Physical Science 6th Edition
Lesson Plan Overview

LEGEND	SE = Student Edition	TE = Teacher Edition	SLM = Student Lab Manual	TLM = Teacher Lab Manual

Section	SE Pages	TE Pages	Teacher Resources	Essential Questions/Content Objectives
UNIT 1: THE STRUCTURE OF MATTER				
CHAPTER 1: MODELING OUR ORDERLY WORLD (10 DAYS) **FOUNDATIONAL CHAPTER**				
1A Order in Our World	4–11	4–11	Career: Serving as a Forensic Scientist	**EQ:** What is the source of order in nature? **Objectives:** 1A1 Define *physical science*. 1A2 List evidences of order in nature. 1A3 Explain why the world is orderly. 1A4 Explain the role of science in dominion.
Ethics Day	9–10	9–10	Ethics: Christian Ethics	1A5 Outline a biblical framework for science and ethics.
1B Modeling Our World	11–14	10–14		**EQ:** How do scientists do science? **Objectives:** 1B1 Define *model*. 1B2 List different models used in physical science. 1B3 Explain the relationship between hypotheses, theories, and laws. 1B4 Outline the process used to do scientific inquiry. 1B5 Explain why we approach science in an orderly fashion.
Lab Day 1	SLM 1–7	TLM 1–7	Lab 1A: *Based on a True Story*—Thinking Safe in the Laboratory	**EQ:** How can we safely investigate in the laboratory?
1C Using Mathematics for Scientific Inquiry	14–20	14–21	How It Works: Balances and Scales Mini Lab: *Understanding Conversion Factors*	**EQ:** How is math used in scientific inquiry? **Objectives:** 1C1 Compare the US customary and SI systems of measurement. 1C2 Explain the benefits of the SI. 1C3 Use scientific instruments to collect data. 1C4 Use mathematical tools to analyze data. 1C5 Compare accuracy and precision. 1C6 Explain how scientists identify the precision of measurements. 1C7 Convert between SI units.
Lab Day 2	SLM 9–14	TLM 9–14	Lab 1B: *How Do We Measure Up?*—Practicing Measuring	**EQ:** How can we get the most accurate and precise measurements?

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Lab Day 3	SLM 15–20	TLM 15–20	Lab 1C: *Visual Data*—Graphing Mass and Volume	**EQ:** How much different information can I find on a graph?
Ethics Day	23	23–23a	Ethics: Reporting Scientific Data	1C8 Explain why it is important for scientists to accurately report data.
Review and Test Days			Chapter 1 Test	
CHAPTER 2: MATTER (8 DAYS) FOUNDATIONAL CHAPTER				
2A Understanding Matter	26–31	26–31	Demonstrations: Matter, Diffusion, Density Mini Lab: *Measuring Volume*	**EQ:** Why is matter so important? **Objectives:** 2A1 Define *matter*. 2A2 Evaluate how well models of matter represent physical matter. 2A3 Calculate mass, volume, and density using the formula for density. 2A4 Explain the difference between mass and weight.
Lab Day 1	SLM 21–25	TLM 21–25	Lab 2A: *Has Mass, Occupies Space*—Modeling Matter	**EQ:** How are physical models created?
2B Classifying Matter	32–34	32–34	Demonstration: Types of Matter	**EQ:** How do scientists classify matter? **Objectives:** 2B1 Compare mixtures and pure substances. 2B2 Classify pure substances as elements or compounds. 2B3 Classify substances as pure substances or mixtures.
2C States of Matter	35–38	35–38	Case Study: How Many States of Matter? Demonstration: Particles in Action Career: Serving as a Materials Scientist	**EQ:** How can particles in a solid be moving? **Objectives:** 2C1 Identify the characteristics of different states of matter. 2C2 Classify different substances as solids, liquids, gases, or plasmas. 2C3 Compare the three common states of matter using the particle model of matter. 2C4 Explain how the particles in a solid can be moving according to the particle model of matter.
2D Changes in Matter	39–44	39–44	Worldview Sleuthing: Bulletproof! Demonstration: Chemical and Physical Changes	**EQ:** How does matter change? **Objectives:** 2D1 Define *physical property* and *chemical property*. 2D2 Classify changes in matter as physical or chemical. 2D3 Summarize the law of conservation of matter. 2D4 Identify changes of state. 2D5 Relate changes of state to the flow of energy.

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Lab Day 2	SLM 27–31	TLM 27–31	Lab 2B: *Something Old, Something New?*—Detecting Physical and Chemical Changes	**EQ:** How can I know whether a new substance forms when I mix two chemicals?
Review and Test Days			Chapter 2 Test	
CHAPTER 3: THE ATOM (9 DAYS) **FOUNDATIONAL CHAPTER**				
Lab Day 1	SLM 33–36	TLM 33–36	Lab 3A: *The Fiery Trial*—Using Flame Tests	**EQ:** Why do burning mineral salts produce different colors of light?
3A The Atomic Model	50–55	50–55	Case Study: A World of Models Demonstrations: Electrostatic Charges, Cathode Rays, The Gold Foil Experiment	**EQ:** How have people thought about matter? **Objectives:** 3A1 Identify the key scientist(s) associated with each atomic model. 3A2 Summarize the key discoveries that shaped atomic theory. 3A3 Justify the continued use of the Bohr model of the atom. 3A4 Summarize our current atomic model. 3A5 Explain how workability acted as the driving force in the development of atomic models.
Lab Days 2–4	SLM 37–39	TLM 37–39b	Lab 3B: *Big Time*—Inquiring into Scale Models of Atoms	**EQ:** What would the dimensions of an atom look like if the atom were enlarged to a size that we could easily see?
3B Atomic Structure	56–62, 65	56–62, 65	Case Study: All Models Are Not Equal (p. 65) Mini Lab: *Finding the Atomic Mass of Eggogen* (p. 63)	**EQ:** What is it like inside an atom? **Objectives:** 3B1 Describe protons, neutrons, and electrons, including their masses, charge, and location. 3B2 Relate the concept of isotopes to variations within the nucleus. 3B3 Determine the number of protons, neutrons, and electrons in an atom using isotope notation. 3B4 Calculate atomic number, mass number, and charge given the number of protons, neutrons, and electrons in an atom. 3B5 Explain how an ion forms. 3B6 Predict the relative abundance of an isotope on the basis of its average atomic mass.
Ethics Day	66–67	66–67	Ethics: Strategies and Protecting People from Radiation	3B7 Explain how we can protect people from exposure to radiation.
Review and Test Days			Chapter 3 Test	

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CHAPTER 4: THE PERIODIC TABLE (7 DAYS) **FOUNDATIONAL CHAPTER**				
4A Organizing the Elements	70–79	70–79	Mini Lab: *Organizing Elements*	**EQ:** How does the periodic table relate to elements in the real world? **Objectives:** 4A1 Identify the contributions of the key scientists associated with the development of the periodic table. 4A2 Explain how workability acted as the driving force in the development of the periodic table. 4A3 Evaluate the predictive power of the periodic table. 4A4 Identify periods, groups, and families on the periodic table. 4A5 Relate the arrangement of the periodic table to our understanding of atomic structure.
Lab Day 1	SLM 41–44	TLM 41–44	Lab 4A: *Bricks and Feathers*—Exploring Element Density in a Period	**EQ:** Are the densities of elements in a row of the periodic table predictable?
4B Classifying the Elements	80–85	80–85	Worldview Sleuthing: Giving Due Credit Demonstration: Sodium's Properties	**EQ:** How is the periodic table useful? **Objectives:** 4B1 Classify elements as metals, nonmetals, and metalloids using a periodic table. 4B2 Compare the properties of metals, nonmetals, and metalloids. 4B3 Identify the families of elements in the periodic table. 4B4 Determine the number of valence electrons in an element according to its family.
Lab Day 2	SLM 45–49	TLM 45–50	Lab 4B: *How Wide Is an Atom?*—Exploring Atomic Radii Trends	**EQ:** Do atomic radii follow a periodic trend?
4C Periodic Trends	86–90, 93	86–90, 93a	Case Study: Allotropes (p. 93)	**EQ:** What can an element's position on the periodic table tell us about the element? **Objectives:** 4C1 Write the electron dot notation for an element. 4C2 Explain why atomic radius changes as it does. 4C3 Arrange elements on the basis of atomic radius. 4C4 Explain the periodic trend in electronegativity. 4C5 Arrange elements on the basis of electronegativity.
Review and Test Days			Chapter 4 Test	

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CHAPTER 5: BONDING AND COMPOUNDS (8 DAYS) **FOUNDATIONAL CHAPTER**				
5A Principles of Bonding	96–98	96–98	Demonstration: Hydrogen	**EQ:** How do compounds form? **Objectives:** 5A1 Define *chemical bond*. 5A2 Compare elements and compounds. 5A3 Explain how a molecule can be an element or a compound. 5A4 Explain how the octet rule guides chemical bonding. 5A5 Show how the properties of compounds can differ from the elements of which they are made.
5B Types of Bonds	99–105	99–105	Demonstration: Properties of Ionic and Metallic Substances Mini Lab: *Modeling Bonds in Three Dimensions* (pp. 106–7)	**EQ:** Why do atoms bond in different ways? **Objectives:** 5B1 Compare the role of electrons in ionic, covalent, and metallic bonding. 5B2 Interpret the Lewis structures for simple compounds. 5B3 Explain why double and triple bonds form using the octet rule. 5B4 Relate polarity to bonds and molecules.
Lab Day 1	SLM 51–54	TLM 51–54	Lab 5A: *The Solution to a Problem*—Solubility and Chemical Bonds	**EQ:** Does bond type indicate solubility?
Lab Day 2	SLM 55–57	TLM 55–57	Lab 5B: *Electric Lines*—Conductivity and Chemical Bonds	**EQ:** Which type of bond conducts electricity better?
5C Writing Chemical Formulas	108–17, 121	108–17, 121	Case Study: Sticky Situation (p. 121)	**EQ:** How do you know how many atoms are in a chemical formula? **Objectives:** 5C1 Predict the ratios of ions or atoms in ionic and covalent compounds. 5C2 Write the chemical formulas for ionic and covalent compounds. 5C3 Name ionic and covalent compounds.
Ethics Day	118	118	Ethics: Pseudoephedrine	5C4 Justify the use of medications.
Review and Test Days			Chapter 5 Test	
CHAPTER 6: THE CHEMISTRY OF LIFE (8 DAYS) **ENRICHMENT CHAPTER**				
6A Organic Compounds	124–33	124–33	Demonstration: Straight Chains Mini Lab: *Modeling Hexane Isomers* (p. 133)	**EQ:** Why is carbon so important? **Objectives:** 6A1 Define *organic compound* and *hydrocarbon*. 6A2 Explain how isomers are formed. 6A3 Compare saturated and unsaturated hydrocarbons.

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Lab Days 1 and 2	SLM 59–61 or SLM 63–66	TLM 59–61b or TLM 63–66	Lab 6A: *Sticky Business*—Inquiring into Glues or Lab 6B: *Milking Chemistry*—Proteins in Food	**EQ:** How can I improve a casein glue? or **EQ:** Which foods are a source of protein?
6B Substituted Hydrocarbons	134–35	134–35		**EQ:** What other elements can be found in organic compounds? **Objectives:** 6B1 Classify substituted hydrocarbons on the basis of their functional group. 6B2 Give examples of how common substituted hydrocarbons are used.
6C Biochemistry	136–40	136–40	Demonstration: Superabsorbent Polymers Career: Serving as a Food Chemist	**EQ:** What molecules are needed for life? **Objectives:** 6C1 Define *polymer*. 6C2 Compare carbohydrates, lipids, and proteins. 6C3 Explain the role of nucleic acids in cell reproduction.
Ethics Day	143	143a	Ethics: Can Fast Food Be Nutritious?	6C4 Explain the importance of nutrition in a fast-food society.
Review and Test Days			Chapter 6 Test	
UNIT 2: CHANGES IN MATTER				
CHAPTER 7: CHEMICAL REACTIONS (10 DAYS) **FOUNDATIONAL CHAPTER**				
7A Chemical Changes	148–54	148–54	Demonstration: Chemical Reaction Indicators Career: Serving as a Toxicologist Mini Lab: *Balanced Diet* (p. 155)	**EQ:** How can I tell whether a chemical change has taken place? **Objectives:** 7A1 List evidences for a chemical change. 7A2 Explain the use of a chemical equation as a model of a chemical reaction. 7A3 Write chemical equations from word equations. 7A4 Balance chemical equations by using the law of conservation of matter. 7A5 Solve simple mole-mass conversion problems.
7B Types of Chemical Reactions	156–58	156–58	Demonstration: Types of Chemical Reactions	**EQ:** Are there different kinds of chemical reactions? **Objectives:** 7B1 Classify chemical reactions. 7B2 Compare oxidation and reduction.
Lab Day 1	SLM 67–71	TLM 67–71	Lab 7A: *Science Fair Revisited*—Types of Chemical Reactions	**EQ:** What happens during a chemical reaction?

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7C Energy in Chemical Reactions	159–61	159–61	Demonstration: Endothermic and Exothermic Reactions	**EQ:** Do chemical reactions always give off energy? **Objectives:** 7C1 Explain the flow of energy in exothermic and endothermic reactions. 7C2 Relate exothermic and endothermic reactions to their energy graphs. 7C3 Define *activation energy*.
7D Reaction Rates and Equilibrium	162–68, 172, 173	162–68, 172, 173	Case Studies: Grain Elevators (p. 172), Building Implosion (p. 173) Link: Reaction Simulation	**EQ:** Why do some things burn slowly while others explode? **Objectives:** 7D1 Summarize the collision model. 7D2 Predict how reaction rate is affected by reaction conditions. 7D3 Compare the actions of catalysts, inhibitors, and enzymes. 7D4 Summarize the law of chemical equilibrium. 7D5 Predict adjustments within a reversible chemical reaction in response to specific changes in conditions by using Le Châtelier's principle.
Lab Days 2–4	SLM 73–75	TLM 73–75b	Lab 7B: *It's in the Bag*—Inquiring into Chemical Reactions	**EQ:** How can I tell which reactants cause which effects?
Review and Test Days			Chapter 7 Test	
CHAPTER 8: NUCLEAR CHANGES (7 DAYS) **ENRICHMENT CHAPTER**				
8A Radioactive Decay	176–84	176–84	Case Study: Vikings Demonstration: Half-Life How It Works: Smoke Detectors	**EQ:** Why do only some isotopes decay? **Objectives:** 8A1 Compare physical, chemical, and nuclear changes. 8A2 Explain why some isotopes decay and others do not. 8A3 Define *radioactive decay*. 8A4 Classify nuclear decay by type. 8A5 Write balanced nuclear decay equations. 8A6 Define *half-life*. 8A7 Predict how much of a sample remains after a given amount of time on the basis of its half-life.
Lab Day	SLM 77–83 or SLM 85–88	TLM 77–83 or TLM 85–88	Lab 8A: *Flipping Out*—Modeling Radioactive Decay or Lab 8B: *Radioactive!*—Exploring Radiation Dose	**EQ:** How can probability predict how long a sample remains radioactive? or **EQ:** What is my annual radiation exposure?

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8B Fission and Fusion	185–91	185–91	Case Study: Tsar Bomba Mini Lab: *Modeling Chain Reactions*	**EQ:** Why is the sun so hot? **Objectives:** 8B1 Compare nuclear fission and fusion. 8B2 Relate chain reaction and critical mass to nuclear fission. 8B3 Explain how nuclear reactions don't violate the law of conservation of matter.
8C Nuclear Changes: Benefits and Risks	191–96	190–96	Worldview Sleuthing: Nuclear Waste	**EQ:** What are the benefits and risks of nuclear changes? **Objectives:** 8C1 Explain how radioactivity is used in medical technology. 8C2 Compare genetic and somatic damage. 8C3 Explain how we detect radiation in order to protect people from harmful radiation. 8C4 Justify applications of nuclear changes.
Ethics Day	199	199	Ethics: Nuclear Power Generation	8C5 Evaluate the positions for and against generating energy from nuclear sources.
Review and Test Days			Chapter 8 Test	
CHAPTER 9: SOLUTIONS (8 DAYS) FOUNDATIONAL CHAPTER				
9A Mixtures and Solutions	202–11	202–11	Worldview Sleuthing: Sports Drinks How It Works: Hot and Cold Packs Demonstrations: Mentos® and Diet Soda, The Tyndall Effect, Mixtures, Energy in Solution, Rates of Dissolving, Boiling Links: Mentos and Diet Soda, Dissolving Rate Applets	**EQ:** How do things dissolve? **Objectives:** 9A1 Compare suspensions, colloids, and solutions. 9A2 Demonstrate the process by which solutions are made. 9A3 Explain energy changes during dissolving. 9A4 Compare different methods for separating mixtures.
Lab Days 1 and 2	SLM 89–91	TLM 89–92	Lab 9A: *All Mixed Up*—Inquiring into Separating Mixtures	**EQ:** How can I separate the components of a mixture?
9B Solution Concentration	212–18, 221	212–19, 221	Case Studies: Road Salt, Maple Syrup (p. 221) Mini Lab: *Mass and Volume in Solutions*	**EQ:** How can we describe the amount of solute in a solution? **Objectives:** 9B1 Compare unsaturated, saturated, and supersaturated solutions. 9B2 Explain measures of concentration, including percent by mass, percent by volume, and molarity. 9B3 Relate colligative properties to measures of concentration. 9B4 Assess the hidden costs of the usage of salt or a brine solution to prevent roads from freezing.

Section	SE Pages	TE Pages	Teacher Resources	Essential Questions/Content Objectives
Lab Day 3	SLM 93–95	TLM 93–95	Lab 9D: *That's Cold*—Investigating Freezing Point Depression	**EQ:** How can I cool a solution below its solvent's normal freezing point?
Ethics Day	221	221	Ethics: Pollution	9B5 Formulate a position on pollution mitigation from a Christian perspective.
Review and Test Days			Chapter 9 Test	
CHAPTER 10: ACIDS, BASES, AND SALTS (7 DAYS) **KEY CHAPTER**				
10A Acids and Bases	224–28	224–28	Case Study: The King of Chemicals Demonstrations: An Acid Reacting with a Metal, Conductivity, Indicators	**EQ:** What's the difference between an acid and a base? **Objectives:** 10A1 Define *acid* and *base* and give common characteristics of each. 10A2 Identify a substance as an acid or base on the basis of its characteristics.
10B Acidity and Alkalinity	228–32	228–32	Demonstrations: Concentration and pH, A Buffered System	**EQ:** Why are strong acids and bases dangerous? **Objectives:** 10B1 Explain the relationship between acid and base strengths. 10B2 Relate the terms *concentration* and *strength*. 10B3 Explain the pH scale. 10B4 Relate pH values with acid or base strength and concentration.
Lab Day	SLM 97–101 or SLM 103–6	TLM 97–101 or TLM 103–6	Lab 10A: *pH pHun*—Determining pH or Lab 10B: *Feeling the Burn*—Comparing the Concentrations of Basic Solutions	**EQ:** Do pH meters and pH paper provide similar results? or **EQ:** Do all basic solutions neutralize acid equally well?
10C Salts	232–38	232–38	Demonstration: Neutralization Mini Lab: *Basic Problem*	**EQ:** What happens when acids and bases mix? **Objectives:** 10C1 Explain how a neutralization reaction occurs. 10C2 Identify the cation of a base and the anion of an acid. 10C3 Predict the salt compound that will be formed in a neutralization reaction.
Ethics Day	238	238	Ethics: Antacids	10C4 Relate the properties of buffers with how they can benefit people.
Review and Test Days			Chapter 10 Test	

Section	SE Pages	TE Pages	Teacher Resources	Essential Questions/Content Objectives
UNIT 3: MATTER IN MOTION				
CHAPTER 11: KINEMATICS (10 DAYS) **FOUNDATIONAL CHAPTER**				
11A Describing Position	246–52	246–52	Demonstrations: Frame of Reference, Distance and Displacement Links: Retrograde Motion, Frames of Reference	**EQ:** How can we describe where an object is? **Objectives:** 11A1 Explain why we still use Newtonian mechanics for studying motion even though it is a less workable model. 11A2 Identify physical systems to analyze motion. 11A3 Explain the importance of frames of reference. 11A4 Calculate distance, displacement, and time using mathematical equations.
Lab Days 1 and 2	SLM 107–9	TLM 107–10	Lab 11A: *Way to Go*—Inquiring into Distance and Displacement	**EQ:** How can we navigate from place to place?
11B Describing Motion	253–59	253–59	Demonstration: Conservation of Momentum Mini Lab: *Graphing Motion* (p. 260)	**EQ:** How can we study motion? **Objectives:** 11B1 Calculate speed, velocity, momentum, and time using mathematical equations. 11B2 Model motion in one dimension using both position versus time and velocity versus time graphs. 11B3 Solve momentum problems. 11B4 Explain situations where momentum is conserved.
11C Changing Motion	261–64	260–64	Demonstrations: Gravitational Acceleration, Centripetal Force Career: Serving as an Imagineer	**EQ:** How do objects move in the real world? **Objectives:** 11C1 Calculate velocity, acceleration, and time using mathematical equations. 11C2 Model motion for accelerated motion using both position versus time and velocity versus time graphs. 11C3 Define *circular motion*. 11C4 Describe the path of a projectile. 11C5 Compare linear, circular, and projectile motion. 11C6 Compare ideal and actual projectile motion.
Lab Day 3	SLM 111–15	TLM 111–15	Lab 11B: *Slow and Steady*—Investigating Uniform Motion	**EQ:** Can we achieve uniform motion?
Lab Day 4	SLM 117–20	TLM 117–20	Lab 11C: *The Gravity of the Situation*—Investigating Free Fall	**EQ:** Can we determine the acceleration due to gravity?
Ethics Day	267	267a	Ethics: Radar Detectors	11C7 Formulate a position on radar detectors from a Christian perspective.
Review and Test Days				

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CHAPTER 12: DYNAMICS (8 DAYS) **FOUNDATIONAL CHAPTER**				
12A Classifying Forces	270–75	270–75	Demonstration: Forces Links: Free-Body Diagram Video, Free-Body Diagram Simulators	**EQ:** What causes a change in motion? **Objectives:** 12A1 Define *force*. 12A2 Compare field forces and contract forces. 12A3 Compare balanced and unbalanced forces.
12B Newton's Law of Motion	275–81	275–81	Demonstrations: The Law of Inertia, Action-Reaction Force Pairs Acting at a Distance	**EQ:** How can we predict changes in motion? **Objectives:** 12B1 Apply Newton's first law to physical systems. 12B2 Solve force problems using Newton's second law. 12B3 Analyze a physical scenario that is based on Newton's third law. 12B4 Identify the normal force in an applicable contact force scenario. 12B5 Draw a free-body diagram for a physical system.
Lab Day 1	SLM 121–24	TLM 121–24	Lab 12A: *Lab Heard Round the World*—Investigating the Second Law of Motion	**EQ:** How are force, mass, and acceleration related?
Lab Day 2	SLM 125–28	TLM 125–28	Lab 12B: *Rough Going*—Investigating the Properties of Friction	**EQ:** How much force does friction exert?
12C Types of Forces	282–90	282–90	Lab Activity as Demonstration Mini Lab: *A Weighty Problem*	**EQ:** How do different forces affect our daily experiences? **Objectives:** 12C1 Define *gravity* and *friction*. 12C2 State the law of universal gravitation and explain the variables that factor into it. 12C3 Relate friction to the effect that it has on motion. 12C4 Create a free-body diagram that identifies the different forces working on a system.
Ethics Day	293	293a–b	Ethics: Mandatory Helmet Laws	12C5 Formulate a position on motorcycle helmet usage from a Christian perspective.
Review and Test Days				
CHAPTER 13: WORK AND MACHINES (8 DAYS) **FOUNDATIONAL CHAPTER**				
13A Work and Mechanical Advantage	296–302	296–302	Link: Cellular Machines	**EQ:** How do simple machines make work easier? **Objectives:** 13A1 Define *work*. 13A2 Relate motion, work, and power. 13A3 Solve work and power problems for simple machines. 13A4 Relate forces and distance in the context of simple machines.

Section	SE Pages	TE Pages	Teacher Resources	Essential Questions/Content Objectives
13B Lever	303–8	303–8	Demonstration: Levers Mini Lab: *Law of Torques*	**EQ:** How can a man move a train? **Objectives:** 13B1 Define *torque*. 13B2 Summarize the law of torques. 13B3 Compare the designs of the three different types of levers. 13B4 Solve work and mechanical advantage problems for different levers.
13C Wheel and Axle	309–12	309–12	Demonstration: Pulleys	**EQ:** Is a wheel all by itself a machine? **Objectives:** 13C1 Compare pulleys, wheels and axles, gears, and blocks and tackles. 13C2 Give examples of pulleys, wheels and axles, gears, and blocks and tackles. 13C3 Solve work and mechanical advantage problems for different pulley systems.
Lab Day 1	SLM 129–32	TLM 129–32	Lab 13A: *A Clear Advantage*—Investigating Pulleys	**EQ:** How does a pulley make work easier?
13D Inclined Plane	313–18	313–18	Demonstration: An Inclined Plane How It Works: Clocks	**EQ:** How does a screw do work? **Objectives:** 13D1 Relate both wedges and screws to inclined planes. 13D2 Solve work and mechanical advantage problems for different inclined planes. 13D3 Justify the use and development of simple machines using the Creation Mandate.
Lab Day 2	SLM 133–37	TLM 133–37	Lab 13B: *Ramping Up*—Experimenting with Inclined Planes	**EQ:** Why is a steep ramp harder to climb than a less steep one?
Review and Test Days			Chapter 13 Test	
CHAPTER 14: ENERGY (9 DAYS) FOUNDATIONAL CHAPTER				
14A Classifying Energy	324–30	324–31	Demonstrations: Kinetic Energy, Kinetic Energy Transfer Mini Lab: *Visualizing Potential Energy* (p. 331)	**EQ:** Where does energy come from? **Objectives:** 14A1 State the law of conservation of energy. 14A2 Explain how energy is conserved. 14A3 Compare kinetic and potential energy. 14A4 Solve energy problems by using the formulas for kinetic and gravitational potential energy. 14A5 Predict the velocity of an object on the basis of conservation of energy.
Lab Day 1	SLM 139–43	TLM 139–43	Lab 14A: *Hold Your Horses*—Investigating Work, Energy, and Power	**EQ:** If I do a task in half the usual amount of time, aren't I doing twice as much work?

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14B Energy Changes	332–36	332–36	Demonstrations: Mechanical Energy, Energy Transformations	**EQ:** How is energy transformed? **Objectives:** 14B1 Define *mechanical energy*. 14B2 Track energy changes in various systems.
Lab Days 2–4	SLM 145–148	TLM 145–148c	Lab 14B: *Time to Climb*—Designing a Better Motor	**EQ:** How can I maximize the efficiency of an energy conversion?
14C Energy Resources	337–43	337–43	Worldview Sleuthing: Clean Energy Link: US Energy Resource Use	**EQ:** How can we best generate energy? **Objectives:** 14C1 Associate energy with different sources. 14C2 Evaluate the benefits and drawbacks to different energy sources. 14C3 Justify efforts to conserve energy on the basis of a biblical worldview.
Review and Test Days			Chapter 14 Test	
CHAPTER 15: THERMODYNAMICS (8 DAYS) KEY CHAPTER				
15A Temperature	348–54	348–54	Demonstration: Thermal Expansion How It Works: Thermostats Link: Gardens by the Bay	**EQ:** Is temperature the same thing as thermal energy? **Objectives:** 15A1 Define *temperature* and *thermometric property*. 15A2 Explain how a thermometer works. 15A3 Compare the Fahrenheit, Celsius, and Kelvin scales. 15A4 Convert temperatures between the three temperature scales.
15B Heat	355–63	355–63	Demonstrations: Convection Currents, The Specific Heat Capacity of Water, The Heating Curve of Water Mini Lab: *Understanding Heating*	**EQ:** Why do metals warm faster than water? **Objectives:** 15B1 Relate temperature, thermal energy, and heat to each other. 15B2 Compare conduction, convection, and radiation. 15B3 Identify when conduction, convection, or radiation are occurring in physical systems. 15B4 Solve specific heat problems. 15B5 Relate thermal energy to changes of state.
Lab Days 1 and 2	SLM 149–53	TLM 149–53b	15A: *Metal Mystery*—Inquiring into Specific Heat	**EQ:** How can thermodynamics help identify a metal?
Lab Day 3	SLM 155–59	TLM 155–59	Lab 15B: *Around the Curve*—Investigating the Heating Curve of Water	**EQ:** Where does the thermal energy go when ice melts and water boils?

Section	SE Pages	TE Pages	Teacher Resources	Essential Questions/Content Objectives
15C Thermodynamics	364–67, 369	364–67, 369b	Case Study: Water as a Coolant (p. 369) Worldview Sleuthing: Urban Heat Islands	**EQ:** What is thermodynamics? **Objectives:** 15C1 Summarize the historical theories of thermodynamics. 15C2 Summarize the first, second, and third laws of thermodynamics. 15C3 Compare various thermodynamics theories.
Review and Test Days			Chapter 15 Test	
CHAPTER 16: FLUIDS (8 DAYS) **KEY CHAPTER**				
16A Properties of Fluids	372–78	372–78	Demonstrations: Fluid Pressure, Buoyancy, A Cartesian Diver Mini Lab: *Demonstration: Density Stack* (p. 379)	**EQ:** Why does a hot air balloon rise? **Objectives:** 16A1 Define *pressure*. 16A2 Calculate pressure, area, and force in physical systems. 16A3 Summarize Archimedes's principle. 16A4 Relate buoyancy to specific gravity. 16A5 Relate density to viscosity.
Lab Day 1–3	SLM 161–63 or SLM 165–67	TLM 161–63 or TLM 165–67b	Lab 16A: *High Pressure Job*—Investigating Fluid Mass and Pressure or Lab 16B: *Load, Load, Load Your Boat*—Designing a Paper Boat	**EQ:** Why are water towers so tall? or **EQ:** How many pennies can a paper boat hold?
16B Gas Laws	380–86	380–86	Demonstrations: Boyle's Law, Charles's Law, Gay-Lussac's Law, The Combined Gas Law	**EQ:** How do changing conditions affect gases? **Objectives:** 16B1 State Boyle's law, Charles's law, and the combined gas law. 16B2 Explain how gas laws model the behavior of gases. 16B3 Calculate quantities using Boyle's law, Charles's law, and the combined gas law.
16C Fluid Mechanics	387–89	387–89	Demonstrations: Pascal's Principle, Bernoulli's Principle Career: Serving as a Piping Engineer	**EQ:** How can a person lift a car? **Objectives:** 16C1 Summarize Pascal's principle. 16C2 Compare a hydraulic machine with a simple machine. 16C3 Summarize Bernoulli's principle. 16C4 Identify the quantity that must be conserved in systems according to Bernoulli's principle.
Review and Test Days			Chapter 16 Test	

Section	SE Pages	TE Pages	Teacher Resources	Essential Questions/Content Objectives
UNIT 4: WAVES AND ENERGY				
CHAPTER 17: PERIODIC MOTION AND WAVES (9 DAYS) **FOUNDATIONAL CHAPTER**				
Lab Day 1	SLM 169–74	TLM 169–74	Lab 17A: *Tick Tock*—Investigating Pendulums	**EQ:** What use is a pendulum?
17A Periodic Motion	396–401	396–401	Demonstrations: Periodic Motion, Periodic Motion on a Swing How It Works: Car Suspension	**EQ:** What affects the swing of a pendulum? **Objectives:** 17A1 Define *periodic motion*. 17A2 Relate the motion of a spring system to the conservation of energy. 17A3 Compare periodic motion with simple harmonic motion.
17B Waves	403–9	402–9	Worldview Sleuthing: Wave Power Generation Demonstrations: The Wave, Waves, Wave Types Mini Lab: *Making Waves* (p. 402)	**EQ:** What moves in a wave? **Objectives:** 17B1 Define *wave* and *mechanical wave*. 17B2 Diagram a transverse wave. 17B3 Relate medium motion with energy motion in a wave. 17B4 Compare transverse and longitudinal waves. 17B5 Calculate wave speed, frequency, and wavelength.
Lab Days 2–4	SLM 175–77	TLM 175–78b	Lab 17B: *Storm Surge!*—Creating Coastal Defenses	**EQ:** How can I model coastal defenses?
17C Wave Behavior	410–15	410–15	Case Study: Galloping Gertie Demonstrations: Reflection, Diffraction, Wave Interference, A Standing Wave, The Doppler Effect	**EQ:** Why does the sound of an ambulance change as it speeds past? **Objectives:** 17C1 Contrast wave behavior in reflection, refraction, and diffraction. 17C2 Compare constructive and destructive interference. 17C3 Summarize the Doppler effect.
Review and Test Days			Chapter 17 Test	
CHAPTER 18: SOUND (8 DAYS) **ENRICHMENT CHAPTER**				
Lab Day 1–3	SLM 179–83 or SLM 185–87	TLM 179–83 or TLM 185–88b	Lab 18A: *Sounding Off*—Investigating the Properties of Sound or Lab 18B: *Sound Advice*—Designing a Sound-Dampening Surface	**EQ:** How are the different properties of sound related? or **EQ:** What types of materials best reduce loud sounds in a building?

Section	SE Pages	TE Pages	Teacher Resources	Essential Questions/Content Objectives
18A Sound Waves	420–23	420–23	Demonstrations: Vibrations, The Need for a Medium, Pitch	**EQ:** How fast is the speed of sound? **Objectives:** 18A1 Describe sound waves. 18A2 Relate wave and medium properties to the speed of sound. 18A3 Compare pitch and frequency. 18A4 Compare loudness and intensity. 18A5 Solve speed of sound problems. 18A6 Define *timbre*.
18B Hearing and Music	424–29	424–29		**EQ:** Why does each kind of musical instrument produce a distinct sound? **Objectives:** 18B1 Describe how the human voice produces sound. 18B2 Identify the structures of the ear and how they impact hearing. 18B3 Explain how a vibrating string produces a sound.
18C Using Sound Waves	430–36	430–36	Career: Serving as an Acoustic Engineer Mini Lab: *Demonstration: Catch a Wave*	**EQ:** In what other ways do we use sound waves? **Objectives:** 18C1 Explain how different sound technologies work. 18C2 Compare infrasonic and ultrasonic sound. 18C3 Apply the properties of sound to help people.
Review and Test Days			Chapter 18 Test	
CHAPTER 19: ELECTRICITY (7 DAYS) KEY CHAPTER				
19A Static Electricity	442–49	442–49	Demonstrations: Electric Charge, Electric Force, Field Lines, Charging by Friction, Charging by Conduction, Charging by Induction Mini Lab: *Observing Electrostatic Charge* (p. 449)	**EQ:** Why do I sometimes get shocked after walking across a carpet? **Objectives:** 19A1 Define *electric force*. 19A2 Compare electric force and gravitational force. 19A3 Analyze the effect of factors that influence electric force. 19A4 Summarize how static charges accumulate.
19B Current Electricity	450–56	450–56	Demonstrations: Electric Current, Electron Movement	**EQ:** Why does the light turn on when I flip the switch? **Objectives:** 19B1 Compare static electricity and current electricity. 19B2 Compare direct current and alternating current. 19B3 Compare conductors and insulators. 19B4 Analyze the effect of factors that influence resistance. 19B5 Solve electrical current problems using Ohm's law.
Lab Day 1	SLM 189–93	TLM 189–93	Lab 19A: *Go with the Flow*—Investigating Ohm's Law	**EQ:** How do resistance and voltage affect current in a circuit?

Section	SE Pages	TE Pages	Teacher Resources	Essential Questions/Content Objectives
19C Circuits	457–66, 469	456–66, 469a	Case Study: Taser® (p. 469) How It Works: Electric Cars	**EQ:** How does current travel through a circuit? **Objectives:** 19C1 Define *short circuit*. 19C2 Compare series and parallel circuits. 19C3 Identify the components of a circuit. 19C4 Draw simple series and parallel circuits from their descriptions. 19C5 Analyze simple series and parallel circuits. 19C6 Solve electric power problems. 19C7 Defend the use of fuses and circuit breakers.
Lab Day 2	SLM 195–200 or SLM 201–6	TLM 195–200 or TLM 201–6	Lab 19B: *Series-ously?*—Investigating Series Circuits or Lab 19C: *The Path Less Traveled*—Investigating Parallel Circuits	**EQ:** How does connecting components in series affect circuits? or **EQ:** How does connecting components in parallel affect circuits?
Review and Test Days			Chapter 19 Test	
CHAPTER 20: MAGNETISM (8 DAYS) **ENRICHMENT CHAPTER**				
Lab Day 1	SLM 207–10	TLM 207–10	Lab 20A: *Lines of Force*—Exploring Magnetic Fields	**EQ:** How can I find the shape of a magnetic field?
20A Magnets and Magnetism	472–74	472–74	Demonstrations: Compasses, Making a Compass Mini Lab: *Magnetic Fields* (p. 475)	**EQ:** Why do magnets stick to some materials and not to others? **Objectives:** 20A1 Sketch magnetic fields, including that of the earth. 20A2 Explain the domain model of magnetism.
20B Electromagnetism	476–79	476–79	Demonstrations: Magnetism from Electricity, Electricity from Magnetism	**EQ:** How do electric and magnetic fields interact? **Objectives:** 20B1 Relate magnetic fields to electrical fields. 20B2 Draw the magnetic field around a wire using the right-hand rule. 20B3 Compare solenoids and electromagnets. 20B4 Give examples of uses for electromagnets.
Lab Days 2 and 3	SLM 211–12	TLM 211–12b	Lab 20B: *Mighty Magnets*—Inquiring into Electromagnets	**EQ:** How can I build a stronger electromagnet?
20C Generating and Using Electricity	480–82, 485	480–82, 485	Worldview Sleuthing: The War of the Currents (p. 485)	**EQ:** Where does the electricity in my house come from? **Objectives:** 20C1 Relate magnetic fields to wire coils in generators. 20C2 Compare how direct current and alternating current are generated. 20C3 Relate coil loops and voltage in transformers. 20C4 Evaluate the use of AC and DC.

Section	SE Pages	TE Pages	Teacher Resources	Essential Questions/Content Objectives
Review and Test Days			Chapter 20 Test	
CHAPTER 21: ELECTROMAGNETIC ENERGY (5 DAYS) **KEY CHAPTER**				
Lab Day 1	SLM 213–19 or SLM 221–26	TLM 213–19 or TLM 221–26	Lab 21A: *Light Limit*—Investigating Changes in Light over Distance or Lab 21B: *Driven to Diffraction*—Investigating the Bending of Light	**EQ:** Why does a flashlight have a limited useful range? or **EQ:** Why does light form a rainbow?
21A Electromagnetic Waves	488–94	488–95	Demonstrations: Newton's Experiment, Calculating the Speed of Light	**EQ:** Why can electromagnetic waves move through space? **Objectives:** 21A1 Compare electromagnetic and mechanical waves. 21A2 Solve speed of light problems. 21A3 Relate wavelength, frequency, and energy in electromagnetic waves. 21A4 Relate the intensity of light to the distance from a spherical light source. 21A5 Compare the wave nature and the particle nature of light.
21B The Electro-magnetic Spectrum	496–99, 501	496–99, 501	Case Study: Seeing Is Believing (p. 501) Worldview Sleuthing: Autonomous Vehicle Sensors Mini Lab: *Testing Sunscreen* (p. 495)	**EQ:** How can we use electromagnetic energy? **Objectives:** 21B1 List the seven major bands in the electromagnetic spectrum according to frequency and wavelength. 21B2 Compare properties of the major bands of the electromagnetic spectrum. 21B3 Classify electromagnetic waves on the basis of their properties. 21B4 Give applications of the major bands of the electromagnetic spectrum.
Review and Test Days			Chapter 21 Test	
CHAPTER 22: LIGHT AND OPTICS (8 DAYS) **ENRICHMENT CHAPTER**				
22A Light Behavior	504–6	504–6		**EQ:** What does light do? **Objectives:** 22A1 Describe the visible light spectrum. 22A2 Compare luminous and illuminated objects. 22A3 Explain why we can model light with rays. 22A4 Compare transparent, translucent, and opaque objects.

Section	SE Pages	TE Pages	Teacher Resources	Essential Questions/Content Objectives
22B Color	507–9	506–9	Demonstrations: Color Absorption and Reflection, Additive Colors	**EQ:** How many colors are there? **Objectives:** 22B1 Evaluate the statement "There are only seven colors." 22B2 Compare primary and secondary colors of light. 22B3 Compare additive and subtractive colors.
22C Reflection and Mirrors	510–13	510–13	How It Works: Lasers Demonstration: The Law of Reflection	**EQ:** How do mirrors produce images? **Objectives:** 22C1 Compare regular and diffuse reflections. 22C2 State the law of reflection. 22C3 Compare real and virtual images. 22C4 Compare the images produced by plane, convex, and concave mirrors. 22C5 Give examples of real-world uses of plane, convex, and concave mirrors.
Lab Day 1	SLM 227–30 or SLM 231–36	TLM 227–30 or TLM 231–36	Lab 22A: *Upon Reflection*—Investigating Mirrors and Virtual Images or Lab 22B: *Through the Lens of the Beholder*—Exploring Lenses	**EQ:** How does a mirror work? or **EQ:** How is optics related to vision?
22D Refraction and Lenses	514–17	514–17	Mini Lab: *Bending Light*	**EQ:** How do glasses help people who can't see well? **Objectives:** 22D1 Define *index of refraction*. 22D2 Define *total internal reflection*. 22D3 Relate converging and diverging lenses to common vision problems.
Ethics Day	521	521	Ethics: Who Owns Your Photos?	22D4 Formulate a Christian position on the use of social media for sharing imagery.
Review and Test Days			Chapter 22 Test	
Review and Final Exam				