

CONTENTS

Editor's Foreword.....	iii
Preface.....	v
Chapter 1 Plasmas in Nature.....	1
1.1 Examples of Plasmas.....	1
1.2 Plasma Parameters.....	5
Chapter 2 Plasma Properties Due to the Coulomb Interaction	13
2.1 Scattering Cross-Section for Momentum Transfer.....	14
2.2 Debye Screening.....	16
2.3 The Coulomb Logarithm.....	19
2.4 The Ion-Sphere Model.....	20
2.5 Plasma Oscillation.....	24
2.6 Collective Motion and Individual- Particlelike Behavior.....	27
2.7 Wave-Particle Interaction.....	31
2.8 Frequency of Coulomb Collisions.....	35
Chapter 3 Density Correlations in Plasmas.....	37
3.1 Propagation of Plasma Oscillation.....	37
3.2 Cross-Section of Thomson Scattering.....	41
3.3 Doppler Effect.....	44
3.4 Density Correlations and Scattering Cross-Sections.....	45
3.5 Structure Factors and the Radial Distribution Function.....	49

Chapter 4	Radio-Wave Scattering from the Ionosphere.....	53	Chapter 10	High-Density Plasma in Stellar Interior.....	177
	4.1 Propagation of Electromagnetic Waves.....	53		10.1 Strongly Coupled Classical Plasmas.....	177
	4.2 Experiments by Bowles.....	59		10.2 Monte Carlo Simulation Results.....	179
	4.3 Collective Versus Individual-Particle Aspects of Scattering.....	63		10.3 Analytic Theories.....	186
	4.4 Dressed Particles.....	64		10.4 Enhancement of Thermonuclear Reaction Rate.....	193
	4.5 Experiments by Pineo, Kraft, and Briscoe...	67		10.5 Electric Resistivity.....	196
	4.6 Ion-Acoustic Wave.....	68	Chapter 11	Free Electron Laser.....	205
Chapter 5	Magnetic Confinement.....	74		11.1 Stanford Experiments.....	205
	5.1 Spiral Motion, Magnetic Moment, and Drifts	74		11.2 Electromagnetic Radiation from Relativistic Electrons.....	210
	5.2 Adiabatic Invariance and Magnetic Mirror...	79		11.3 Inverse Compton Scattering.....	213
	5.3 Rayleigh-Taylor Instability.....	83		11.4 Spontaneous Emission.....	215
	5.4 Toroidal Confinement.....	87		11.5 Induced Emission.....	221
	5.5 Minimum-B Geometry.....	88	Chapter 12	Plasma Phenomena Around Neutron Stars or Black Holes.....	224
Chapter 6	Electron Plasmas in Metals.....	92		12.1 Pulsars.....	225
	6.1 The Fermi Distribution and the Hartree- Fock Exchange Energy.....	92		12.2 Rotating Magnetic Neutron Stars.....	227
	6.2 The Dielectric Response Function.....	97		12.3 X-Ray Pulsars.....	238
	6.3 The Random-Phase Approximation.....	100		12.4 Black Hole Model of Cygnus X-1.....	243
	6.4 Local-Field Corrections.....	103	Appendix 1	The Delta Function.....	252
	6.5 The Ground-State Energy.....	112	Appendix 2	Fourier Analysis and Application.....	254
Chapter 7	Charged Particles or X-Rays Injected in Metals..	117	Appendix 3	Plasma Kinetic Equation and Fluctuations.....	259
	7.1 Characteristic Energy-Loss Spectroscopy....	117	Appendix 4	Dielectric Tensor.....	267
	7.2 Plasmon Dispersion.....	120	Appendix 5	Dielectric Response Functions in the Random- Phase Approximation.....	273
	7.3 Stopping Power and the Wake Potential.....	125	Appendix 6	Static Structure Factor in the Hartree-Fock Approximation.....	283
	7.4 Ion Clusters Injected in Metals.....	131	Appendix 7	Fluctuation-Dissipation Theorem and its Applications.....	285
Chapter 8	Electromagnetic Wave in Magnetized Plasma.....	137	Appendix 8	Superposition of Dressed Particles.....	290
	8.1 Helicon and Alfvén-Wave Experiments in Solid-State Plasmas.....	137	Appendix 9	Incoherent Scattering of Electromagnetic Radiation.....	294
	8.2 Propagation of Electromagnetic Waves in a Magnetized Plasma.....	141	References	298
	8.3 Circularly Polarized Waves.....	143	Index	307
	8.4 Uncompensated Plasmas.....	146			
	8.5 Compensated Two-Component Plasmas.....	151			
Chapter 9	Nonlinear Effects.....	156			
	9.1 Trapped Particles.....	156			
	9.2 The Amplitude Oscillation.....	159			
	9.3 Ion-Acoustic Wave Solitons.....	163			
	9.4 Ponderomotive Force.....	170			