

Contents

Chapter 1

THE NATURE OF SCIENCE AND SCIENTIFIC INQUIRY	2
1.1 The Nature of Science	4
1.2 The Nature of Scientific Inquiry.....	16
CHAPTER 1 INVESTIGATION	
Investigation 1A: Get in the Swing: Controlling Variables.....	30

UNIT A: REPRODUCTION

Unit A Preview	32
-----------------------------	----

Chapter 2

CELL GROWTH AND REPRODUCTION	34
2.1 The Importance of Cell Division	36
2.2 Cell Structures Involved in Cell Division....	39
2.3 From DNA to Proteins	42
Awesome Science: Using Mitochondrial DNA to Solve Mysteries	48
2.4 The Cell Cycle.....	49
2.5 Changes to a Cell's DNA	53
2.6 Cell Division and Asexual Reproduction....	57
2.7 EXPLORE AN ISSUE: Beyond Dolly—Cloning Mammals	61
CHAPTER 2 INVESTIGATIONS	
Investigation 2A: Observing Cell Division in Plants and Animals	64
Investigation 2B: Determining the Rate of Cell Division in Plant and Animal Cells	66
CHAPTER 2 REVIEW	68



Chapter 3

SEXUAL REPRODUCTION	72
3.1 Meiosis	74
3.2 Sexual Reproduction and the Diversity of Life	79
3.3 Methods of Sexual Reproduction	83
3.4 Development of the Zygote	88
3.5 Reproductive Technologies in Agriculture ...	93
CHAPTER 3 INVESTIGATIONS	
Investigation 3A: Examining Flowers	98
Investigation 3B: Examining Seeds	100
CHAPTER 3 REVIEW	102

Chapter 4

HUMAN REPRODUCTION	106
4.1 The Male Reproductive System	108
4.2 The Female Reproductive System	112
4.3 Pregnancy: Fertilization to Birth	117
ScienceWorks: Cord Blood: Biological Insurance ..	122
4.4 Gender Determination in Humans	123
4.5 Atypical Meiosis	127
4.6 Prenatal Procedures	130
TechConnect: Fighting Huntington's Disease	133
4.7 Reproductive Technologies	134
4.8 EXPLORE AN ISSUE: Surrogate Mothers	137
CHAPTER 4 INVESTIGATION	
Investigation 4A: The Human Karyotype	139
CHAPTER 4 REVIEW	140
Unit A Review	144

UNIT B: ATOMS, ELEMENTS, AND COMPOUNDS

Unit B Preview 148

Chapter 5

PROPERTIES AND CHANGES 150

5.1 The Classification of Matter 152

5.2 Properties of Matter 157

TechConnect: What You See May Not Be
What You Get 165

5.3 Changes in Matter 166

5.4 The Kinetic Molecular Theory and
Changes of State 171

CHAPTER 5 INVESTIGATION

Investigation 5A: The Nature of
a Burning Candle 176

CHAPTER 5 REVIEW 178

Chapter 6

THE ELEMENTS 182

6.1 The History of Chemistry 184

6.2 Naming and Classifying the Elements 188

6.3 Putting the Elements in Order 193

CHAPTER 6 INVESTIGATION

Investigation 6A: Creating a Periodic Table 197

CHAPTER 6 REVIEW 198

Chapter 7

ATOMIC THEORY—INSIDE THE INVISIBLE 202

7.1 Development of a Modern Atomic Theory .. 204

7.2 The Bohr Theory of the Atom 209

Awesome Science: Lasers Shed Light on Cancer .. 213

7.3 The Modern Periodic Table 214

7.4 Using the Bohr Theory 218

CHAPTER 7 INVESTIGATIONS

Investigation 7A: Flame Colours 224

Investigation 7B: Ions and Atoms 226

CHAPTER 7 REVIEW 228

Chapter 8

IONIC COMPOUNDS: NAMES AND FORMULAS .. 232

8.1 Writing Chemical Formulas 234

8.2 Ion Charge and the Formulas of
Ionic Compounds 238

8.3 Naming Ionic Compounds 245

8.4 Chemical Families 248

ScienceWorks: Semiconductors—
Metalloids in Action 255

8.5 EXPLORE AN ISSUE:
Heavy Metals in the Environment 256

CHAPTER 8 INVESTIGATIONS

Investigation 8A: Separating the Elements
from a Compound 258

Investigation 8B: Chemical Families
and Compounds 260

CHAPTER 8 REVIEW 262

Unit B Review 266



UNIT C: CHARACTERISTICS OF ELECTRICITY

Unit C Preview 270

Chapter 9

STATIC ELECTRICITY 272

9.1 Types of Electric Charge 274

9.2 Charging by Friction, Conduction,
and Induction 279

9.3 Insulators and Conductors 282

9.4 Electric Force 285

9.5 Applications of Static Electricity 288

Awesome Science: Electrifying Fish 291

CHAPTER 9 INVESTIGATIONS

Investigation 9A: Charging by Friction 292

Investigation 9B: The Electroscope 294

CHAPTER 9 REVIEW 296

Chapter 10

CURRENT ELECTRICITY 300

10.1 Electricity and Electric Circuits 302

10.2 Electric Current 306

10.3 Electric Potential Difference (Voltage) 310

10.4 Resistors and Ohm's Law 315

10.5 Resistors in Series and Parallel Circuits ... 320

ScienceWorks: Heart Defibrillators 326

CHAPTER 10 INVESTIGATIONS

Investigation 10A: Voltage of Cells in Series
and Parallel Circuits 327

Investigation 10B: Resistors in Series and
Parallel Circuits 328

CHAPTER 10 REVIEW 330

Chapter 11

USING ELECTRICITY 334

11.1 Work, Energy, and Power 336

11.2 Electrical Energy and Power 340

TechConnect: The Oscilloscope 345

11.3 **EXPLORE AN ISSUE:**
Producing Electrical Energy 346

11.4 Household Electrical Energy 349

CHAPTER 11 INVESTIGATION

Investigation 11A: Household Electrical
Energy Use 355

CHAPTER 11 REVIEW 356

Unit C Review 360



UNIT D: SPACE EXPLORATION

Unit D Preview 364

Chapter 12

THE SOLAR SYSTEM 366

12.1 The Night Sky 368

12.2 The Earth–Moon System 376

12.3 Our Solar System 381

12.4 A Closer Look at the Planets 386

Awesome Science: Pluto: Too Puny to
be a Planet 395

12.5 The History of Astronomy 396

CHAPTER 12 INVESTIGATIONS

Investigation 12A: Sunrise and Sunset:
Measuring the Photoperiod 404

Investigation 12B: Retrograde Motion 405

Investigation 12C: Using a Star Map 406

CHAPTER 12 REVIEW 408

Chapter 13

THE UNIVERSE AND ITS STARS 412

13.1 The Origin of the Universe 414

13.2 Measuring Distances in Space 419

13.3 The Birth of Stars, and the Sun 425

ScienceWorks: SOHO: The Solar and
Heliospheric Observatory 430

13.4 Stars: Old Age, Death, and New Life 431

13.5 Galaxies and Our Home: The Milky Way ... 437

13.6 Dark Energy and the Expansion
of the Universe 442

CHAPTER 13 INVESTIGATIONS

Investigation 13A: Bright Line Spectra 446

Investigation 13B: Triangulation:
Measuring Distances to the Stars 448

Investigation 13C: A Rotating Sun? Sunspots
Provide the Answer 450

Investigation 13D: Hunting for Galaxies 452

CHAPTER 13 REVIEW 454

Chapter 14

THE TOOLS OF THE ASTRONOMER 458

14.1 Ancient and Modern Tools 460

14.2 **EXPLORE AN ISSUE:**
Light Pollution Solution 468

14.3 Computers and Probes 470

Awesome Science: The International
Space Station 475

CHAPTER 14 REVIEW 476

Chapter 15

EXPLORING SPACE 480

15.1 Faster Than the Speed of Light 482

15.2 Getting into Space 486

15.3 All These Worlds 492

15.4 **EXPLORE AN ISSUE:**
Terraforming: Are We Developers
or Caretakers? 498

15.5 Are We Alone? 500

TechConnect: The MOST with the Least:
Canada’s First Space Telescope 504

CHAPTER 15 INVESTIGATION

Investigation 15A: Launching a Simple Rocket ... 505

CHAPTER 15 REVIEW 506

Unit D Review 510



SKILLS HANDBOOK 514

GLOSSARY 566

INDEX 576

CREDITS 582