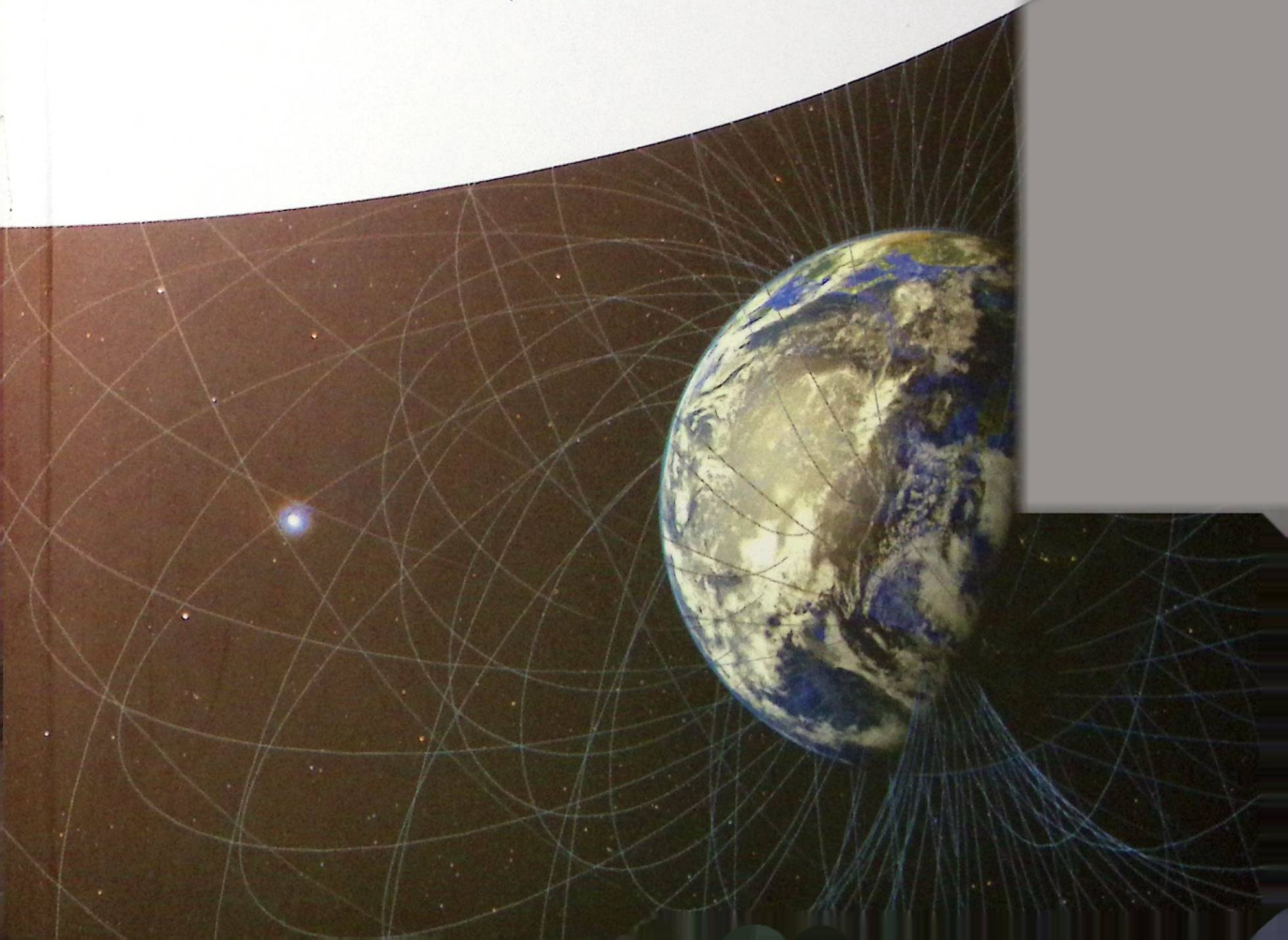


GENERAL PHYSICS 2

FOR SENIOR HIGH SCHOOL

REVISED EDITION

Helen E. Caintic, PhD



GENERAL PHYSICS 2

FOR SENIOR HIGH SCHOOL

REVISED EDITION

Helen E. Caintic, PhD



C & E Publishing, Inc.
2023

TABLE OF CONTENTS

List of Activities	vii
List of Figures	viii
List of Tables	xv
Preface	xvii

Unit I: Electrostatics

Chapter 1: Electric Charges and Electric Fields	2
Lesson 1.1. Electric Charge	4
Lesson 1.2. Coulomb's Law	13
Lesson 1.3. Electric Field	23
Lesson 1.4. Electric Flux and Gauss's Law	30
Chapter 2: Electric Potential and Electric Potential Energy	36
Lesson 2.1. Electric Potential	37
Lesson 2.2. Equipotential Lines and Potential Gradients	47
Chapter 3: Capacitance and Dielectrics	55
Lesson 3.1. Capacitance and Capacitors	56
Lesson 3.2. Energy Stored and Electric Field Energy in Capacitors	65
Lesson 3.3. Dielectrics	71

Unit II: Charges in Motion

Chapter 4: Current, Resistivity, and Resistance	80
Lesson 4.1. Electric Current	81
Lesson 4.2. Resistance, Resistivity, and Ohm's Law	88
Lesson 4.3. Electromotive Force (EMF) and Potential Difference (PD)	97
Lesson 4.4. Effects of Electric Current and Devices for Measuring Currents and Voltages	104

Chapter 5: Direct-Current Circuit	114
Lesson 5.1. Resistors in Series and in Parallel	115
Lesson 5.2. <i>R-C</i> Circuits	129
Chapter 6: Magnetism	139
Lesson 6.1. Magnetic Fields	140
Lesson 6.2. Motion of a Charged Particle in a Magnetic Field	148
Lesson 6.3. Magnetic Field of a Current-Carrying Wire	158

Unit III: Electromagnetism

Chapter 7: Magnetic Induction	176
Lesson 7.1. Electromagnetic Induction	177
Lesson 7.2. Application of Magnetic Induction in Alternating Currents	191
Chapter 8: Light as an Electromagnetic Wave	213
Lesson 8.1. The Dual Nature of Light	214
Lesson 8.2. Polarization of Electromagnetic Waves	235
Chapter 9: Geometric Optics	243
Lesson 9.1. Image Formation in Mirrors and Lenses	244
Chapter 10: Interference and Diffraction	269
Lesson 10.1. Interference and Diffraction of Light	270

Unit IV: Modern Physics

Chapter 11: Relativity	286
Lesson 11.1. Einstein's Theories of Relativity	287
Chapter 12: Atomic and Nuclear Physics	301
Lesson 12.1. Atomic and Nuclear Phenomena	302
Glossary	323
Bibliography	327
Index	329

INDEX

A

- alpha radiation, 314
- alternating current, 197
- ammeter, 105
- ampere, 84
- Ampere's law, 164

B

- back emf, 193
- beta radiation, 315
- Biot-Savart law, 162
- Bohr model, 310

C

- capacitance, 56, 57
- capacitor, 30, 56, 60
- charge distribution, 30
- coherence, 272
- Compton effect, 305, 312
- conductors, 17, 19
- constructive interference, 272
- converging lens, 229, 252
- Coulomb's law, 13, 14
- critical angle, 231

- current density, 85
- current, 81, 84

D

- destructive interference, 272
- dielectric, 71
- diffraction grating, 279
- diffraction, 270, 277
- diopter, 260
- direct current, 114
- dispersion, 233
- diverging lens, 252
- Doppler effect, 297
- drift velocity, 85

E

- electric charge, 4, 5, 10
- electric circuit, 81, 98, 115
- electric field intensity, 26, 27
- electric field, 216
- electric flux, 30, 31, 32
- electric potential, 37, 38
- electromagnetic oscillation, 207

electromagnetic spectrum, 218
electromotive force, 97
electron volt, 44
electroscope, 7
energy density, 66
equipotential lines, 47

F

Faraday's law, 186
Fleming's right-hand rule, 188
focal length, 245
focal point, 252
forward emf, 193

G

galvanometer, 107
gamma radiation, 315
Gauss's law, 31, 32

H

half-life, 316
Hertz's experiment, 217
Huygen's principle, 277

I

impedance, 201
induced current, 180
induced emf, 180
induction, 9
inertial frame of reference, 288
insulators, 17, 19

K

Kirchhoff's rules, 124

L

length contraction, 292
lenses, 229
Lenz's law, 187, 188

M

magnetic field, 140, 142, 143, 149
magnetic flux density, 162
magnetic flux, 184
magnetic induction, 162
Malus's law, 239
mirror, 224
monochromatic, 270
motional emf, 181
mutual inductance, 194

O

Ohm's law, 88, 91
ohmic, 94

P

parallel,
capacitors, 60
circuit, 116
parallel-plate capacitor, 57
resistors, 121
path difference, 272

photoelectric effect, 303
 use, 307

polarization, 237

potential difference, 38

potential gradient, 50

power, 101

R

reflection, 220, 221

refraction, 225

relativistic momentum, 293

relativistic postulate, 288

resistance, 88

resistivity, 89

resonance, 207

resonant frequency, 206

rest energy, 294

right-hand rule, 149, 161, 188

S

self-inductance, 191

series,

 capacitors, 61

 circuit, 161

 resistors, 118

single-slit diffraction, 277

Snell's law, 226

special theory of relativity, 287

speed of light postulate, 288

static electricity, 3

T

tesla, 150

time constant, 130

time dilation, 289

total internal reflection, 231

V

voltmeter, 98, 105

W

work function, 304