

# Physical Science

GRADE 8

<b>Matter</b> <ul style="list-style-type: none"><li>• Physical/chemical properties and changes</li><li>• Solids, liquids and gases</li><li>• Elements, compounds and mixtures</li><li>• Atomic structure and periodic table</li><li>• Formulas, chemical bonds and reactions</li><li>• Acids and base</li></ul>	<b>Energy</b> <ul style="list-style-type: none"><li>• Heat</li><li>• Electrical</li><li>• Light</li><li>• Mechanical</li><li>• Potential and kinetic</li><li>• Conservation</li><li>• Transformation</li></ul>	<b>Motion Forces and Work</b> <ul style="list-style-type: none"><li>• Six Simple machines</li><li>• Motion, Speed and velocity, acceleration, friction</li><li>• Newton's 3 laws of motion</li></ul>
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## STANDARD 1

*The student understands and uses scientific concepts and principles.*

**To meet this standard, the student will:**

**Benchmark 8.1.1: Use properties to identify, describe, and categorize substances, materials, and objects**

**Indicator:**

- 8.1.1.1 Describe objects using physical properties including shape, density, solubility, odor, melting point, boiling point, color, weight, length, density, mass, temperature and volume
- 8.1.1.2 Describe objects using chemical properties (acidity, basicity, combustibility, reactivity)
- 8.1.1.3 Distinguish between familiar forms of energy including heat, electrical, light, sound and mechanical
- 8.1.1.4 Describe the structure of atoms, including the location of protons, neutrons, and electrons
- 8.1.1.5 Use the periodic table to be able to answer questions about the elements
- 8.1.1.6 Identify the element symbol with the element name
- 8.1.1.6 Differentiate between types of chemical bonds
- 8.1.1.7 Define solution in terms of solute and solvent
- 8.1.1.8 Define diffusion and osmosis
- 8.1.1.9 Identify/define isotonic, hypertonic, and hypotonic solutions
- 8.1.1.10 Differentiate between potential and kinetic energy
- 8.1.1.11 Classify waves as mechanical or electromagnetic
- 8.1.1.12 Define, describe and/or calculate motion, speed, velocity
- 8.1.1.13 Define and calculate acceleration using proper terms
- 8.1.1.14 Describe the difference between balanced and unbalanced forces
- 8.1.1.15 Calculate and define momentum
- 8.1.1.16 Identify the different types of friction
- 8.1.1.17 Identify when work is done on an object
- 8.1.1.18 Explain what machines do and how they make work easier
- 8.1.1.19 Identify the difference between actual and ideal mechanical advantage
- 8.1.1.20 Describe the 6 types of compound machines

Key: 1. Grade 1.1 Standard 1.1.1 Benchmark 1.1.1.1 Indicator

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**Benchmark 8.1.2: Measure properties and characteristics**

**Indicators:**

- 8.1.2.1 Use instruments to measure time, temperature, length, mass, weight, and volume
- 8.1.2.2 Calculate density and rates of change
- 8.1.2.3 Understand the goals of measurement and the usefulness of standard measurements (metric system)
- 8.1.2.4 Use estimation skills to check measurements
- 8.1.2.5 Read, analyze, and understand graphs and the use of x and y axis in relation to manipulated and responding variables

**Benchmark 8.1.3: Understand that interactions within and among systems cause changes in matter and energy**

**Indicators:**

- 8.1.3.1 Use the particle theory of matter to describe the differences between solids, liquids and gases
- 8.1.3.2 Compare/contrast elements, compounds, mixtures, acids, bases and salts
- 8.1.3.3 Investigate the interactions among volume, pressure, and temp of matter
- 8.1.3.4 Explain how matter is recycled through geological and biological processes
- 8.1.3.5 Recognize processes which transform one form of energy into another

**Benchmark 8.1.4: Construct and use models to predict, test, and understand scientific phenomena**

**Indicators:**

- 8.1.4.1 Construct a physical model related to atomic structure
- 8.1.4.2 Construct models of simple machines and explain each in terms of work, force and motion
- 8.1.4.3 Construct and explain a diagram or working model of an electric circuit
- 8.1.4.4 Recognize the usefulness and limitations of models and theories as scientific representations of Reality
- 8.1.4.5 Identify Newton's three laws of motion as a model for understanding

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## STANDARD 2

*The student conducts scientific investigations to expand understanding of the natural world.*

To meet this standard, the student will:

### **Benchmark 8.2.1: Plan and implement scientific investigations**

#### **Indicators:**

- 8.2.1.1 Draw inferences based on observations (labs)
- 8.2.1.2 Identify questions and concepts which could guide scientific investigations; define the problem; formulate testable hypotheses and use them to guide the inquiry and essential resource requirements; and identify the known facts and acceptable parameters
- 8.2.1.3 Select appropriate tools, methods, resource requirements, and safety issues and identify the sequential steps to be followed in an investigation
- 8.2.1.4 Analyze and refine the experimental design; conduct an experiment controlling appropriate variables individually and/or with others
- 8.2.1.5 Formulate and revise scientific explanations and models using logic and evidence
- 8.2.1.6 Communicate accurately the approach, methods, results, conclusions, and known limitations of the investigation in a manner that allows the results to be understood and verified
- 8.2.1.7 Know and use safe approaches in investigations

### **Benchmark 8.2.2: Think logically, analytically, and creatively**

#### **Indicators:**

- 8.2.2.1 Use analytical thinking to examine the question/problem from different points of view
- 8.2.2.2 Evaluate evidence to determine scientific validity of claims and explanations
- 8.2.2.3 Use scientific knowledge to compare, order, and categorize in complex situations
- 8.2.2.4 Identify and explain the thought processes used in conducting a scientific investigation

### **Benchmark 8.2.3: Practice the principles of scientific inquiry**

#### **Indicators:**

- 8.2.3.1 Record, display, and report data accurately
- 8.2.3.2 Understand the proprietary nature of scientific discoveries
- 8.2.3.3 Evaluate alternative scientific explanations in an open, intellectually honest way
- 8.2.3.4 Analyze the existing knowledge about a question/problem to determine what is yet unknown and unanswered; propose strategies to learn more
- 8.2.3.5 Recognize in what ways faulty procedures can affect the results of scientific inquiry
- 8.2.3.6 Recognize useful information can result from both successful and unsuccessful scientific investigations
- 8.2.3.7 Pursue scientific inquiry by continually evaluating investigative strategies and modifying them appropriately

Key: 1. Grade 1.1 Standard 1.1.1 Benchmark 1.1.1.1 Indicator

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**Benchmark: 8.2.4: Understand the relationship between evidence and scientific explanation**

**Indicators:**

- 8.2.4.1 Understand factors that limit the extent of scientific investigation
- 8.2.4.2 Understand that scientific principles, theories, and laws are logically consistent, abide by rules of evidence, are open to question and modification, are based on historical and current scientific knowledge, and are invented by acts of imagination, intelligence, and logic through scientific investigation

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## STANDARD 3

The student *applies science knowledge and skills to solve problems and meet challenges.*

To meet this standard, the student will:

**Benchmark 8.3.1: Identify problems and challenges in which science knowledge and skills can be applied**

**Indicators:**

- 8.3.1.1 Identify a challenge or problem of interest to students which lends itself to being resolved through the application of science/technology
- 8.3.1.2 Define the components of a problem, criteria of a suitable solution, and the variables that will affect the solution design

**Benchmark 8.3.2: Research, design, and test a variety of ways to address problems and/or challenges**

**Indicators:**

- 8.3.2.1 Research, design, test (including use of models and simulations) alternative solutions to a science/technology challenge
- 8.3.2.2 Identify and describe the risks/benefits, trade-offs, and constraints when developing alternative solutions

**Benchmark 8.3.3: Evaluate solutions and consequences**

**Indicators:**

- 8.3.3.1 Using criteria for a suitable solution compare and evaluate solutions and consequences
- 8.3.3.2 Using the evaluation results determine which solution is best and predict the consequences of its implementation

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## STANDARD 4

*The student uses effective communication skills and tools to build and demonstrate understanding of science.*

To meet this standard, the student will:

**Benchmark 8.4.1: Use listening, observing, and reading skills to obtain scientific information**

**Indicators:**

- 8.4.1.1 Demonstrate comprehension by asking clarifying questions, contributing to the conversation, and paraphrasing the information presented
- 8.4.1.2 Read, comprehend, and critique scientific information from popular, academic, technical, and telecommunication sources

**Benchmark 8.4.2: Use writing and speaking skills to organize and express science ideas**

**Indicators:**

- 8.4.2.1 Produce science and technical reports and explanations that are coherent, logical, and scientifically accurate
- 8.4.2.2 Use science vocabulary appropriately in written explanations, conversations, and verbal presentations

**Benchmark 8.4.3: Use effective communication strategies and tools to prepare and present science information**

**Indicators:**

- 8.4.3.1 Produce science products using standard and advanced software features as available for use in a home, workplace, or community setting
- 8.4.3.2 Use available science software programs, computer equipment, telecommunication systems, and peripherals to access information and conduct scientific investigations
- 8.4.3.3 Select and use appropriate science data and strategies to effectively present a clear and persuasive position to an audience

Key: 1. Grade 1.1 Standard 1.1.1 Benchmark 1.1.1.1 Indicator

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## STANDARD 5

*The student understands how science knowledge and skills are connected to other subject areas and real-life situations.*

To meet this standard, the student will:

### **Benchmark 8.5.1: Use mathematics to enhance scientific understanding**

#### **Indicators:**

- 8.5.1.1 Use mathematical expressions to represent patterns observed in the natural world
- 8.5.1.2 Use mathematical relationships to understand results from scientific investigations
- 8.5.1.3 Use probability and statistical methods to describe, analyze, evaluate, and make decisions about the results of a scientific investigation
- 8.5.1.4 Use mathematics (symbols, graphs, geometry, algebra, etc.) to represent and describe a situation resulting from scientific investigation
- 8.5.1.5 Use mathematics to convert between different units of measurement within the metric system
- 8.5.1.6 Identify the different parts of a chemical equation
- 8.5.1.7 Balance a chemical equation

### **Benchmark 8.5.2: Understand the relationship between science and technology**

#### **Indicators:**

- 8.5.2.1 Investigate how scientific inquiry and technological design are used in various careers
- 8.5.2.2 Explain how scientific inquiry results in knowledge which can improve technological designs and vice versa

### **Benchmark 8.5.3: Examine the relationship between science and history**

#### **Indicators:**

- 8.5.3.1 Explain how and why the conduct of science and technology has changed over the last 500 years
- 8.5.3.2 Explain how historical periods and events have influenced and been influenced by scientific and technological advances

### **Benchmark 8.5.4: Examine the relationship among science, society, and the workplace**

#### **Indicators:**

- 8.5.4.1 Describe how the scientific enterprise is influenced by societal, environmental, economic, political, and ethical considerations
- 8.5.4.2 Explain why science and technology alone cannot resolve local, national, and/or international challenges
- 8.5.4.3 Investigate the scientific, technological, and mathematical knowledge and training requirements for occupational/career areas of interest

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## STANDARD 6

The student *understands how science knowledge carries with it responsibility for its application.*

To meet this standard, the student will:

**Benchmark 8.6.1:** Understands how the use of resources affects population growth and the global environment  
(Population)

**Indicators:**

N/A

**Benchmark 8.6.2:** Understand the importance of maintaining resources and environmental quality  
(Environmental Quality/Resources)

**Indicators:**

- 8.6.2.1 Recognize the delicate balance between limited and renewable resources
- 8.6.2.2 Recognize the negative effects of poor resource management
- 8.6.2.3 Recognize ways to preserve earth's limited resources
- 8.6.2.4 Recognize ways to renew earth's renewable resources

**Benchmark 8.6.3:** Understand the ethical issues inherent in scientific research (Ethics)

**Indicators:**

- 8.6.3.1 Recognize personal and social responsibility when planning and conducting scientific research
- 8.6.3.2 Understand the importance of honesty and accuracy in scientific reporting
- 8.6.3.3 Recognize that technology and scientific discoveries can be applied in ways other than how its discoverers intended
- 8.6.3.4 Recognize that science and technology applications cannot be isolated from other aspects of life (ethical, social, and economic)
- 8.6.3.5 Recognize personal and social responsibility when planning and conducting scientific research

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## STANDARD 7

*The student applies a Christian perspective to scientific concepts and principles.*

To meet this standard, the student will:

**Benchmark 8.7.1:** Understand that the Bible and the findings of science do not conflict

**Indicator:**

- 8.7.1.1 Identify that the Bible tells us that God is the creator of our earth, including matter, energy, force, and motion

**Benchmark 8.7.2:** Understand that the Bible teaches us that God is the creator of everything

**Indicators:**

- 8.7.2.1 Analyze current views of the formation of the universe through a Christian worldview  
8.7.2.2 Recognize God as the designer and Creator of every detail of the universe.

**Benchmark 8.7.3:** Understand that God preserves and controls His creation, the world we study in science, so that it continues to function as He planned

**Indicators:**

- 8.7.3.1 Explain how the traits, properties, and patterns of energy, heat, and matter display God's orderliness  
8.7.3.2 Identify patterns in God's restless earth that prove he is in control

**Benchmark 8.7.4:** Understand that God created everything for His own purpose, and creation is meant to praise and glorify God

**Indicators:**

- 8.7.4.1 Identify that God created objects with different properties for us to use to honor Him

**Benchmark 8.7.5:** Understand that God uses His creation to teach people eternal truth through the study of science

**Indicators:**

- 8.7.5.1 Credit God with the wonder of life and the world around us  
8.7.5.2 Identify examples of patterns and order in science that point to God as the creator

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