

CONTENTS

INTRODUCTION

PHYSICAL FOUNDATIONS

	PAGE
§ 1. DEVELOPMENT OF THE QUANTUM THEORY OF AN OSCILLATOR FROM THE THEORY OF RADIATION	1
§ 2. GENERAL CONCEPTION OF THE QUANTUM THEORY	6
§ 3. THE CONCEPTIONS OF ATOMIC AND MOLECULAR STRUCTURE	12

FIRST CHAPTER

THE THEORY OF HAMILTON AND JACOBI

§ 4. EQUATIONS OF MOTION AND HAMILTON'S PRINCIPLE.	17
§ 5. THE CANONICAL EQUATIONS	20
§ 6. CYCLIC VARIABLES	24
§ 7. CANONICAL TRANSFORMATIONS	28
§ 8. THE HAMILTON-JACOBI DIFFERENTIAL EQUATION	36

SECOND CHAPTER

PERIODIC AND MULTIPLY PERIODIC MOTIONS

§ 9. PERIODIC MOTIONS WITH ONE DEGREE OF FREEDOM	45
§ 10. THE ADIABATIC INVARIANCE OF THE ACTION VARIABLES AND THE QUANTUM CONDITIONS FOR ONE DEGREE OF FREEDOM	52
§ 11. THE CORRESPONDENCE PRINCIPLE FOR ONE DEGREE OF FREEDOM	60
§ 12. APPLICATION TO ROTATOR AND NON-HARMONIC OSCILLATOR	63
§ 13. MULTIPLY PERIODIC FUNCTIONS	71
§ 14. SEPARABLE MULTIPLY PERIODIC SYSTEMS	76
§ 15. GENERAL MULTIPLY PERIODIC SYSTEMS. UNIQUENESS OF THE ACTION VARIABLES	86
§ 16. THE ADIABATIC INVARIANCE OF THE ACTION VARIABLES AND THE QUANTUM CONDITIONS FOR SEVERAL DEGREES OF FREEDOM	95
§ 17. THE CORRESPONDENCE PRINCIPLE FOR SEVERAL DEGREES OF FREEDOM	99
§ 18. METHOD OF SECULAR PERTURBATIONS	107
§ 19. QUANTUM THEORY OF THE TOP AND APPLICATION TO MOLECULAR MODELS	110
§ 20. COUPLING OF ROTATION AND OSCILLATION IN THE CASE OF DIATOMIC MOLECULES	122

THIRD CHAPTER

SYSTEMS WITH ONE RADIATING ELECTRON

	PAGE
§ 21. MOTIONS IN A CENTRAL FIELD OF FORCE	130
§ 22. THE KEPLER MOTION	139
§ 23. SPECTRA OF THE HYDROGEN TYPE	147
§ 24. THE SERIES ARRANGEMENT OF LINES IN SPECTRA NOT OF THE HYDROGEN TYPE	151
§ 25. ESTIMATES OF THE ENERGY VALUES OF THE OUTER ORBITS IN SPECTRA NOT OF THE HYDROGEN TYPE	155
§ 26. THE RYDBERG-RITZ FORMULA	161
§ 27. THE RYDBERG CORRECTIONS FOR THE OUTER ORBITS AND THE POLARISATION OF THE ATOMIC CORE	165
§ 28. THE PENETRATING ORBITS	169
§ 29. THE X-RAY SPECTRA	173
§ 30. ATOMIC STRUCTURE AND CHEMICAL PROPERTIES	180
§ 31. THE ACTUAL QUANTUM NUMBERS OF THE OPTICAL TERMS	183
§ 32. THE BUILDING UP OF THE PERIODIC SYSTEM OF THE ELEMENTS	191
§ 33. THE RELATIVISTIC KEPLER MOTION	201
§ 34. THE ZEEMAN EFFECT	207
§ 35. THE STARK EFFECT FOR THE HYDROGEN ATOM	212
§ 36. THE INTENSITIES OF LINES IN THE STARK EFFECT OF HYDROGEN	220
§ 37. THE SECULAR MOTIONS OF THE HYDROGEN ATOM IN AN ELECTRIC FIELD	229
§ 38. THE MOTION OF THE HYDROGEN ATOM IN CROSSED ELECTRIC AND MAGNETIC FIELDS	235
§ 39. THE PROBLEM OF TWO CENTRES	241

FOURTH CHAPTER

THEORY OF PERTURBATION

§ 40. THE SIGNIFICANCE OF THE THEORY OF PERTURBATIONS FOR THE MECHANICS OF THE ATOM	247
§ 41. PERTURBATIONS OF A NON-DEGENERATE SYSTEM	249
§ 42. APPLICATION TO THE NON-HARMONIC OSCILLATOR	257
§ 43. PERTURBATIONS OF AN INTRINSICALLY DEGENERATE SYSTEM	261
§ 44. AN EXAMPLE OF ACCIDENTAL DEGENERATION	265
§ 45. PHASE RELATIONS IN THE CASE OF BOHR ATOMS AND MOLECULES	269
§ 46. LIMITING DEGENERATION	275
§ 47. PHASE RELATIONS TO ANY DEGREE OF APPROXIMATION	282
§ 48. THE NORMAL STATE OF THE HELIUM ATOM	286
§ 49. THE EXCITED HELIUM ATOM	292

APPENDIX

I. TWO THEOREMS IN THE THEORY OF NUMBERS	300
II. ELEMENTARY AND COMPLEX INTEGRATION	303
INDEX	313