

CONTENTS

INTRODUCTION

2 WAVE EQUATIONS

Simple harmonic motion and wave equations. Relation between energy and amplitude. General differential equation of simple harmonic motion. Linear combinations of solutions. Alternative solutions of the differential equation. Progressive waves. Standing waves. The Schrödinger wave equation. Eigenfunctions and eigenvalues. Interpretation of ψ

3 PARTICLE IN A BOX

Particle in a one-dimensional box. Normalisation of wave functions. Orthogonality. Quantum mechanical operators. The postulates of quantum mechanics. Particle in a rectangular three-dimensional box

4 POTENTIAL ENERGY BARRIERS 54

Directional implications of wave equations. Single potential barriers. The tunnel effect

5 APPLICATIONS OF ONE-DIMENSIONAL MODELS 71

Conjugated systems. The vibrational energy of a diatomic molecule. The electronic energy of a diatomic molecule

6	THE LINEAR HARMONIC OSCILLATOR	91
	Approximate solution. Exact solution	
	PARTICLE ON A RING	101
8	THE RIGID ROTATOR	11
	The F equation. The T equation. The energy levels	
9	THE HYDROGEN ATOM	
	The F equation. The T equation. The R equation. The energy levels. The angular momentum of the electron. The hydrogen wave functions. The radial function. The angular function. Electron spin	
	APPENDIX 1 Complex Numbers	145
	APPENDIX 2 The Tunnel Effect	148
	APPENDIX 3 Trigonometric Relationships	151
	APPENDIX 4 Differentials and Integrals	153
	FURTHER READING	155
	INDEX	