
CONTENTS

FOREWORD by Charles W. Misner	ix
FOREWORD by Sheila Tobias	xi
PREFACE	xiii
PART ONE: OVERVIEW	1
1 INTRODUCTION	3
An Eye Opener	3
Memorization Versus Understanding	5
2 PEER INSTRUCTION	9
Why Lecture?	9
The <i>ConcepTest</i>	10
Results	14
Do Problem-Solving Skills Suffer?	15
Feedback	16
Conclusion	18
3 MOTIVATING THE STUDENTS	19
Setting the Tone	19
Preclass Reading	22
Examinations	23

4 A STEP-BY-STEP GUIDE TO PREPARING FOR A PEER INSTRUCTION LECTURE	25
Lecture Outline	25
<i>ConcepTests</i>	26
Demonstrations	27
Lecture	27
Examinations	28
The Problem with Conventional Problems	29
Why Bother?	30
5 SAMPLE LECTURE	33
6 EPILOGUE	39
Often-Asked Questions	39
Recommendations	41
PART TWO: RESOURCES	43
7 FORCE CONCEPT INVENTORY	45
Force Concept Inventory	47
Answer Key for Force Concept Inventory	58
8 MECHANICS BASELINE TEST	59
Mechanics Baseline Test	60
Answer Key for Mechanics Baseline Test	70
9 QUESTIONNAIRE RESULTS	71
Introductory Questionnaire Results	71
10 READING QUIZZES	75
Kinematics	76
Newton's Laws	76

Forces	77
Work	77
Conservative Forces	78
Potential Energy	79
Gravitation	79
Momentum	80
Collisions	81
Rotational Kinematics I	81
Rotational Kinematics II	82
Rotational Dynamics I	82
Rotational Dynamics II	83
Oscillations	84
Waves	84
Sound	85
Fluid Statics	86
Fluid Dynamics	86
Electrostatics I	87
Electrostatics II	88
Electric Potential I	89
Electric Potential II	89
Capacitance	90
Ohm's Law	91
DC Circuits	92
Magnetostatics	92
Ampère's Law	93
Hall Effect	94
Magnetic Inductance	94
Mutual Inductance	95
AC Circuits I	95
AC Circuits II	96
Maxwell's Equations	97
Electromagnetic Waves I	97
Electromagnetic Waves II	98
Geometrical Optics I	98
Geometrical Optics II	99
Physical Optics I	100
Physical Optics II	100
Diffraction	101
Historical Introduction to Modern Physics	101
Wave-Particle Duality/Uncertainty	102
Spectral Lines	103
Bohr Atom	103
Answer Key for Reading Quizzes	104

11 CONCEPTTESTS	105
Kinematics	106
Forces	111
Energy, Work, and the Conservation of Energy	116
Gravitation	123
Inertial Mass, Momentum, and Collisions	125
Interactions	135
Reference Frames	139
Rotations	142
Oscillations	156
Sound	165
Fluid Statics	167
Optics	174
Electrostatics	188
Dielectrics & Capacitors	194
DC Circuits	196
Magnetism	202
AC Circuits	210
Electrodynamics	215
Modern Physics	217
12 CONCEPTUAL EXAM QUESTIONS	223
Kinematics	224
Newton's Laws	224
Work and Energy	228
Momentum & Collisions	229
Rotations	230
Oscillations, Waves, and Sound	231
Fluids	231
Electrostatics	232
DC Circuits	235
Magnetism	236
Induction and Maxwell's Equations	239
AC Circuits	240
Optics	242
Modern Physics	242
APPENDIX: CD-ROM INSTRUCTIONS	245
INDEX	247