Contents

LIST OF CONTRIBUTORS ix
CONTENTS OF PREVIOUS VOLUMES xi

The Theory of Collisions Between Charged Particles and Highly Excited Atoms

I. C. Percival and D. Richards

I. Introduction 2
II. The Classical Hydrogen Atom 7
III. Optical Properties and the Correspondence Principle 18
IV. Correspondence Principles Applied to Excitation 25
V. Classical Collisions 32
VI. Quantum Mechanics Applied to Excitation 46
VII. Collisions of Charged Particles and Hydrogenics 59
References 79

Electron Impact Excitation of Positive Ions

M. J. Seaton

I. Introduction 83
II. Experimental Methods 92
III. Theory 98
IV. Results 113
References 138
Note Added in Proof 142

The *R*-Matrix Theory of Atomic Processes

P. G. Burke and W. D. Robb

I. Introduction 144
II. Potential Scattering 145
III. Scattering of Electrons by Complex Atoms 157
IV. Discussion of Related Theories 178
V. Photoionization and Electron Impact Ionization 184
VI. Polarizabilities and Nonlinear Optical Coefficients 189
VII. Results 197
VIII. Conclusions 211
References 211

Role of Energy in Reactive Molecular Scattering: An Information-Theoretic Approach

R. B. Bernstein and R. D. Levine

I. Introduction 216
II. Specificity of Energy Disposal and Selectivity of Energy Requirements 218
III. Reactive Collisions at Fixed Total Energy 220
IV. Reaction Probability Matrices 222
V. Energy Dependence of Probability Matrices 225
VI. Information Content of a Distribution 227
VII. Entropy of a Product State Distribution 230
VIII. The Prior Distribution and the Surprisal 233
IX. Vibrational Surprisal Plots 238
X. Rotational Surprisals 242
XI. Triangular Plot Representations of Product State Distributions 245
XII. Translational Surprisals 249
XIII. Inelastic Surprisals 254
XIV. Selectivity of Energy Consumption 256
XV. Entropy Deficiency of a State Population Distribution 258
XVI. Application of the Principle of the Most Probable Distribution 264
XVII. High versus Low Resolution: Mixing Entropy and Mutual Entropy 267
XVIII. Branching Ratios 272
XIX. Dynamical Models 278
XX. Dependence of Reaction Cross Sections on Total Energy 280
XXI. Practical Applications 285
Appendix 1: State-to-State Cross Sections 285
Appendix 2: The ω-Matrix 287
Appendix 3: Statistical Theories 290
References 293

Inner Shell Ionization by Incident Nuclei

Johannes M. Hansteen

I. Introduction 299
II. Theoretical Treatments of the Coulomb Ionization Process 302
III. Selected Results from the SCA Model 313
IV. Multiple Coulomb Ionizations 320
V. Selected Background Effects 323
VI. Tentative Future Aspects and Conclusions 324
References 326

Stark Broadening

Hans R. Griem

I. Introduction 331
II. Effects of Electron Collisions 335
III. Effects of Ion Collisions 345
IV. Many-Body Effects 349
V. Outlook 357
References 357

Chemiluminescence in Gases

M. F. Golde and B. A. Thrush

I. Introduction 361
II. Chemiluminescence in Combination Processes 363
III. Chemiluminescence in Atom Transfer Processes 381
IV. Chemiluminescence in Complex Chemical Systems 394
References 405

AUTHOR INDEX 411
SUBJECT INDEX 425