Physics, 3rd Edition

Lesson Plan Overview

| Day(s) | Topic | Pages | Support Materials | Bible Integration\*\* |
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| Unit 1: A Framework | | | | |
| Chapter 1: Foundations of Physics | | | | |
| 1 | 1A Why Study Physics? | 1–5 | See *Physics* Support Materials CD | Kick off the year by helping students answer the question, “Why should a Christian study Physics?” The answer should involve helping people and glorifying God by fulfilling the Creation Mandate.  Discuss how the Bible’s story–Creation, Fall, and Redemption–play out in Physics. |
| 2–3 | 1B What Is Physics? | 5–15 | Encourage each student to follow God’s will for their life when choosing a career.  Dispel students’ misconceptions about what science is, does, and how it should be used.  Emphasize that the goal of science is model-making, not establishing truth. God’s Word does that.  Encapsulate a Christian worldview for your students in Creation, Fall, and Redemption.  Be sure to discuss Thomas Kuhn and how his philosophy of science dovetails into a discussion of worldview. |
| 4 | 1C How Do Physicists Work? | 16–21 | Expose students to the joy and glory of doing science. They are no more human and God-like than when they are exercising dominion over God’s world.  Point out dominion science and modeling as a recurring feature in this textbook. |
| 5 | Chapter 1 Test\* | | | |
| Chapter 2: Measurement | | | | |
| 6 | 2A Dimensions of Physics | 22–30 | See *Physics* Support Materials CD | Begin the chapter by discussing the dominion modeling about the challenges of measuring the speed of light. |
| 7 | 2B Principles of Measurement | 31–35 | Discuss why accuracy in measurements should be important to a Christian.  Tie in the opening dominion modeling here by discussing how Ole Rømer measured the speed of light. Students will manipulate data from Table 2-3 in review questions. |
| 8–9 | 2C Truth in Measurements and Calculations | 36–41 |  |
| 10 | 2D Problem Solving | 41–45 | Put the problem-solving exercises in this book in context by motivating students to consider science as solving problems to help people. |
| 11 | Lab 2: Measurement | | | |
| 12 | Chapter 2 Test\* | | | |
| Unit 2: Classical Mechanics | | | | |
| Chapter 3: Motion in One Dimension | | | | |
| 13–14 | 3A Describing Motion | 46–60 | See *Physics* Support Materials CD | Open the chapter by discussing the dominion modeling about modeling the stopping distance of cars. |
| 15 | Lab 3-1: The Recording Timer | | | |
| 16–17 | 3B Equations of Motion | 61–71 |  | Tie in the opening dominion modeling here by discussing how to model braking distance. Students will manipulate data from Table 3-1 in review questions. |
| 18 | Lab 3-2: Displacement, Velocity, and Acceleration | | | |
| 19 | Chapter 3 Test\* | | | |
| Chapter 4: Vectors and Scalars | | | | |
| 20 | 4A Properties of Vectors and Scalars | 72–76 | See *Physics* Support Materials CD | Kick off the chapter by discussing the dominion science problem about how meteorologists need to accurately model hurricanes. |
| 21 | 4B Operations with Vectors: Geometric Techniques | 76–79 |  |
| 22 | Lab 4: Vectors | | | |
| 23–24 | 4C Operations with Vectors: Mathematical Techniques | 79–91 |  | Tie in the opening dominion science problem here by discussing how meteorologists use vectors to model hurricanes. This helps us save people’s lives. |
| 25 | Chapter 4 Test\* | | | |
| Chapter 5: Motion in a Plane | | | | |
| 26 | 5A Kinematics of Two-Dimensional Motion | 92–97 | See *Physics* Support Materials CD | Begin the chapter by discussing the dominion science problem about the need for humanitarian aid in inaccessible locations.  When discussing frames of reference, ask students, “What is a Christian’s frame of reference for life? How is this significant?” |
| 27–28 | 5B Projections | 97–111 | Tie in the opening dominion science problem here by discussing airdrops and how they involve projectile motion. |
| 29 | Lab 5: Horizontal Projection | | | |
| 30 | Chapter 5 Test\* | | | |
| Chapter 6: Dynamics | | | | |
| 31 | 6A The History of Dynamics | 112–116 | See *Physics* Support Materials CD | Open the chapter by discussing the dominion science problem about how aircraft carriers operate and are used to maintain peace. |
| 32 | 6B Forces | 116–123 |  |
| 33 | Lab 6: Balanced and Unbalanced Forces | | | |
| 34 | 6C Newton’s Laws of Motion | 123–135 |  | Tie in the opening dominion science problem here by discussing aircraft catapults and arresting wires on aircraft carriers. |
| 35 | Chapter 6 Test\* | | | |
| Chapter 7: Circular Motion | | | | |
| 36 | 7A Circular Motion | 136–145 | See *Physics* Support Materials CD | Kick off the chapter by discussing the dominion modeling about exploring Saturn’s moons. Be sure to expose students to the driving force behind space exploration in an evolutionary science environment. |
| 37 | 7B Dynamics of Circular Motion | 146–150 |  |
| 38 | Lab 7: Circular Motion | | | |
| 39–40 | 7C Universal Gravitation | 151–163 |  | Have students evaluate the philosophical implications of the Copernican Revolution.  Tie in the opening dominion modeling here by discussing some of the properties of Saturn’s moons. Students will manipulate data from Table 7-2 in review questions. Point out how this investigation is part of exercising dominion. |
| 41 | Chapter 7 Test\* | | | |
| Chapter 8: Applying Newton’s Laws | | | | |
| 42 | 8A Simplifying Problems | 164–167 | See *Physics* Support Materials CD | Begin the chapter by discussing the dominion science problem about deaths and injuries due to head-on collisions. |
| 43 | 8B Transmitting Mechanical Forces | 168–175 |  |
| 44 | 8C Friction | 176–180 |  |
| 45 | 8D More Applications | 181–193 | Tie in the opening dominion science problem here by discussing the ubiquitous and life-saving invention of Jersey barriers. |
| 46 | Lab 8: Transmitted Forces | | | |
| 47 | Chapter 8 Test\* | | | |
| Chapter 9: Work and Energy | | | | |
| 48 | 9A Work | 194–201 | See *Physics* Support Materials CD | Open the chapter by discussing the dominion science problem about the need to explore renewable energy resources. |
| 49–50 | 9B Energy | 202–210 |  |
| 51 | 9C Total Mechanical Energy | 211–217 | Tie in the opening dominion science problem here by discussing hydropower and its benefits and challenges. |
| 52 | Lab 9: Conservation of Energy—Spring Constant | | | |
| 53 | Chapter 9 Test\* | | | |
| Chapter 10: Conservation of Energy | | | | |
| 54 | 10A Total Mechanical Energy | 218–225 | See *Physics* Support Materials CD | Kick off the chapter by discussing the dominion science problem about developing safe elevators. |
| 55 | 10B Simple Machines | 226–237 | Link the use of machines to the ability to better exercise dominion for your students.  Tie in the opening dominion science problem here by discussing elevator safety mechanisms. |
| 56 | Lab 10: Mechanical Advantage—Efficiency | | | |
| 57 | Chapter 10 Test\* | | | |
| Chapter 11: Momentum | | | | |
| 58–59 | 11A Principles of Momentum | 238–245 | See *Physics* Support Materials CD | Begin the chapter by discussing the dominion science problem about car accident injuries and fatalities. |
| 60–61 | 11B Collisions | 246–256 | Tie in the opening dominion science problem here by discussing the technology behind crash-test dummies. |
| 62 | 11C Center of Mass and Angular Momentum | 257–263 |  |
| 63 | Lab 11: Conservation of Momentum | | | |
| 64 | Chapter 11 Test\* | | | |
| Chapter 12: Periodic Motion | | | | |
| 65 | 12A Simple Harmonic Motion | 264–269 | See *Physics* Support Materials CD | Open the chapter by discussing the dominion modeling about mach speed. |
| 66 | 12B Periodic Motion and the Pendulum | 270–276 | Help students discern the difference between managing God’s creation through divination versus dominion. |
| 67 | Lab 12-1: Period of a Pendulum | | | |
| 68 | 12C Oscillations in the Real World | 277–280 |  |  |
| 69 | 12D Waves | 280–291 |  | Tie in the opening dominion modeling here by discussing how scientists and pilots model mach speed. Students will manipulate data from Table 12-3 in review questions. Highlight efforts to suppress sonic booms in populated areas. |
| 70 | Lab 12-2: Speed of Sound in Air | | | |
| 71 | Chapter 12 Test\* | | | |
| Unit 3: Thermodynamics and Matter | | | | |
| Chapter 13: Properties of Matter | | | | |
| 72 | 13A Theories of Matter | 292–298 | See *Physics* Support Materials CD | Kick off the chapter by discussing the dominion science problem about replacing asbestos because of its health risks. |
| 73 | Lab 13: Length of a Molecule | | | |
| 74–75 | 13B States of Matter | 299–311 |  | Tie in the opening dominion science problem here by discussing fiberglass insulation that replaces asbestos. |
| 76 | Chapter 13 Test\* | | | |
| Chapter 14: Expansion and Temperature | | | | |
| 77 | 14A Thermal Properties | 312–318 | See *Physics* Support Materials CD | Begin the chapter by discussing the dominion science problem about preemies who are born with major respiratory problems. |
| 78 | Lab 14-1: Coefficient of Thermal Expansion | | | |
| 79 | 14B Measuring Temperature | 319–323 |  |  |
| 80–81 | 14C Gas Laws | 324–337 |  | Tie in the opening dominion science problem here by discussing Forrest Bird’s inventions of ventilators for both infants and adults. |
| 82 | Lab 14-2:Charles’s Law | | | |
| 83 | Lab 14-3: Boyle’s Law | | | |
| 84 | Chapter 14 Test\* | | | |
| Chapter 15: Thermal Energy and Heat | | | | |
| 85 | 15A Theories of Heat | 338–342 | See *Physics* Support Materials CD | Open the chapter by discussing the dominion modeling about why different metals are used for different purposes. |
| 86–87 | 15B Thermal Energy and Matter | 342–351 | Tie in the opening dominion modeling here by discussing the specific heats of different metals. This helps people use the best metal for a purpose. Students will manipulate data from Table 15-2 in review questions. |
| 88 | Lab 15: Latent Heat of Fusion | | | |
| 89 | 15C Mechanisms for Heat Transfer | 352–357 |  |  |
| 90 | Chapter 15 Test\* | | | |
| Chapter 16: Thermodynamic Laws | | | | |
| 91–92 | 16A The Zeroth and First Laws | 358–366 | See *Physics* Support Materials CD | Kick off the chapter by discussing the dominion science problem about how uncomfortable summer heat is! |
| 93–94 | 16B The Second and Third Laws | 358–374 | Tie in the opening dominion science problem here by discussing the invention of the air conditioner and how it has transformed society. |
| 95 | 16C: Entropy and Its Consequences | 374–381 | Trigger student thought by linking entropy with biblical concepts like the current degradation of nature and the future of the universe. |
| 96 | Chapter 16 Test\* | | | |
| Chapter 17: Fluid Mechanics | | | | |
| 97–98 | 17A Hydrostatics: Fluids at Rest | 382–395 | See *Physics* Support Materials CD | Begin the chapter by discussing the dominion science problem about the need for localized energy sources. |
| 99 | Lab 17: Buoyancy | | | |
| 100–101 | 17B: Hydrodynamics: Fluids in Motion | 396–409 |  | Tie in the opening dominion science problem here by discussing wind turbines and wind farms for energy generation. Highlight the opportunities and challenges in this effort of dominion. |
| 102 | Chapter 17 Test\* | | | |
| Unit 4: Electromagnetics | | | | |
| Chapter 18: Electric Charge | | | | |
| 103 | 18A Electrification | 410–418 | See *Physics* Support Materials CD | Open the chapter by discussing the dominion modeling about the challenges of figuring out the charge of a single electron.  Tie in the opening dominion modeling here by discussing Millikan’s oil drop experiment. Students will manipulate data from Millikan’s original paper compiled in Table 18-1 in review questions. |
| 104 | 18B Detecting Electric Charge | 419–427 | Highlight Faraday as an example of a Christian scientist. |
| 105 | Lab 18: Electrostatic Charges | | | |
| 106 | Chapter 18 Test\* | | | |
| Chapter 19: Electric Fields | | | | |
| 107 | 19A Modeling the Electric Field | 428–435 | See *Physics* Support Materials CD | Kick off the chapter by discussing the dominion science problem about seeing really small defects in things like computer chips engineered on the atomic level.  Tie in the opening dominion science problem here by discussing the technology behind scanning tunneling electron microscopes. |
| 108–109 | 19B Capacitors | 436–445 |  |
| 110 | Chapter 19 Test\* | | | |
| Chapter 20: Electrodynamics | | | | |
| 111 | 20A Current, Voltage, and Resistance | 446–453 | See *Physics* Support Materials CD | Begin the chapter by discussing the dominion science problem about the challenges in establishing transcontinental telephone service. |
| 112 | Lab 20-1: Batteries, Circuits, and Resistors | | | |
| 113 | 20B Electrical Circuits | 454–462 |  |  |
| 114 | Lab 20-2: Series Circuits, and  Lab 20-3: Parallel Circuits, if applicable | | | |
| 115 | 20C Semiconductors and Transistors | 463–473 |  | Tie in the opening dominion science problem here by discussing the historical development of the integrated circuit. Go further in stimulating student thought by asking the question, “Can non-believing scientists like the ones who invented the IC help exercise dominion?” |
| 116 | Chapter 20 Test\* | | | |
| Chapter 21: Magnetism | | | | |
| 117 | 21A Describing Magnetism | 474–481 | See *Physics* Support Materials CD | Open the chapter by discussing the dominion modeling about understanding the mass-to-charge ratio of an electron.  Inspire your students to see how God protects His creation with the magnetosphere. |
| 118 | Lab 21: Mapping a Magnetic Field | | | |
| 119 | 21B Electromagnetism and Charges | 482–490 |  | Tie in the opening dominion modeling here by discussing Thomson’s experiment using the cathode ray tube. Students will manipulate data from Thomson’s original paper compiled in Table 21-2 in review questions. |
| 120 | 21C Electromagnetism and Conductors | 491–497 |  |  |
| 121 | Chapter 21 Test\* | | | |
| Chapter 22: Electromagnetism | | | | |
| 122 | 22A Currents and Magnetic Fields | 498–505 | See *Physics* Support Materials CD | Kick off the chapter by discussing the dominion science problem about the challenges in providing electricity for the US population. |
| 123 | 22B Alternating Current | 506–512 | Tie in the opening dominion science problem here by discussing the current AC power distribution system in the United States. |
| 124 | Lab 22-1: Electrical Work | | | |
| 125 | 22C AC Circuit Characteristics | 513–521 |  | Highlight Maxwell as a Christian who used his scientific capabilities to influence his field for God’s glory. |
| 126 | Lab 22-2: Capacitors, Diodes, and Transistors | | | |
| 127 | Chapter 22 Test\* | | | |
| Unit 5: Geometric Optics and Light | | | | |
| Chapter 23:Light and Reflection | | | | |
| 128 | 23A Light and the Electromagnetic Spectrum | 522–528 | See *Physics* Support Materials CD | Begin the chapter by discussing the dominion modeling about understanding planetary albedo. |
| 129 | 23B Sources and Propagation of Light | 529–534 |  |
| 130–131 | 23C Reflection and Mirrors | 535–549 | Tie in the opening dominion modeling here by discussing how scientists measure and interpret albedos of astronomical bodies. Students will manipulate data from Table 23-1 in review questions. Pull in a discussion of albedo and current concerns about global warming. |
| 132 | Lab 23-1:Plane Mirror Reflections | | | |
| 133 | Lab 23-2: Curved Mirror Reflections | | | |
| 134 | Chapter 23 Test\* | | | |
| Chapter 24: Refraction | | | | |
| 135–136 | 24A Theory of Refraction | 550–559 | See *Physics* Support Materials CD | Open the chapter by discussing the dominion modeling about the refraction of different types of glasses. Different glasses can be used in different ways.  Highlight how God used light dispersion in a rainbow as a symbol of God’s promise to Noah.  Tie in the opening dominion modeling here by discussing different glasses and their refraction data. Students will manipulate data from Table 24-3 in review questions. Pull in a discussion on recycling glass as an issue of stewardship. |
| 137 | Lab 24-1: Refraction | | | |
| 138 | 24B Application of Refraction—Lenses | 559–571 |  |  |
| 139 | Lab 24-2: Focal Length of a Thin Lens | | | |
| 140 | Chapter 24 Test\* | | | |
| Chapter 25: Wave Optics | | | | |
| 141 | 25A Wave Interference | 572–583 | See *Physics* Support Materials CD | Kick off the chapter by discussing the dominion science problem about counterfeiting, especially counterfeited medications. |
| 142 | 25B Diffraction | 584–588 | Tie in the opening dominion science problem here by discussing holograms that reduce counterfeiting of medications. |
| 143 | Lab 25: Reflected Diffraction | | | |
| 144 | 25C Polarization of Light | 589–595 |  |  |
| 145 | Chapter 25 Test\* | | | |
| Chapter 26: Using Light | | | | |
| 146–147 | 26A Intensity and Color | 596–605 | See *Physics* Support Materials CD | Begin the chapter by discussing the dominion science problem about archiving pictures for posterity. |
| 148 | Lab 26: Illuminance and Luminous Flux | | | |
| 149 | 26B Optical Instruments | 606–615 |  | Tie in the opening dominion science problem here by discussing CCDs used in digital cameras. |
| 150 | Chapter 26 Test\* | | | |
| Unit 6: Modern Physics | | | | |
| Chapter 27: Relativity | | | | |
| 151 | 27A: Galilean Relativity | 616–624 | See *Physics* Support Materials CD | Open the chapter by discussing the dominion science problem about increasing the accuracy of GPS. |
| 152–153 | 27B: Special Relativity | 625–633 |  |
| 154 | 27C: General Relativity | 634–639 | Tie in the opening dominion science problem here by discussing how GPS receivers use relativity to correct position measurements. |
| 155 | Chapter 27 Test\* | | | |
| Chapter 28: Quantum Physics | | | | |
| 156 | 28A: Quantum Theory | 640–645 | See *Physics* Support Materials CD | Kick off the chapter by discussing the dominion science problem about securing sensitive information. |
| 157 | 28B: Quantum Mechanics and the Atom | 646–651 |  |
| 158 | 28C: Modern Atomic Models | 652–661 | Tie in the opening dominion science problem here by discussing quantum cryptography. Use this to open up a discussion on how dominion sometimes involves fighting against the fallen nature of man. |
| 159 | Chapter 28 Test\* | | | |
| Chapter 29: Nuclear Physics | | | | |
| 160 | 29A Radiation and Radioactivity | 662–670 | See *Physics* Support Materials CD | Begin the chapter by discussing the dominion modeling about finding out the ages of historical finds like the Dead Sea Scrolls. |
| 161 | 29B Radioactive Decay | 671–677 |  | Expose your students to the presuppositions and assumptions behind radioactive dating and geochronology.  Tie in the opening dominion modeling here by discussing the assumptions and uses of radiocarbon dating. Students will manipulate data from Table 29-3 in review questions. |
| 162 | Lab 29-1: Radioactive Decay Simulation | | | |
| 163 | 29C Nuclear Reactions | 678–683 |  | Open up a discussion on the potential opportunities and challenges to fusion energy. |
| 164 | 29D Subatomic Particles | 684–692 |  |  |
| 165 | Lab 29-2: Elementary Nuclear Particles | | | |
| 166 | Chapter 29 Test\* | | | |