

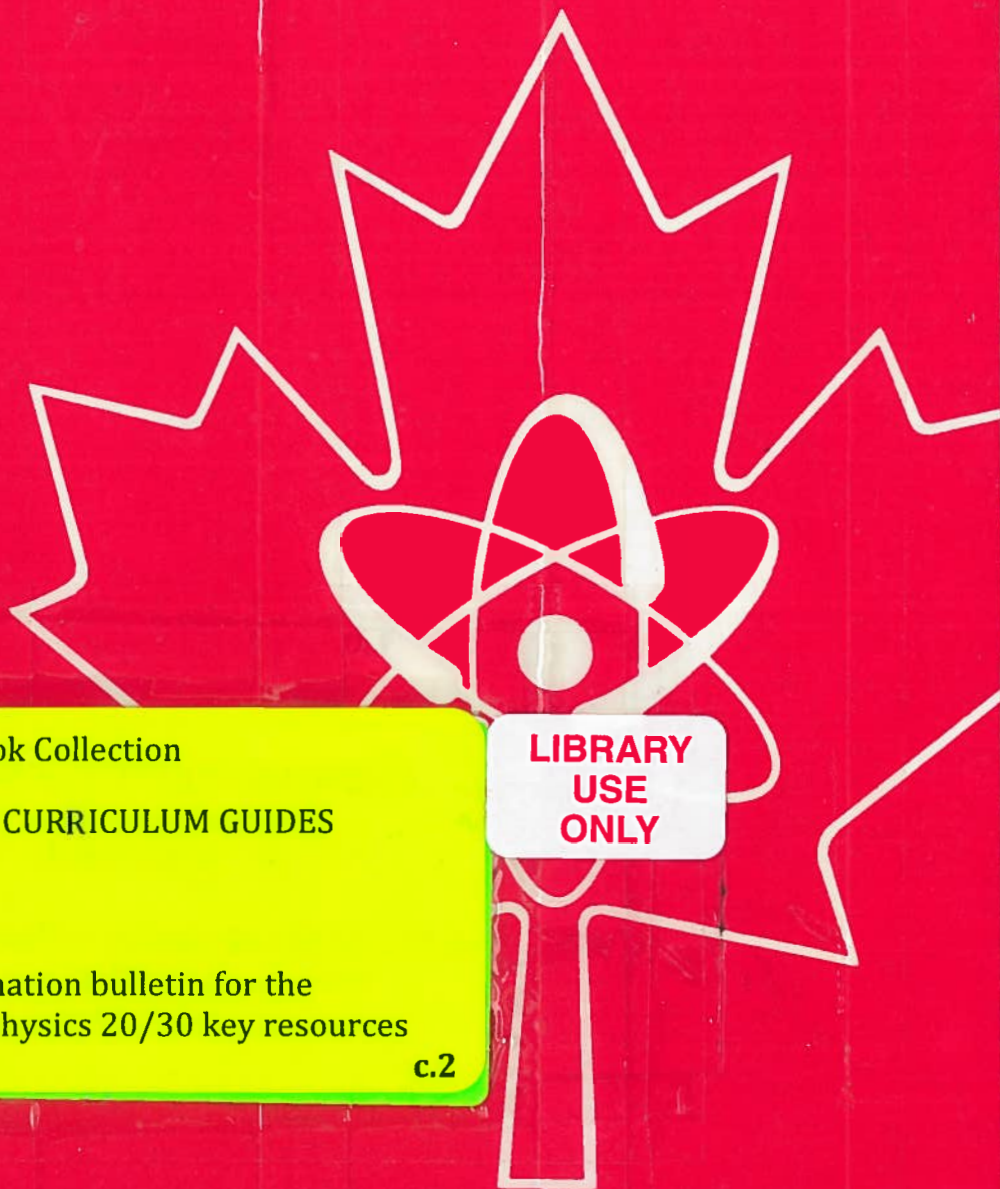


Saskatchewan  
Education

# Science

## An Information Bulletin for the Secondary Level Physics 20/30 Key Resources

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# **Science**

**An Information Bulletin  
for the Secondary Level**

**Physics 20/30 Key Resources**

**Saskatchewan Education  
June, 1992**

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# Acknowledgements

Saskatchewan Education gratefully acknowledges the professional contributions and advice given by the following members of the Science Curriculum Advisory Committee:

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- inhouse and contracted consultants
- pilot teachers
- other contributing field personnel

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## Key Resources

Dyer, Frank and William Tallman. (1991). ***Physics in Action***. Toronto: Harcourt Brace Jovanovich.

The level of reading and use of mathematics in this text make it most suitable for students who find that the sciences are difficult to understand. Investigations are included in the text. The number and depth of the concepts discussed is limited. Some supplementation for Physics 30 topics is necessary.

Hewitt, Paul. (1992). ***Conceptual Physics***. Don Mills, ON: Addison-Wesley.

This text develops the concepts of light, sound, heat, mechanics and electricity with virtually no emphasis on mathematical analysis. As such it is useful for students who are having difficulty reading and understanding conventional texts. It may be useful for introducing these concepts to all students, before proceeding a vigorous mathematical treatment of the topics.

The *Teaching Guide*, *Next Time Questions*, and *Concept Development Exercises* are supplementary resources which provide teachers with good support for classroom activities. These would be especially valuable for first time physics teachers or teachers with little physics background.

Martindale, D.E. et al. (1987). ***Fundamentals of Physics: An Introductory Course***. Toronto: D.C. Heath.

This text, which has been one of the authorized texts for many years, gives excellent support to the curriculum. It is especially strong in its discussion of the applications of physics concepts. Laboratory investigations are included in the text. Martindale and his co-authors are Ontario science educators.

Martindale, D.E. et al. (1986). ***Fundamentals of Physics: A Senior Course***. Toronto: D.C. Heath.

This text is most appropriate for average to gifted students, or for enrichment of topics. As in Martindale's other books, laboratory investigations are included in the text.

Martindale, D.E. et al. (1992). ***Heath Physics***. Toronto: D.C. Heath.

This text is a synthesis of *Fundamentals of Physics: An Introductory Course* and *Fundamentals of Physics: A Senior Course*, printed in four colours for the American market. It incorporates the best aspects of both of the original Canadian texts. Laboratory investigations in the incorporated in the text.

Wolfe, T.J.E. et al. (1989). ***Physics Today 1***. Scarborough, ON: Prentice-Hall.

The strength of this text is in its discussion of the applications of physical principles and its chapter-end suggestions of investigations for student research. The text includes laboratory investigations. Some supplementation for Physics 30 topics is necessary.

Zitzewitz, Paul W. and Robert Neff. (1992). ***Merrill Physics: Principles and Problems***. Westerville, OH: Glencoe/McGraw-Hill.

This colourful text has excellent teacher support materials. Worthy of special note are booklets entitled *Physics Skills*, *Critical Thinking*, *Supplemental Lessons*, *Enrichment*, and *Reteaching*.

### Teacher's Notes:

*Conceptual Physics* and *Merrill Physics: Principles and Problems* have laboratory manuals that are separate from the texts. *Merrill Physics: Principles and Problems* has some activities incorporated into the text. Notations such as "Lab activity, page 28" refer to activities from the text. For all other resources, the activities are incorporated into the text.



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# Physics 20

## Core Unit I: The Physics of Everyday Things (15 hours)

### ***Conceptual Physics***

- A. Introduction to Physics
  - pages 1-7
- B. Discovering Physics
  - See the recommendations in the Curriculum Guide regarding this topic.
- C. Measurement and Data Analysis
  - Appendices A and B

Further supplementation is recommended.

### ***Conceptual Physics Laboratory Manual***

- A. Introduction to Physics
    - Activity 1
- Fundamentals of Physics: An Introductory Course***

- A. Introduction to Physics
  - Supplementation is required.
- B. Discovering Physics
  - See the recommendations in the Curriculum Guide regarding this topic.
- C. Measurement and Data Analysis
  - Some useful information is available in the Appendices, but further supplementation is required.

### ***Fundamentals of Physics: A Senior Course***

- A. Introduction to Physics
  - Supplementation is required.
- B. Discovering Physics
  - See the recommendations in the Curriculum Guide regarding this topic.
- C. Measurement and Data Analysis
  - pages 2-41 This resources offers a comprehensive treatment of this topic.

### ***Heath Physics***

- A. Introduction to Physics
  - pages xxi-xxii
  - Supplementation is required.
- B. Discovering Physics
  - See the recommendations in the Curriculum Guide regarding this topic.
- C. Measurement and Data Analysis
  - Good information is available in the Appendices A-K. Further supplementation may be provided through many of the activities identified in this resource.

### ***Merrill Physics: Principles and Problems***

- A. Introduction to Physics
  - pages 4-9
- B. Discovering Physics
  - See the recommendations in the Curriculum Guide regarding this topic.
- C. Measurement and Data Analysis
  - pages 14-34
  - Lab activity p. 28

### ***Merrill Physics: Principles and Problems Laboratory Manual***

- A. Introduction to Physics
  - Experiment 1.1
- B. Discovering Physics
  - Supplementation required.
- C. Measurement and Data Analysis
  - Experiments 2.1, 2.2, 2.3

At the end of each chapter, *Physics Today 1* presents a section entitled **Investigations**. Many interesting activities can be selected from this section. One advantage of using these investigations is that they are open-ended, and no procedure is given. Students have to design their own experiments to investigate the problem being explored.

**A. Introduction to Physics**

- Brief section in the introduction on pages xxi and xxii.

**B. Discovering Physics**

- See the recommendations in the Curriculum Guide regarding this topic.

**C. Measurement and Data Analysis**

- Appendices A-K. Many of the investigations also help to support the development of this section.

**Physics in Action****A. Introduction to Physics**

- See the recommendations in the Curriculum Guide for this section and for section B — Discovering Physics.

**C. Measurement and Data Analysis**

- Appendices A and C



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## Core Unit II: Waves (15 hours)

### ***Conceptual Physics***

#### **A. Properties of Waves**

1. Wave Terminology
  - pages 362-365, 368-369
2. Universal Wave Equation
  - pages 366-368
3. Principle of Superposition
  - pages 369-378

#### **B. Wave Phenomena**

- Supplementation is required for section B.

### ***Conceptual Physics Laboratory Manual***

#### **A. Properties of Waves**

1. Wave Terminology
  - Activities 64, 67
  - Experiment 65
2. Universal Wave Equation
3. Principle of Superposition
  - Activity 66

### ***Fundamentals of Physics: An Introductory Course***

#### **A. Properties of Waves**

1. Wave Terminology
  - pages 274-80
2. Universal Wave Equation
  - pages 280-2
3. Principle of Superposition
  - pages 289-92, 328-41

#### **B. Wave Phenomena**

1. Transmission, Reflection, and Refraction
  - pages 283-8
  - Activities 10.2, 10.3, 10.4
2. Diffraction and other Wave Phenomena
  - pages 292-94
  - Activities 10.5, 10.6, 10.7

### ***Fundamentals of Physics: A Senior Course***

#### **A. Properties of Waves**

1. Wave Terminology
  - pages 446-448, 459-461, 482-483
2. Universal Wave Equation
  - pages 462-464
3. Principle of Superposition
  - pages 468-474
  - Investigations 12.1, 12.3, 13.5

#### **B. Wave Phenomena**

1. Transmission, Reflection, and Refraction
  - pages 464-467, 482-491
  - Investigations 12.2, 13.1, 13.2, 13.3
2. Diffraction and other Wave Phenomena
  - page 461, pages 492-496
  - Investigation 13.4

### ***Heath Physics***

#### **A. Properties of Waves**

1. Wave Terminology
  - pages 308-314
  - Investigation 10.1
2. Universal Wave Equation
  - pages 314-316
3. Principle of Superposition
  - pages 323-328
  - Investigations 10.5, 10.6, 10.7

#### **B. Wave Phenomena**

1. Transmission, Reflection, and Refraction
  - page 314-317, 319-322, 346-347
  - Investigations 10.2, 10.3, 10.4
2. Diffraction and other Wave Phenomena, as for Transmission, Reflection, and Refraction

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## ***Merrill Physics: Principles and Problems***

### **A. Properties of Waves**

1. Wave Terminology
  - pages 287-290, 293-294
2. Universal Wave Equation
  - pages 290-291
3. Principle of Superposition
  - pages 294-298

### **B. Wave Phenomena**

1. Transmission, Reflection, and Refraction
  - pages 299-300
  - Lab page 297
2. Diffraction and other Wave Phenomena
  - pages 300-302

## ***Merrill Physics: Principles and Problems Laboratory Manual***

### **A. Properties of Waves**

1. Wave Terminology
  - Experiments 14.1, 14.2

## ***Physics Today 1***

### **A. Properties of Waves**

1. Wave Terminology
  - pages 226-227, 281-283
2. Universal Wave Equation
  - pages 283-284
3. Principle of Superposition
  - pages 285-287

### **B. Wave Phenomena**

1. Transmission, Reflection, and Refraction
2. Diffraction and other Wave Phenomena
  - The text does not cover these topics directly as part of chapter 12, **Vibrations and Waves**. They could be integrated in Core Unit III. Alternatively, if Optional Unit V on **Sound** is covered, the topics could be integrated there as well. Activities 12.6 and 12.7 provides students with opportunities to investigate wave phenomena.

## ***Physics in Action***

### **A. Properties of Waves**

1. Wave Terminology
  - pages 157-164
2. Universal Wave Equation
  - page 190
3. Principle of Superposition
  - pages 183-187

### **B. Wave Phenomena**

- This topic is dealt with in the context of mirrors and lenses.

---

## Core Unit III: Light (25 hours)

### ***Conceptual Physics***

#### **A. Characteristics of Light**

1. Sources and Transmission of Light
  - pages 394-395, 398-404
2. The Speed of Light
  - pages 395-398

#### **B. Reflection**

1. Laws of Reflection
  - pages 431-433, 435-437
2. Plane Mirrors
  - pages 433-434
3. Curved Mirrors

#### **C. Refraction**

1. Snell's Law
  - pages 437-443
2. Total Internal Reflection
  - pages 444-449
  - Supplementation is required.

### ***Conceptual Physics Laboratory Manual***

#### **A. Characteristics of Light**

1. Sources and Transmission of Light
  - Activity 70
  - Experiment 71

#### **B. Reflection**

2. Plane Mirrors
  - Activities 75, 76, 77

### ***Fundamentals of Physics: An Introductory Course***

#### **A. Characteristics of Light**

1. Sources and Transmission of Light
  - pages 370, 373-374
2. The Speed of Light
  - pages 370-373

#### **B. Reflection**

1. Laws of Reflection
  - pages 376-377
  - Activity 13.2
2. Plane Mirrors
  - pages 377-380
  - Activity 13.3
3. Curved Mirrors
  - pages 394-405
  - Activity 14.8

#### **C. Refraction**

1. Snell's Law
  - pages 420-426
  - Activity 15.1
2. Total Internal Reflection
  - pages 426-8
  - Activity 15.2

### ***Fundamentals of Physics: A Senior Course***

#### **A. Characteristics of Light**

1. Sources and Transmission of Light
  - pages 406-407, 411-412, 515, 524
2. The Speed of Light
  - pages 407-410

#### **B. Reflection**

1. Laws of Reflection
  - pages 412-413, 415-416, 516, 520
2. Plane Mirrors
  - This section is integrated with the Laws of Reflection.
3. Curved Mirrors
  - pages 413-415, 416-422
  - Investigation 11.1

#### **C. Refraction**

1. Snell's Law
  - pages 422-424, 517, 521-522
  - Investigation 11.2
2. Total Internal Reflection
  - pages 425-426

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## **Heath Physics**

### **A. Characteristics of Light**

1. Sources and Transmission of Light
  - pages 410-412, 415-417
  - Investigation 13.1
2. The Speed of Light
  - pages 412-414

### **B. Reflection**

1. Laws of Reflection
  - pages 418-419
  - Investigations 13.2, 13.3
2. Plane Mirrors
  - pages 419-427,
3. Curved Mirrors
  - pages 438-454, 460-461

### **C. Refraction**

1. Snell's Law
  - pages 464-470, 473-476, 481
2. Total Internal Reflection
  - pages 470-472, 477-478

## **Merrill Physics: Principles and Problems**

### **A. Characteristics of Light**

1. Sources and Transmission of Light
  - pages 329-330, 333, 335-336
  - Lab page 334
2. The Speed of Light
  - pages 331-332

### **B. Reflection**

1. Laws of Reflection
  - pages 347-348
2. Plane Mirrors
  - pages 368-369
3. Curved Mirrors
  - pages 370-377
  - Lab page 379

### **C. Refraction**

1. Snell's Law
  - pages 348-351, 354-355
  - Lab page 352
2. Total Internal Reflection
  - pages 356-359

## **Merrill Physics: Principles and Problems Laboratory Manual**

### **A. Characteristics of Light**

1. Sources and Transmission of Light
  - Experiment 16.1

### **B. Reflection**

1. Laws of Reflection
  - Experiment 17.1
3. Curved Mirrors
  - Experiment 18.1

### **C. Refraction**

1. Snell's Law
  - Experiment 17.2

## **Physics Today 1**

### **A. Characteristics of Light**

1. Sources and Transmission of Light
  - pages 367-368
2. The Speed of Light
  - pages 406-407

### **B. Reflection**

1. Laws of Reflection
  - pages 369-372
2. Plane Mirrors
  - pages 373-375
  - Activity 15.6
3. Curved Mirrors
  - pages 377-391
  - Activity 15.7

### **C. Refraction**

1. Snell's Law
  - pages 408-416
  - Activity 16.5
2. Total Internal Reflection
  - pages 417-425
  - Activity 16.6

---

## ***Physics in Action***

### **A. Characteristics of Light**

- Supplementation is required.

### **B. Reflection**

#### **1. Laws of Reflection**

- pages 231-234

#### **2. Plane Mirrors**

- pages 228-231

#### **3. Curved Mirrors**

- pages 232-247

### **C. Refraction**

#### **1. Snell's Law**

- pages 254-259

#### **2. Total Internal Reflection**

- pages 260-268

### **Teacher's Notes:**

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## Core Unit IV: Heat (15 hours)

### **Conceptual Physics**

- A. Heat and Temperature
  - pages 300-303
- B. Specific Heat Capacity and Latent Heat
  - pages 304-308
- C. Thermodynamics
  - pages 308-315

### **Conceptual Physics Laboratory Manual**

- A. Heat and Temperature
  - Experiment 49
- B. Specific Heat Capacity and Latent Heat
  - Activities 58, 61, 62
  - Experiments 52, 59, 60

### **Fundamentals of Physics: An Introductory Course**

- A. Heat and Temperature
  - pages 196-199, 203-210
  - Activity 8.2
- B. Specific Heat Capacity and Latent Heat
  - pages 210-214
  - Activities 8.3, 8.4, 8.5
- C. Thermodynamics
  - pages 214-219

### **Fundamentals of Physics: A Senior Course**

Supplementation is required. This Core Unit is not covered in this resource.

### **Heath Physics**

- A. Heat and Temperature
  - pages 226-233
  - Investigation 8.1
- B. Specific Heat Capacity and Latent Heat
  - pages 233-244
  - Investigations 8.2, 8.3, 8.4, 8.5

- C. Thermodynamics
  - pages 244-253

### **Merrill Physics: Principles and Problems**

- A. Heat and Temperature
  - pages 242-248
  - Lab page 249
- B. Specific Heat Capacity and Latent Heat
  - pages 250-252
- C. Thermodynamics
  - pages 252-260, 279-282

### **Merrill Physics: Principles and Problems Laboratory Manual**

- B. Specific Heat capacity and Latent Heat
  - Experiment 12.1

### **Physics Today 1**

- A. Heat and Temperature
  - pages 218-220, 230-233, 234-240
  - Activity 10.6
- B. Specific Heat Capacity and Latent Heat
  - pages 248-63
  - Activities 11.4, 11.5
- C. Thermodynamics
  - Supplementation is required.

### **Physics in Action**

- A. Heat and Temperature
  - Supplementation required.
- B. Specific Heat Capacity and Latent Heat
  - pages 320-348
- C. Thermodynamics
  - pages 302-319



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## Optional Unit V: Sound

### ***Conceptual Physics***

#### **A. Applications**

1. The Human Ear
2. Other Applications
  - Supplementation is required for section A.

#### **B. Transmission of Sound**

1. Production of Sound
  - pages 381-384
2. Speed of Sound
  - page 384

#### **C. Characteristics of Sound**

1. Intensity
  - page 385
2. Pitch
  - pages 386-391
3. The Doppler Effect
  - pages 373-377
4. Harmonics, Resonance, and Interference
  - Supplementation is required.

### ***Conceptual Physics Laboratory Manual***

#### **B. Transmission of Sound**

1. Production of Sound
  - Activity 68
2. Speed of Sound
  - Experiment 69

### ***Fundamentals of Physics: An Introductory Course***

#### **A. Applications**

1. The Human Ear
  - pages 321-324
2. Other Applications
  - pages 328-331, 352-357

#### **B. Transmission of Sound**

1. Production of Sound
  - pages 314-315, 318-319, 324-328
2. Speed of Sound
  - pages 316-317
  - Activities 11.1, 12.3

#### **C. Characteristics of Sound**

1. Intensity
  - pages 319-321
2. Pitch
  - Relate this to the material on the frequency of waves.
3. The Doppler Effect
  - pages 358-359
4. Harmonics, Resonance, and Interference
  - pages 338-352
  - Activities 12.1, 12.2

### ***Fundamentals of Physics: A Senior Course***

#### **A. Applications**

#### **B. Transmission of Sound**

#### **C. Characteristics of Sound**

- These topics are omitted in this resource. Supplementation is required.

### ***Heath Physics***

#### **A. Applications**

1. The Human Ear
  - pages 357-360
2. Other Applications
  - pages 360-367, 390-395

#### **B. Transmission of Sound**

1. Production of Sound
  - pages 350-351, 354-355
2. Speed of Sound
  - pages 352-353
  - Investigations 11.1, 12.3

#### **C. Characteristics of Sound**

1. Intensity
  - pages 355-357
2. Pitch
  - Some overlap is found in sections of chapters 11 and 12.
3. The Doppler Effect
  - pages 396-397
4. Harmonics, Resonance, and Interference
  - pages 376-390
  - Investigations 12.1, 12.2

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## ***Merrill Physics: Principles and Problems***

### **A. Applications**

1. The Human Ear
  - pages 318-320
2. Other Applications
  - Supplementation is required.

### **B. Transmission of Sound**

1. Production of Sound
  - pages 307-308, 314-315
2. Speed of Sound
  - Lab page 313

### **C. Characteristics of Sound**

1. Intensity and 2. Pitch
  - pages 310-312
3. The Doppler Effect
  - pages 309-310
4. Harmonics, Resonance, and Interference
  - pages 315-318, 320-323

## ***Merrill Physics: Principles and Problems Laboratory Manual***

### **A. Applications**

2. Other Applications
  - Experiment 15.1

### **C. Characteristics of Sound**

4. Harmonics, Resonance and Interference
  - Experiment 15.2

## ***Physics Today 1***

### **A. Applications**

1. The Human Ear
  - pages 307-309
2. Other Applications of Sound
  - Found throughout chapters 13-14. Chapter 14, **The Physics of Music**, presents many interesting applications.

### **B. Transmission of Sound**

1. Production of Sound
  - pages 297-302
2. Speed of Sound
  - pages 309-312
  - Activities 13.10, 14.13

### **C. Characteristics of Sound**

1. Intensity
  - pages 304-307
  - Activity 13.11
2. Pitch
  - pages 299-303
3. The Doppler Effect
  - Supplementation is required.
4. Harmonics, Resonance, and Interference
  - pages 313-317, 337-341
  - Activities 13.12, 14.14

## ***Physics in Action***

### **A. Applications**

1. The Human Ear
  - pages 176-182
2. Other Applications of Sound
  - pages 143-151

### **B. Transmission of Sound**

1. Production of Sound
  - pages 156-162
2. Speed of Sound
  - pages 138-143

### **C. Characteristics of Sound**

1. Intensity and 2. Pitch
  - Supplementation is required.
3. The Doppler Effect
  - page 171
4. Harmonics, Resonance and Interference
  - pages 165-172, 183-188, 191-193

## Optional Unit VI: Optics

### **Conceptual Physics**

#### **A. Applications**

1. Human Vision
  - pages 462-464
2. Other Applications
  - pages 460-462
  - Supplementation is recommended.

#### **B. Lenses**

- pages 452-460, 464-466

#### **C. Physical Optics**

1. Important Phenomena
  - pages 469-486
2. Electromagnetic Radiation
  - pages 398-399
  - Supplementation is required.
3. Colour
  - pages 411-428

### **Conceptual Physics Laboratory Manual**

#### **A. Applications**

1. Human Vision
  - Activity 84
2. Other Applications
  - Activities 72, 79, 80, 85
  - Experiment 73

#### **B. Lenses**

- Activity 83
- Experiments 81, 82

### **Fundamentals of Physics: An Introductory Course**

#### **A. Applications**

1. Human Vision
  - pages 455-459, 474-475
2. Other Applications
  - pages 454-455, 478-480
  - Colour plates between pages 484-485

#### **B. Lenses**

- pages 444-454
- Activity 16.1

#### **C. Physical Optics**

1. Important Phenomena
  - pages 470-471
  - Activity 17.1
2. Electromagnetic Radiation
  - pages 476-477
3. Colour
  - pages 471-476
  - Activity 17.2

### **Fundamentals of Physics: A Senior Course**

#### **A. Applications**

1. Human Vision
  - Supplementation is required.
2. Other Applications
  - pages 534-535, 554-556

#### **B. Lenses**

- pages 428-435
- Investigation 11.3

#### **C. Physical Optics**

1. Important Phenomena
  - pages 514-551, 557-560
  - Investigations 14.1, 14.2, 14.3
2. Electromagnetic Radiation
  - pages 650-651
3. Colour
  - pages 531-533
  - Supplementation is required.

### **Heath Physics**

#### **A. Applications**

1. Human Vision
  - pages 501-505, 522-523
2. Other Applications
  - pages 500-501, 506-508, 526-529

#### **B. Lenses**

- pages 492-500
- Investigation 16.1

### C. Physical Optics

1. Important Phenomena
  - Supplementation is required.
2. Electromagnetic Radiation
  - pages 524-525
3. Colour
  - pages 518-521, 524
  - Investigations 17.1, 17.2

### ***Merrill Physics: Principles and Problems***

#### A. Applications

1. Human Vision
  - pages 384-386
2. Other Applications
  - pages 384, 400-402

#### B. Lenses

- pages 380-384

#### C. Physical Optics

1. Important Phenomena
  - pages 391-398
2. Electromagnetic Radiation
  - Supplementation is required.
3. Colour
  - Lab page 399
  - Supplementation is required.

### ***Merrill Physics: Principles and Problems Laboratory Manual***

#### A. Applications

2. Other Applications
  - Experiment 16.2

### ***Physics Today 1***

#### A. Applications

1. Human Vision
  - pages 452-455
2. Other Applications
  - These can be found throughout chapters 15-18. Chapter 18, **Magnifiers, Projectors, and Colour**, is particularly good for considering applications.

#### B. Lenses

- pages 436-457
- Activities 17.6, 18.7

#### C. Physical Optics

1. Important Phenomena
  - page 471
  - Activity 18.8
  - Supplementation from other resources might be required for this topic.
2. Electromagnetic Radiation
  - pages 237-240, 470, 670
3. Colour
  - pages 473-484
  - Activities 18.9, 18.10

### ***Physics in Action***

#### A. Applications

1. Human Vision
  - pages 290-295
2. Other Applications
  - pages 289

#### B. Lenses

- pages 274-290

#### C. Physical Optics

1. Important Phenomena
  - Supplementation is required.
2. Electromagnetic Radiation
  - Supplementation is required.
3. Colour
  - pages 200-222

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# Physics 30

## Core Unit I: Kinematics and Dynamics (30 hours)

### *Conceptual Physics*

#### A. Understanding Motion

- pages 10-11

#### B. Vector and Scalar Quantities

- pages 66-76

#### C. Distance and Displacement

- Supplementation is required.

#### D. Speed and Velocity

- pages 11-14

#### E. Acceleration

- pages 14-16

Topics A to E require further supplementation.

#### F. Newton's Laws of Motion

- pages 25-34, 37-41, 54-63

### *Conceptual Physics Laboratory Manual*

#### B. Vector and Scalar Quantities

- Activity 16
- Experiments 17,18

#### D. Speed and Velocity

- Activities 2,3

#### E. Acceleration

- Activities 5,6
- Experiment 4

#### F. Newton's Laws of Motion

- Activities 7, 8, 9, 13
- Experiments 10, 11, 12, 14, 15

### *Fundamentals of Physics: An Introductory Course*

#### A. Understanding Motion

- Activities 1.1, 1.4, 1.10

#### B. Vector and Scalar Quantities

- pages 2-3, 60-1, 101-3

#### C. Distance and Displacement

- pages 3-7

#### D. Speed and Velocity

- pages 7-21, 62-88
- Activities 1.2, 1.3

#### E. Acceleration

- pages 34-49, 68-69
- Activities 2.1, 2.3

#### F. Newton's Laws of Motion

- pages 114-134
- Activities 6.1, 6.2

### *Fundamentals of Physics: A Senior Course*

#### A. Understanding Motion

- pages 17-21, 42, 103-110, 187-190
- Investigation 1.1, 1.2

#### B. Vector and Scalar Quantities

- pages 88-103, 110-114

#### C. Distance and Displacement

- pages 43-45, 47-49

#### D. Speed and Velocity

- pages 45-46, 49-60
- Investigation 2.3

#### E. Acceleration

- pages 60-74
- Investigations 2.1, 2.2, 2.4

#### F. Newton's Laws of Motion

- pages 128-147
- Investigation 4.1

### *Heath Physics*

#### A. Understanding Motion

- pages 2, 61
- Investigation 1.1

#### B. Vector and Scalar Quantities

- pages 2-3, 64-65

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**C. Distance and Displacement**

- pages 3-5

**D. Speed and Velocity**

- pages 5-21, 66-72
- Investigations 1.2, 1.3

**E. Acceleration**

- pages 36-51
- Investigations 2.1, 2.2, 2.3, 4.5

**F. Newton's Laws of Motion**

- pages 102-105, 115-119, 128-148, 165
- Investigation 5.1, 6.1, 6.2

***Merrill Physics: Principles and Problems***

**A. Understanding Motion**

- pages 41-42

**B. Vector and Scalar Quantities**

- pages 51-52

**C. Distance and Displacement**

- pages 42-45

**D. Speed and Velocity**

- pages 46-49, 53-55, 56
- Lab page 50

**E. Acceleration**

- pages 63-69, 71-75
- Lab, page 70

**F. Newton's Laws of Motion**

- pages 87-97, 100-102, 109-125
- Lab page 98

***Merrill Physics: Principles and Problems  
Laboratory Manual***

**A. Understanding Motion**

- Experiment 3.1

**E. Acceleration**

- Experiments 4.1, 4.2
- Lab, page 70

**F. Newton's Laws of Motion**

- Experiments 5.1, 6.2

***Physics Today 1***

**A. Understanding Motion**

- pages 3-4, 14-5
- Activity 1.5

**B. Vector and Scalar Quantities**

- pages 5-12

**C. Distance and Displacement**

- pages 5-6

**D. Speed and Velocity**

- pages 22-35
- Activities 2.5, 2.6

**E. Acceleration**

- pages 46-63
- Activity 3.5

**F. Newton's Laws of Motion**

- pages 75-80, 110-24
- Activity 5.6

***Physics in Action***

**A. Understanding Motion**

- pages 2-7

**B. Vector and Scalar Quantities**

- Supplementation is required

**C. Distance and Displacement**

- Supplementation is required.

**D. Speed and Velocity**

- pages 9-16

**E. Acceleration**

- pages 22-36

**F. Newton's Laws of Motion**

- pages 50-52
- Supplementation is recommended.



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## Core Unit II: Mechanical Energy (10 hours)

### ***Conceptual Physics***

- A. Work
  - pages 101-102
- B. Power
  - pages 103-104
- C. Kinetic Energy
  - pages 106-116
- D. Gravitational Potential Energy
  - pages 104-105
  - Problem solving needs further supplementation.

### ***Conceptual Physics Laboratory Manual***

- A. Work
  - Activity 21
- B. Power
  - Activity 22
- C. Kinetic Energy
  - Activity 23
  - Experiments 24, 25, 26
- D. Gravitational Potential Energy
  - Experiment 28

### ***Fundamentals of Physics: An Introductory Course***

- A. Work
  - pages 148-52
- B. Power
  - pages 152-4, Activity 7.1
- C. Kinetic Energy
  - pages 161-4
- D. Gravitational Potential Energy
  - pages 158-61, Activity 7.4

### ***Fundamentals of Physics: A Senior Course***

- A. Work
  - pages 332-338
- B. Power
  - Supplementation is needed.
- C. Kinetic Energy
  - pages 339-347
  - Investigations 9.1, 9.2, 9.3, 9.4
- D. Gravitational Potential Energy
  - pages 372-380, 387-391
  - Investigations 10.1, 10.2

### ***Heath Physics***

- A. Work
  - pages 174-178, 180-184
- B. Power
  - pages 178-180
  - Investigation 7.1
- C. Kinetic Energy
  - pages 187-199
- D. Gravitational Potential Energy
  - pages 184-187, 203
  - Investigations 7.2, 7.3, 7.4

### ***Merrill Physics: Principles and Problems***

- A. Work
  - pages 197-202
- B. Power
  - pages 202-203
  - Lab page 204
- C. Kinetic Energy
  - pages 219-222
- D. Gravitational Potential Energy
  - pages 222-224, 227-233
  - Lab page 225

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### ***Physics Today 1***

#### **A. Work**

- pages 133-137

#### **B. Power**

- pages 153-155
- Activity 6.8

#### **C. Kinetic Energy**

- pages 144-146

#### **D. Gravitational Potential Energy**

- pages 141-144

### ***Physics in Action***

#### **A. Work**

- pages 62-69

#### **B. Power**

- pages 75-76

#### **C. Kinetic Energy**

- pages 72-75

#### **D. Gravitational Potential Energy**

- pages 70-71

### **Teacher's Notes:**

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## Core Unit III: Electricity (20 hours)

### **Conceptual Physics**

#### **A. Applications**

- Supplementation is required.

#### **B. Current and Potential Difference**

##### **1. Current**

- pages 521-523, 529-532

##### **2. Electric Potential Difference**

- pages 514-516, 523-525

##### **3. Ohm's Law**

- pages 525-528

#### **C. Electric Circuits**

##### **1. Kirchhoff's Laws**

- Supplementation is required.

##### **2. Series and Parallel Circuits**

- pages 537-547

#### **D. Electric Power and Energy**

- pages 532-533

### **Conceptual Physics Laboratory Manual**

#### **B. Current and Potential Difference**

##### **3. Ohm's Law**

- Experiments 88, 89, 90

#### **C. Electric Circuits**

##### **2. Series and Parallel Circuits**

- Activities 87, 91

#### **D. Electric Power and Energy**

- Activity 94

### **Fundamentals of Physics: An Introductory Course**

#### **A. Applications**

- pages 524-8, 557, 590-93, 596-600

#### **B. Current and Potential Difference**

##### **1. Current**

- pages 516-519

##### **2. Electric Potential Difference**

- pages 519-524

##### **3. Ohm's Law**

- pages 539-542

- Activity 20.1

#### **C. Electric Circuits**

##### **1. Kirchhoff's Laws**

- pages 536-539, 547-552

##### **2. Series and Parallel Circuits**

- pages 532-536, 543-547
- Activities 20.2, 20.3

#### **D. Electric Power and Energy**

- pages 552-556

### **Fundamentals of Physics: A Senior Course**

#### **A. Applications**

#### **B. Current and Potential Difference**

#### **C. Electric Circuits**

#### **D. Electric Power and Energy**

- Supplementation is required.

### **Heath Physics**

#### **A. Applications**

- pages 561, 576-580, 608-611

#### **B. Current and Potential Difference**

##### **1. Current**

- pages 568-571

##### **2. Electric Potential Difference**

- pages 571-576

##### **3. Ohm's Law**

- pages 593-595

- Investigation 20.1

#### **C. Electric Circuits**

##### **1. Kirchhoff's Laws**

- pages 590-593

##### **2. Series and Parallel Circuits**

- pages 586-590, 593-606

- Investigations 20.2, 20.3

#### **D. Electric Power and Energy**

- pages 606-608

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## ***Merrill Physics: Principles and Problems***

### **A. Applications**

- pages 460-462, 480-482, 486

### **B. Current and Potential Difference**

#### **1. Current**

- pages 447-448

#### **2. Electric Potential Difference**

- pages 431-435

#### **3. Ohm's Law**

- pages 451-454

### **C. Electric Circuits**

#### **1. Kirchhoff's Laws**

- pages 449-451, 454-455, 470-478, 482-485
- Labs on pages 456, 479

#### **2. Series and Parallel Circuits**

- Integrated with Kirchhoff's Laws section.

### **D. Electric Power and Energy**

- pages 457-459

## ***Merrill Physics: Principles and Problems Laboratory Manual***

### **B. Current and Potential Difference**

#### **3. Ohm's Law**

- Experiments 22.1, 22.2

### **C. Electric Circuits**

#### **2. Series and Parallel Circuits**

- Experiments 23.1, 23.2

## ***Physics Today 1***

### **A. Applications**

- These can be found interspersed throughout chapters 19-24. See also pages 525-531, 575-578.

### **B. Current and Potential Difference**

#### **1. Current**

- pages 531-533

#### **2. Electric Potential Difference**

- pages 533-535

#### **3. Ohm's Law**

- pages 560-562
- Activity 21.9

### **C. Electric Circuits**

#### **1. Kirchhoff's Laws**

- pages 538-544

#### **2. Series and Parallel Circuits**

- pages 535-538, 544-547, 564-571
- Activities 20.7, 20.8, 21.10, 21.11

### **D. Electric Power and Energy**

- pages 571-575

## ***Physics in Action***

### **A. Applications**

- pages 374-375

### **B. Current and Potential Difference**

#### **1. Current**

- pages 376-377

#### **2. Electric Potential Difference**

- pages 377

#### **3. Ohm's Law**

- pages 374-379

### **C. Electric Circuits**

#### **1. Kirchhoff's Laws**

- Supplementation is required.

#### **2. Series and Parallel Circuits**

- pages 368-373, 380-385

### **D. Electric Power and Energy**

- Supplementation is required.

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## Core Unit IV: Nuclear Physics (15 hours)

### ***Conceptual Physics***

- A. Natural Radioactivity
  - pages 600-603, 613-614
- B. Nuclear Fission
  - pages 618-621
- C. Nuclear Reactors
  - pages 621-624

### ***Conceptual Physics Laboratory Manual***

- A. Natural Radioactivity
  - Experiments 30.1, 31.1
- B. Nuclear Fission
  - Activity 98

### ***Fundamentals of Physics: An Introductory Course***

- A. Natural Radioactivity
  - pages 658-664
- B. Nuclear Fission
  - pages 722-727
- C. Nuclear Reactors
  - pages 728-737

### ***Fundamentals of Physics: A Senior Course***

- Supplementation is required for this Core Unit.

### ***Heath Physics***

- A. Natural Radioactivity
  - pages 752-755
- B. Nuclear Fission
  - pages 790-791
- C. Nuclear Reactors
  - pages 794-803

### ***Merrill Physics: Principles and Problems***

- A. Natural Radioactivity
  - pages 616-618
- B. Nuclear Fission
  - pages 645-647
- C. Nuclear Reactors
  - pages 647-649.
  - Supplementation is required.

### ***Physics Today 1***

- A. Natural Radioactivity
  - pages 667-675, 695-709
- B. Nuclear Fission
  - pages 716-733
- C. Nuclear Reactors
  - pages 720, 723-732

### ***Physics in Action***

- A. Natural Radioactivity
  - pages 418-431
- B. Nuclear Fission
  - Supplementation is required.
- C. Nuclear Reactors
  - pages 452-455

## Optional Unit V: Applications of Kinematics and Dynamics

### **Conceptual Physics**

#### **A. Momentum**

1. Impulse and Momentum
  - pages 86-92
2. Law of Conservation of Momentum
  - pages 93-98

#### **B. Frictional Forces**

- pages 42-43.
- Supplementation is required.

#### **C. Projectile Motion**

- pages 17-21, 46-50, 76-82

#### **D. Uniform Circular Motion**

- pages 119-128

#### **E. Universal Gravitation**

- pages 162-187

### **Conceptual Physics Laboratory Manual**

#### **A. Momentum**

1. Impulse and Momentum
  - Activities 19,30
  - Experiment 20

#### **B. Frictional Forces**

- Experiments 27,29

#### **D. Uniform Circular Motion**

- Activities 34, 36
- Experiment 35

#### **E. Universal Gravitation**

- Activity 32
- Experiments 31,33

### **Fundamentals of Physics: An Introductory Course**

#### **A. Momentum**

- Supplementation is required.

#### **B. Frictional Forces**

- pages 99-101
- Activity 5.2

#### **C. Projectile Motion**

- pages 74-79
- Activities 4.2, 4.3 (or 4.4), 4.5

#### **D. Uniform Circular Motion**

- Supplementation is required.

#### **E. Universal Gravitation**

- pages 91-98

### **Fundamentals of Physics: A Senior Course**

#### **A. Momentum**

##### **1. Impulse and Momentum**

- pages 290-297

##### **2. Law of Conservation of Momentum**

- pages 298-316
- Investigations 8.1, 8.2

#### **B. Frictional Forces**

- pages 162-166, 210-213

#### **C. Projectile Motion**

- pages 167-179, Investigation 5.1

#### **D. Uniform Circular Motion**

- pages 179-186, 272-275, Investigation 5.2

#### **E. Universal Gravitation**

- pages 276-285

### **Heath Physics**

#### **A. Momentum**

##### **1. Impulse and Momentum**

- pages 149-152

##### **2. Law of Conservation of Momentum**

- pages 152-158

#### **B. Frictional Forces**

- pages 113-114

#### **C. Projectile Motion**

- pages 84-91
- Investigations 4.1, 4.2, 4.3 (or 4.4)

#### **D. Uniform Circular Motion**

- pages 72-77

#### **E. Universal Gravitation**

- pages 103-110



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**Merrill Physics: Principles and Problems****A. Momentum**

1. Impulse and Momentum
  - pages 175-178
2. Law of Conservation of Momentum
  - pages 180-190
  - Lab page 182

- B. Frictional Forces**
- pages 96-97

- C. Projectile Motion**
- pages 132-139
  - Lab page 140

- D. Uniform Circular Motion**
- pages 142-146

- E. Universal Gravitation**
- pages 155-167
  - Lab page 158

**Merrill Physics: Principles and Problems  
Laboratory Manual****A. Momentum**

2. Law of Conservation of Momentum
  - Experiment 9.1, 9.2

- B. Frictional Forces**
- Experiment 5.2

- C. Projectile Motion**
- Experiments 7.1, 7.2

- D. Uniform Circular Motion**
- Experiment 8.1

**Physics Today 1****A. Momentum**

1. Impulse and Momentum
2. Law of Conservation of Momentum
  - Supplementation is required.

- B. Frictional Forces**
- pages 104-9
  - Supplementation is required.

- C. Projectile Motion**
- Use topic A and supplementary material. See also pages 89-94 and Activity 4.5.

- D. Uniform Circular Motion**
- Supplementation is required.

- E. Universal Gravitation**
- pages 80-89
  - Activity 4.5

**Physics in Action****A. Momentum**

1. Impulse and Momentum
2. Law of Conservation of Momentum
  - Supplementation is required for topics 1 and 2.

- B. Frictional Forces**
- pages 40-49
  - Supplementation is required.

- C. Projectile Motion**
- 
- D. Uniform Circular Motion**
- Supplementation is required for C and D.

- E. Universal Gravitation**
- pages 52-57

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## Optional Unit VI: Fluid Mechanics

### ***Conceptual Physics***

- A. Density
  - pages 253-254
- B. Pressure
  - pages 266-269, 285-289
- C. Pascal's Principle
  - pages 277-279,
- D. Archimedes' Principle
  - pages 271-276
- E. Bernoulli's Principle
  - pages 292-295

### ***Conceptual Physics Laboratory Manual***

- A. Density
  - Activities 41, 45
  - Experiment 42
- B. Pressure
  - Activities 47, 48
- D. Archimedes' Principle
  - Experiment 46

### ***Fundamentals of Physics: An Introductory Course***

- A. Density
  - pages 236-239
- B. Pressure
  - pages 239-246
  - Activity 9.1
- C. Pascal's Principle
  - pages 246-250
- D. Archimedes' Principle
  - pages 250-259
  - Activities 9.2, 9.3
- E. Bernoulli's Principle
  - pages 259-263

### ***Fundamentals of Physics: A Senior Course***

- Supplementation is required.

### ***Heath Physics***

- A. Density
  - pages 268-271
- B. Pressure
  - pages 271-278
  - Investigation 9.1
- C. Pascal's Principle
  - pages 278-282
- D. Archimedes' Principle
  - pages 282-291
  - Investigations 9.2, 9.3
- E. Bernoulli's Principle
  - pages 291-295

### ***Merrill Physics: Principles and Problems***

- A. Density
  - Supplementation is required.
- B. Pressure
  - pages 266-268
- C. Pascal's Principle
  - pages 268-269
- D. Archimedes' Principle
  - pages 269-272
  - Lab page 271
- E. Bernoulli's Principle
  - pages 272-274

### ***Merrill Physics: Principles and Problems Laboratory Manual***

- D. Archimedes' Principle
  - Experiment 13.1

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### ***Physics Today 1***

#### **A. Density**

- pages 165-168

#### **B. Pressure**

- pages 169-176

#### **C. Pascal's Principle**

- pages 176-180
- Activity 7.5

#### **D. Archimedes' Principle**

- pages 186-194
- Activities 8.4, 8.5

#### **E. Bernoulli's Principle**

- pages 202-209
- Activity 9.4

### ***Physics in Action***

#### **A. Density**

- pages 122-128

Topics B - E require supplementation.

### **Teacher's Notes:**

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## Optional Unit VII: Electromagnetism

### ***Conceptual Physics***

- A. Magnetism
  - pages 507-512, 550-556
- B. Electromagnetism
  - pages 556-559
- C. The Motor Principle
  - pages 559-563
- D. Electromagnetic Induction
  - pages 566-613

### ***Conceptual Physics Laboratory Manual***

- A. Magnetism
  - Activities 92, 93

### ***Fundamentals of Physics: An Introductory Course***

- A. Magnetism
  - pages 568-577, 581
- B. Electromagnetism
  - pages 582-589
  - Activities 22.1, 22.2
- C. The Motor Principle
  - pages 593-595
  - Activities 22.3, 22.4
- D. Electromagnetic Induction
  - pages 614-636
  - Activities 23.1, 23.2, 23.3

### ***Fundamentals of Physics: A Senior Course***

- A. Magnetism
  - pages 618-622
- B. Electromagnetism
  - pages 623-629
- C. The Motor Principle
  - pages 629-632
  - Investigation 16.1

- D. Electromagnetic Induction
  - Supplementation is required.

### ***Heath Physics***

- A. Magnetism
  - pages 624-632
  - Investigation 21.1
- B. Electromagnetism
  - pages 640-650, 665
  - Investigations 22.1, 22.2
- C. The Motor Principle
  - pages 651-658
  - Investigations 22.3, 22.4
- D. Electromagnetic Induction
  - pages 674-695
  - Investigations 23.1, 23.2, 23.3 (demonstration)

### ***Merrill Physics: Principles and Problems***

- A. Magnetism
  - pages 491-495
- B. Electromagnetism
  - pages 496-500
- C. The Motor Principle
  - pages 502-508
  - Lab page 501
- D. Electromagnetic Induction
  - pages 515-521, 523-529
  - Lab page 522

### ***Merrill Physics: Principles and Problems Laboratory Manual***

- A. Magnetism
  - Experiment 24.1
- B. Electromagnetism
  - Experiments 24.2, 24.3
- D. Electromagnetic Induction
  - Experiments 25.1, 25.2
  - Lab page 522

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### ***Physics Today 1***

#### **A. Magnetism**

- pages 589-595

#### **B. Electromagnetism**

- pages 596-607
- Activities 22.8, 22.9, 22.10

#### **C. The Motor Principle**

- pages 618-630
- Activity 23.7

#### **D. Electromagnetic Induction**

- pages 630-636
- Activities 23.8, 23.9

### ***Physics in Action***

#### **A. Magnetism**

#### **B. Electromagnetism**

- Supplementation is required.

#### **C. The Motor Principle**

- pages 388-393

#### **D. Electromagnetic Induction**

- pages 394-399

### **Teacher's Notes:**

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## Optional Unit VIII: Modern Physics

### ***Conceptual Physics***

- A. Atomic Theory
  - pages 597-598, 600-601
- B. Half Life and Radioactive Decay
  - pages 603-612
- C. Nuclear Fusion
  - Supplementation is required.
- D. Applications
  - Supplementation is required.
- E. Contemporary Physics
  - Chapter 38.

### ***Conceptual Physics Laboratory Manual***

- A. Atomic Theory
  - Activity 95
- B. Half Life and Radioactive Decay
  - Activities 96, 97
- C. Nuclear Fusion
  - Activity 98.

### ***Fundamentals of Physics: An Introductory Course***

- A. Atomic Theory
  - pages 672-684, 688-692
- B. Half Life and Radioactive Decay
  - pages 692-694
- C. Nuclear Fusion
  - pages 738-740
- D. Applications
  - pages 695-715, 728-737
- E. Contemporary Physics
  - Chapters 24, 25, 26 offer many possibilities.

### ***Fundamentals of Physics: A Senior Course***

- A. Atomic Theory
  - This is dispersed throughout Chapters 15 to 20. Refer to the Key Concepts in the Curriculum Guide.
- B. Half Life and Radioactive Decay
  - Supplementation is required.
- C. Nuclear Fusion
  - Supplementation is required.
- D. Applications
  - pages 780-796
- E. Contemporary Physics
  - A wide selection of possibilities is found throughout Chapters 15, 17, 18, 19 and 20.

### ***Heath Physics***

- A. Atomic Theory
  - Supplementation is required.
- B. Half Life and Radioactive Decay
  - pages 756-779, 788-789
- C. Nuclear Fusion
  - pages 804-806
- D. Applications
  - pages 768-769, 773-779, 811
- E. Contemporary Physics
  - pages 770-771



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**Merrill Physics: Principles and Problems**

- A. Atomic Theory
  - pages 616-618
- B. Half Life and Radioactive Decay
  - pages 618-622, 640-642
  - Lab page 623
- C. Nuclear Fusion
  - pages 649-652
- D. Applications
  - pages 625-628, 643-644
- E. Contemporary Physics
  - Select material from Chapters 27, 28, 29, or 30.

**Merrill Physics: Principles and Problems  
Laboratory Manual**

- A. Atomic Theory
  - Experiments 26.1, 27.1
- D. Applications
  - Experiments 27.2, 28.1, 29.1

**Physics Today 1**

- A. Atomic Theory
  - pages 675-679
- B. Half Life and Radioactive Decay
  - pages 679-682, 690-695
- C. Nuclear Fusion
  - pages 733-739
- D. Applications
  - Many applications are presented throughout chapters 25-27.
- E. Contemporary Physics
  - Chapter 25 offers a few possibilities for this section.

**Physics in Action**

- A. Atomic Theory
  - pages 429-431
- B. Half Life and Radioactive Decay
  - pages 446-449
- C. Nuclear Fusion
  - page 456
- D. Applications
  - pages 434-443

**Teacher's Notes:**