

Contents

<i>Getting the most from this book</i>	v	8 Dimensional analysis	166
1 Kinematics	1	1 Introduction to dimensional analysis	167
1 The language of motion in one dimension	2	2 The dimensions of further quantities	168
2 The constant acceleration formulae	11	3 Other systems of units	169
3 Variable acceleration	17	4 Dimensional consistency	171
2 Forces and motion	25	5 Finding the form of the relationship	172
1 Forces and Newton's laws of motion	26	6 The method of dimensions	174
2 Working in vectors	34	Practice questions: Set 1	181
3 Forces in equilibrium	42	9 Motion under a variable force	185
4 Finding resultant forces	50	1 Motion in more than one dimension	186
3 A model for friction	58	2 The equation of a path	195
1 A model for friction	59	3 Path of a projectile	199
2 Modelling with friction	60	4 Projecting on a uniform slope	207
4 Moments of forces	70	5 Motion under variable acceleration	214
1 Introduction to moments	71	10 Circular motion	226
2 The moment of a force which acts at an angle	83	1 Introduction to circular motion	227
3 Sliding and toppling	93	2 Circular motion with constant speed	231
5 Work, energy and power	100	3 The conical pendulum	233
1 Energy and momentum	101	4 Banked tracks	236
2 Work and energy	101	5 Circular motion with variable speed	245
3 Gravitational potential energy	109	11 Hooke's law	267
4 Work and kinetic energy for two-dimensional motion	113	1 Strings and springs	268
5 Power	118	2 Using Hooke's law with more than one spring or string	274
6 Impulse and momentum	126	3 Work and energy	282
1 Impulse	127	4 Vertical motion involving elastic forces	288
2 Conservation of momentum	131	12 Modelling oscillations	297
3 Newton's law of impact	138	1 Oscillating motion	298
7 Centre of mass 1	147	2 Simple harmonic motion as a function of time	304
1 The centre of mass	148		
2 Centre of mass of two- and three-dimensional bodies	153		

3	Alternative forms of the equation for SHM	312	14 Oblique impact	372	
4	SHM as the projection of circular motion	318	1	Impulse and momentum in more than one dimension	373
5	Oscillating mechanical systems	326	2	Oblique impact of smooth elastic spheres	381
13	Centre of mass 2	341	Practice questions: Set 2	389	
1	Calculating volumes	342	<i>Answers</i>	392	
2	Centres of mass	350	<i>Index</i>	419	
3	Centres of mass of plane regions	361			