

APPENDICES

A.	<i>Summary of Important Numerical Relations in the Free Electron Theory of Metals</i>	757
B.	<i>The Chemical Potential</i>	759
C.	<i>The Sommerfeld Expansion</i>	760
D.	<i>Plane-Wave Expansions of Periodic Functions in More Than One Dimension</i>	762
E.	<i>The Velocity and Effective Mass of Bloch Electrons</i>	765
F.	<i>Some Identities Related to Fourier Analysis of Periodic Systems</i>	767
G.	<i>The Variational Principle for Schrödinger's Equation</i>	769

H.	<i>Hamiltonian Formulation of the Semiclassical Equations of Motion, and Liouville's Theorem</i>	771
I.	<i>Green's Theorem for Periodic Functions</i>	772
J.	<i>Conditions for the Absence of Interband Transitions in Uniform Electric or Magnetic Fields</i>	773
K.	<i>Optical Properties of Solids</i>	776
L.	<i>Quantum Theory of the Harmonic Crystal</i>	780
M.	<i>Conservation of Crystal Momentum</i>	784
N.	<i>Theory of the Scattering of Neutrons by a Crystal</i>	790
O.	<i>Anharmonic Terms and n-Phonon Processes</i>	796
P.	<i>Evaluation of the Landé g-Factor</i>	797
 INDEX		 799