

NM Public Education Department

SCIENCE: PHYSICAL SCIENCE

END-OF-COURSE EXAM | GRADE 9-12 | YEAR 17-18

ASSESSMENT BLUEPRINT

Purpose Statement

Physical Science

The Physical Science End-of-Course (EOC) exam is intended to measure student proficiency of the New Mexico Science Standards. This course-level exam is provided to all students who have completed Physical Science or related courses. This exam can be given for the following STARS course codes:

1703 - Physical Science

Intended as a final exam for the course, this is a summative exam covering a range of content, skills, and applications. Scores are reported to the teacher, school, district, and state levels for the purposes of student grades, curriculum review, student graduation requirements, and NMTeach summative reports.

Materials Required for Testing:

NMPED Physical Science Reference Sheet/Periodic Table and a Scientific or Graphing Calculator

“The EOCs are exams written by New Mexico Teachers for New Mexico Students.”

During the 2016-17 school year, teachers were brought together in person or online as part of the blueprint and exam revision process. The NMPED extends our gratitude to all those who contributed to this improvement process. Although we were unable to implement every suggestion due to conflicting viewpoints at times, this blueprint reflects the best collaborative effort among dedicated peers.

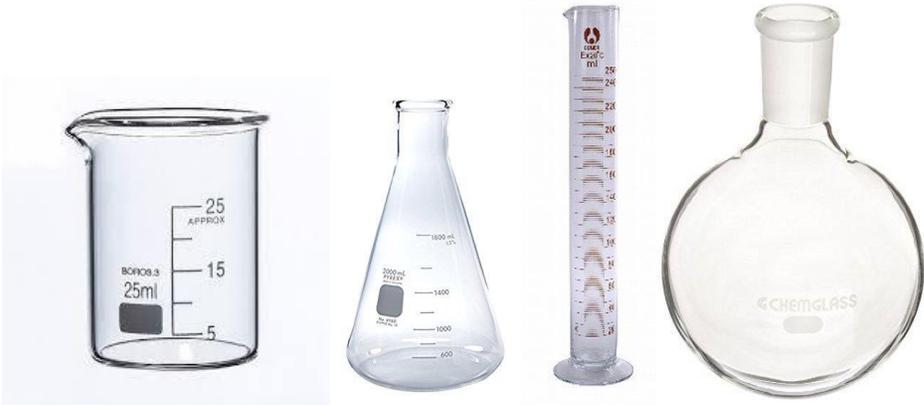
The NMPED would like to especially recognize the following person(s) who led the revision for this blueprint:

- *Debbie Dean, Ph.D., Hobbs Municipal Schools, NBCT, Blueprint Lead*

Explanation of Blueprint Layout & Test Specifications Table

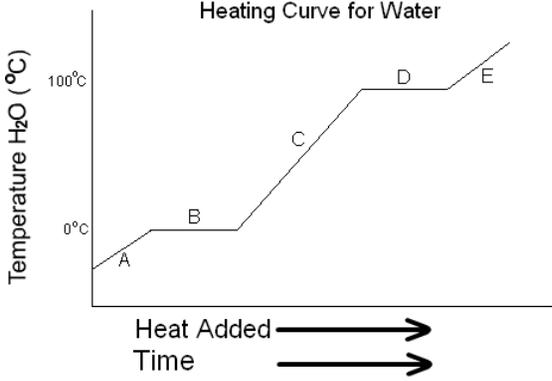
Standard	Standards with Test Item Specifications:
<p><i>The standards identified in this portion of the blueprint are aligned to the New Mexico Grades 9-12 Science Standards:</i></p> <p>http://www.ped.state.nm.us/MathScience/dl08/Standards/G9-12ScienceStandards.pdf</p> <p><i>New Mexico Teachers identified the standards to be measured on the EOC exam using the following criteria: 1) a great deal of instructional time is spent on the standard as identified in the curriculum and/or; 2) the standard is important to subsequent learning.</i></p> <p><i>It is important to note that the standards in the blueprint are only a subset of standards to be measured with the understanding that teachers cover more standards during the course of instruction than what has been selected to be measured.</i></p>	<p>Standards with Test Item Specifications:</p> <ul style="list-style-type: none"> ● <i>This portion of the blueprint identifies the specific skills and knowledge students will have to demonstrate during the exam.</i> ● <i>Although the standard may be broader, the item specifications may place constraint on portions of the standards in order to provide more transparency as to what specifically will be measured relative to the standard.</i> ● <i>Item specifications provide guidelines for the item writer so they know what topics to specifically focus on when authoring items.</i> ● <i>Topics and terms in bold will be emphasized on the exam.</i>
	<p>Item Types:</p> <p><i>The item types for this EOC exam are limited to: MC = multiple choice with or without stimulus (e.g., picture, graph, chart)</i></p>
	<p>Sample Question(s):</p> <p><i>Sample questions have been provided to assist teachers to correlate the questions with the performance standards and the test item specification, when applicable.</i></p> <ul style="list-style-type: none"> ● <i>An * denotes the correct answer</i> ● <i>DOK = Depth of Knowledge</i> ● <i>Some sample questions may be items released items from prior EOC exams</i>

Blueprint Table - Physical Science

Standard/Learning Outcome	Standard with Test Item Specifications:
<p>I.1.1.1</p> <p>Strand I: Scientific Thinking and Practice</p> <p>Standard I: Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically</p> <p>Benchmark I: Use accepted scientific methods to collect, analyze, and interpret data and observations and to design and conduct scientific investigations and communicate results.</p>	<p>1. Describe the essential components of an investigation, including appropriate methodologies, proper equipment, and safety precautions.</p> <p>Specifications:</p> <ul style="list-style-type: none"> ● Identify appropriate use of laboratory equipment ● Identify proper lab safety techniques & procedures <hr/> <p>Item Types: <i>MC = multiple choice with or without stimulus</i></p> <hr/> <p>Sample Question:</p> <div style="text-align: center;">  <p style="text-align: center;"> 1 2 3 4 </p> </div> <p>Which of the above would be used to make the most accurate measurements?</p>

	<p>A) 1 B) 2 C) 3 * D) 4</p> <p><i>Standard: I.I.I.1</i> <i>DOK Level: 1</i></p>
<p>I.I.I.2</p> <p>Strand I: Scientific Thinking and Practice</p> <p>Standard I: Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.</p> <p>Benchmark I: Use accepted scientific methods to collect, analyze, and interpret data and observations and to design and conduct scientific investigations and communicate results.</p>	<p>Standard with Test Item Specifications:</p> <p>2. Design and conduct scientific investigations that include:</p> <ul style="list-style-type: none"> • testable hypotheses • controls and variables • methods to collect, analyze, and interpret data • results that address hypotheses being investigated • predictions based on results • re-evaluation of hypotheses and additional experimentation as necessary • error analysis <p>Specifications:</p> <ul style="list-style-type: none"> • Distinguish between hypotheses, theories, and laws • Distinguish between independent and dependent variables • Distinguish between control groups and experimental groups (and their importance) <p>Item Types: <i>MC = multiple choice with or without stimulus</i></p> <p>Sample Question:</p> <p>In an experiment that determines how adding heat to gas changes the volume of the gas, which would be a correct statement?</p>

	<p>A) The volume of gas is the independent variable and the temperature is the dependent variable.</p> <p>B) The volume of gas is the dependent variable and heat is the independent variable. *</p> <p>C) The temperature is dependent on the amount of gas.</p> <p>D) The amount of heat is independent of the volume of gas.</p> <p><i>Standard: I.1.1.2</i></p> <p><i>DOK Level: 2</i></p>
<p>I.1.1.4</p> <p>Strand I: Scientific Thinking and Practice</p> <p>Standard I: Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically</p> <p>Benchmark I: Use accepted scientific methods to collect, analyze, and interpret data and observations and to design and conduct scientific investigations and communicate results.</p>	<p>Standard with Test Item Specifications:</p> <p>4. Convey results of investigations using scientific concepts, methodologies, and expressions, including:</p> <ul style="list-style-type: none"> • scientific language and symbols • diagrams, charts, and other data displays • mathematical expressions and processes (e.g., mean, median, slope, proportionality) • clear, logical, and concise communication • reasoned arguments. <p>Specifications:</p> <ul style="list-style-type: none"> • Interpret data using graphs, diagrams, charts, and data displays • Compute averages, ratios, and percentages from data <p>Item Types:</p> <p><i>MC = multiple choice with or without stimulus</i></p> <p>Sample Question:</p>

	<p style="text-align: center;">Heating Curve for Water</p>  <p>Using the graph above, choose the statement that accurately describes the data.</p> <p>A) As time passes, the temperature decreases. B) As heat is added, the temperature decreases. C) As time passes, the heat decreases. D) As heat is added, the temperature increases.*</p> <p><i>Standard: I.1.1.4</i> <i>DOK Level: 2</i></p>
<p>I.1.11.2</p> <p>Strand I: Scientific Thinking and Practice</p> <p>Standard I: Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically</p>	<p>Standard with Test Item Specifications:</p> <p>2. Use scientific reasoning and valid logic to recognize:</p> <ul style="list-style-type: none"> • faulty logic • cause and effect • the difference between observation and unsubstantiated inferences and conclusions • potential bias <p>Specifications:</p> <ul style="list-style-type: none"> • Analyze how the manipulated (independent) variable affects the responding

<p>Benchmark II: Understand that scientific processes produce scientific knowledge that is continually evaluated, validated, revised, or rejected.</p>	<p>(dependent) variable</p> <ul style="list-style-type: none"> Identify proper ways to avoid potential biases when performing research Recognize obvious bias in scientific research/studies
	<p>Item Types: <i>MC = multiple choice with or without stimulus</i></p>
	<p>Sample Question:</p> <p>If a scientist chooses data from a particular trial to report instead of representing all of the trials, what is this known as?</p> <p>A) analyzing data B) a blind experiment C) removing outliers D) exhibiting bias*</p> <p><i>Standard: I.I.II.2</i> <i>DOK Level: 1</i></p>
<p>I.I.III.4</p> <p>Strand I: Scientific Thinking and Practice</p> <p>Standard I: Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.</p>	<p>Standard with Test Item Specifications:</p> <p>4. Identify and apply measurement techniques and consider possible effects of measurement errors.</p> <p>Specifications:</p> <ul style="list-style-type: none"> Use specific measurement techniques, such as: <ul style="list-style-type: none"> Measuring length using SI units (m, cm, mm, km, etc.) Distinguish and use appropriate SI prefixes Measure volume using a graduated cylinder correctly Use a digital scale to measure mass

<p>Benchmark III: Use mathematical concepts, principles, and expressions to analyze data, develop models, understand patterns and relationships, evaluate findings, and draw conclusions.</p>	<p>Item Types: <i>MC = multiple choice with or without stimulus</i></p> <p>Sample Question:</p> <p>Use the illustration to determine the most accurate reading of volume.</p>  <p>A) 16.5 ml B) 15.5 ml* C) 17 ml D) 10.5 ml</p> <p><i>Standard: I.I.III.4</i> <i>DOK Level: 1</i></p>
<p>I.I.III.5</p> <p>Strand I: Scientific Thinking and Practice</p> <p>Standard I: Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting,</p>	<p>Standard with Test Item Specifications:</p> <p>5. Use mathematics to express and establish scientific relationships (e.g., scientific notation, vectors, dimensional analysis).</p> <p>Specifications:</p> <ul style="list-style-type: none"> ● SI unit conversions ● Convert between scientific notation and standard form (and vice-versa) ● Understand why scientific notation is useful in dealing with really large or

<p>predicting, and validating to think critically.</p> <p>Benchmark III: Use mathematical concepts, principles, and expressions to analyze data, develop models, understand patterns and relationships, evaluate findings, and draw conclusions.</p>	<p>small numbers</p> <p>Item Types: <i>MC = multiple choice with or without stimulus</i></p> <p>Sample Question:</p> <p>The distance from Earth to Alpha Centauri is 4.132×10^{16} km. Which of the following expresses this distance correctly?</p> <p>A) 413,200,000,000,000,000,000 B) 413,200,000,000,000 C) 41,320,000,000,000,000 * D) 4,132,000,000,000,000</p> <p><i>Standard: I.I.III.5</i> <i>DOK Level: 1</i></p>
<p>II.I.I.1</p> <p>Strand II: The Content of Science</p> <p>Standard I (Physical Science): Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.</p> <p>Benchmark I: Understand the properties, underlying structure, and reactions of</p>	<p>Standard with Test Item Specifications:</p> <p><u><i>Properties of Matter</i></u></p> <p>1. Classify matter in a variety of ways (e.g., element, compound, mixture; solid, liquid, gas; acidic, basic, neutral).</p> <p>Specifications:</p> <ul style="list-style-type: none"> ● Identify differences between elements and compounds ● Identify differences between homogeneous and heterogeneous mixtures ● Identify the factors which are used to distinguish between solids, liquids, and gases (volume and shape) <p>Item Types: <i>MC = multiple choice with or without stimulus</i></p>

<p>matter.</p>	<p>Sample Question:</p> <p>Matter can be classified as either a substance or a mixture. Which of the following is classified correctly?</p> <p>A) calcium - compound B) vanilla ice cream - homogenous mixture* C) gold - heterogeneous mixture D) vanilla ice cream – element</p> <p><i>Standard: II.I.I.1</i> <i>DOK Level: 1</i></p>
<p>II.I.I.2</p> <p>Strand II: The Content of Science</p> <p>Standard I (Physical Science): Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.</p> <p>Benchmark I: Understand the properties, underlying structure, and reactions of matter.</p>	<p>Standard with Test Item Specifications:</p> <p><u><i>Properties of Matter</i></u> 2. Identify, measure, and use a variety of physical and chemical properties (e.g., electrical conductivity, density, viscosity, chemical reactivity, pH, melting point).</p> <p>Specifications:</p> <ul style="list-style-type: none"> ● Acid-base questions will be conceptual only ● Identify acids and bases by the use of a pH scale (need a visual of the pH scale) ● Calculate density using the density formula <p>Item Types: <i>MC = multiple choice with or without stimulus</i></p> <p>Sample Question:</p> <p>Calculate the density of a rock with a mass of 13 grams and a volume of 5 cm³.</p>

	<p>A) 1g/cm^3 B) 2.6g/cm^3 * C) 2.6g/cm D) 1g/cm</p> <p><i>Standard: II.1.1.2</i> <i>DOK Level: 1</i></p>
<p>II.1.1.4</p> <p>Strand II: The Content of Science</p> <p>Standard I (Physical Science): Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.</p> <p>Benchmark I: Understand the properties, underlying structure, and reactions of matter.</p>	<p>Standard with Test Item Specifications:</p> <p><u><i>Properties of Matter</i></u> 4. Describe trends in properties (e.g., ionization energy or reactivity as a function of location on the periodic table, boiling point of organic liquids as a function of molecular weight).</p> <p>Specifications:</p> <ul style="list-style-type: none"> • Need the use of a periodic table • Interpreting the periodic table (e.g., how it's organized based on atomic number, valence electrons, metals, non-metals, metalloids. From left to right across a period, and down a group/family, what is the ionization energy trend?) <p>Item Types: <i>MC = multiple choice with or without stimulus</i></p> <p>Sample Question:</p> <p>Use the periodic table to predict which one of the following elements has the highest ionization energy.</p> <p>A) Ba B) N C) He* D) H</p>

	<p><i>Standard: II.1.1.4</i> <i>DOK Level: 2</i></p>
<p>II.1.1.6</p> <p>Strand II: The Content of Science</p> <p>Standard I (Physical Science): Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.</p> <p>Benchmark I: Understand the properties, underlying structure, and reactions of matter.</p>	<p>Standard with Test Item Specifications:</p> <p><u><i>Structure of Matter</i></u></p> <p>6. Understand atomic structure, including:</p> <ul style="list-style-type: none"> • most space occupied by electrons • nucleus made of protons and neutrons • isotopes of an element • masses of proton and neutron 2000 times greater than mass of electron • atom held together by proton-electron electrical forces <p>Specifications:</p> <ul style="list-style-type: none"> • Understand location, size, and charge of subatomic particles • Know what an isotope is • Understand that the atomic mass is calculated off the weighted average of all isotopes for that element <p>Item Types: <i>MC = multiple choice with or without stimulus</i></p> <p>Sample Question:</p> <p>Elements that have the same number of protons, but different number of neutrons are known as which of the following?</p> <ul style="list-style-type: none"> A) compounds B) prototypes C) isotonic D) isotopes*

	<p><i>Standard: II.1.1.6</i> <i>DOK Level: 1</i></p>
<p>II.1.1.8</p> <p>Strand II: The Content of Science</p> <p>Standard I (Physical Science): Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.</p> <p>Benchmark I: Understand the properties, underlying structure, and reactions of matter.</p>	<p>Standard with Test Item Specifications:</p> <p><u>Structure of Matter</u></p> <p>8. Make predictions about elements using the periodic table (e.g., number of valence electrons, metallic character, reactivity, conductivity, type of bond between elements).</p> <p>Specifications:</p> <ul style="list-style-type: none"> • Need the use of a periodic table (based on the location on the periodic table, student should be able to determine the number of valence electrons) • Know ionic bonds are between metal and non-metal • Know covalent bonds are between two non-metals <p>Item Types: <i>MC = multiple choice with or without stimulus</i></p> <p>Sample Question:</p> <p>Use the periodic table to determine which of the following combinations form covalent bonds:</p> <p style="margin-left: 40px;">A) Bi and Ne B) Al and Si C) Na and Cl D) N and F*</p> <p><i>Standard: II.1.1.8</i> <i>DOK Level: 2</i></p>

<p>II.I.I.10</p> <p>Strand II: The Content of Science</p> <p>Standard I (Physical Science): Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.</p> <p>Benchmark I: Understand the properties, underlying structure, and reactions of matter.</p>	<p>Standard with Test Item Specifications:</p> <p><u>Structure of Matter</u> Know that states of matter (i.e., solid, liquid, gas) depend on the arrangement of atoms and molecules and on their freedom of motion.</p> <p>Specifications:</p> <ul style="list-style-type: none"> Identify the change in kinetic (endothermic or exothermic) energy during phase changes (sublimation, deposition, vaporization, condensation, melting, and freezing) <p>Item Types: <i>MC = multiple choice with or without stimulus</i></p> <p>Sample Question:</p> <p>Which sample of water would have the lowest amount of internal energy?</p> <p>A) ice* B) water with ice C) water without ice D) steam</p> <p><i>Standard: II.I.I.10</i> <i>DOK Level: 2</i></p>
<p>II.I.I.13</p> <p>Strand II: The Content of Science</p> <p>Standard I (Physical Science): Understand the structure and</p>	<p>Standard with Test Item Specifications:</p> <p><u>Chemical Reactions</u> 13. Understand types of chemical reactions (e.g., synthesis, decomposition, combustion, redox, neutralization) and identify them as exothermic or endothermic.</p> <p>Specifications:</p>

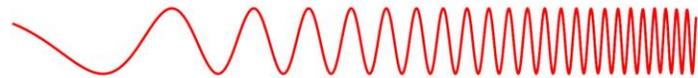
<p>properties of matter, the characteristics of energy, and the interactions between matter and energy.</p> <p>Benchmark I: Understand the properties, underlying structure, and reactions of matter</p>	<ul style="list-style-type: none"> Given a specific chemical reaction, interpret the type of reaction that took place Determine products or reactants in a chemical reaction
	<p>Item Types: <i>MC = multiple choice with or without stimulus</i></p>
	<p>Sample Question:</p> <p>Which of the following formulas demonstrates a synthesis reaction?</p> <p>A) $A + BC \rightarrow AC + B$ B) $AB + CD \rightarrow AD + CB$ C) $AB \rightarrow A + B$ D) $A + B \rightarrow AB^*$</p> <p><i>Standard: II.I.I.13</i> <i>DOK Level: 1</i></p>
<p>II.I.I.14</p> <p>Strand II: The Content of Science</p> <p>Standard I (Physical Science): Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.</p>	<p>Standard with Test Item Specifications:</p> <p><u>Chemical Reactions</u></p> <p>14. Know how to express chemical reactions with balanced equations that show:</p> <ul style="list-style-type: none"> conservation of mass products of common reactions <p>Specifications:</p> <ul style="list-style-type: none"> Know how to balance a simple chemical reaction to fulfill the law of conservation of mass
	<p>Item Types:</p>

<p>Benchmark I: Understand the properties, underlying structure, and reactions of matter.</p>	<p><i>MC = multiple choice with or without stimulus</i></p> <p>Sample Question:</p> <p>Which formula correctly shows the reaction of hydrogen gas and oxygen gas to form water?</p> <p>A) $2\text{H} + \text{O} \rightarrow \text{H}_2\text{O}$ B) $\text{H} + \text{O} \rightarrow \text{H}_2\text{O}$ C) $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$ D) $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}^*$</p> <p><i>Standard: II.I.I.14</i> <i>DOK Level: 1</i></p>
<p>II.I.II.1</p> <p>Strand II: The Content of Science</p> <p>Standard I (Physical Science): Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.</p> <p>Benchmark II: Understand the transformation and transmission of energy and how energy and matter interact.</p>	<p>Standard with Test Item Specifications:</p> <p><u><i>Energy Transformation and Transfer</i></u></p> <p>1. Identify different forms of energy, including kinetic, gravitational (potential), chemical, thermal, nuclear, and electromagnetic.</p> <p>Specifications:</p> <ul style="list-style-type: none"> • Distinguish between potential and kinetic energy <p>Item Types: <i>MC = multiple choice with or without stimulus</i></p> <p>Sample Question:</p> <p>Which of the following most accurately describes the form of energy found in food that you eat and gasoline in cars?</p> <p>A) mechanical energy</p>

	<p>B) kinetic energy C) chemical potential energy* D) thermal energy</p> <p><i>Standard: II.I.II.1</i> <i>DOK Level: 1</i></p>
<p>II.I.II.4</p> <p>Strand II: The Content of Science</p> <p>Standard I (Physical Science): Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.</p> <p>Benchmark II: Understand the transformation and transmission of energy and how energy and matter interact.</p>	<p>Standard with Test Item Specifications:</p> <p><u><i>Energy Transformation and Transfer</i></u></p> <p>4. Understand how heat can be transferred by conduction, convection, and radiation, and how heat conduction differs in conductors and insulators.</p> <p>Specifications:</p> <ul style="list-style-type: none"> Given different real life examples of heat transfer, be able to distinguish between conduction, convection, and radiation <p>Item Types: <i>MC = multiple choice with or without stimulus</i></p> <p>Sample Question:</p> <p>Heat transferred through an eating utensil from a bowl of hot soup is an example of what type of heat transfer?</p> <p>A) insulation B) radiation C) convection D) conduction*</p> <p><i>Standard: II.I.II.4</i> <i>DOK Level: 1</i></p>

<p>II.I.II.8</p> <p>Strand II: The Content of Science</p> <p>Standard I (Physical Science): Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.</p> <p>Benchmark II: Understand the transformation and transmission of energy and how energy and matter interact.</p>	<p>Standard with Test Item Specifications:</p> <p><u><i>Interactions of Energy and Matter</i></u></p> <p>8. Describe the characteristics of electromagnetic waves (e.g., visible light, radio, microwave, X-ray, ultraviolet, gamma) and other waves (e.g., sound, seismic waves, water waves), including:</p> <ul style="list-style-type: none"> • origin and potential hazards of various forms of electromagnetic radiation • energy of electromagnetic waves carried in discrete energy packets (photons) whose energy is inversely proportional to wavelength. <p>Specifications:</p> <ul style="list-style-type: none"> • Visual (image) will be provided in stimulus to show the different electromagnetic wave spectrum. See sample question • Determine the wavelength and frequency from left to right on the electromagnetic wave spectrum image • Know how the electromagnetic wave spectrum correlates to wave frequency (radio-gamma) (inversely related) • Know where visible light is found on the spectrum
	<p>Item Types: <i>MC = multiple choice with or without stimulus</i></p>
	<p>Sample Question:</p>

Radiation Type	Radio	Microwave	Infrared	Visible	Ultraviolet	X-ray	Gamma ray
Wavelength (m)	10^3	10^{-2}	10^{-5}	0.5×10^{-6}	10^{-8}	10^{-10}	10^{-12}



Which of the wavelengths above would have the highest frequency?

- A) visible
- B) radio
- C) infrared
- D) X-ray*

Standard: II.I.II.8

DOK Level: 2

II.I.III.1

Strand II: The Content of Science

Standard I (Physical Science): Understand the structure and properties of matter, the characteristics of energy, and the interactions between

Standard with Test Item Specifications:

Forces

1. Know that there are four fundamental forces in nature: gravitation, electromagnetism, weak nuclear force, and strong nuclear force.

Specifications:

- Given a specific example, determine which type of fundamental force in nature it is

<p>matter and energy.</p> <p>Benchmark III: Understand the motion of objects and waves, and the forces that cause them.</p>	<p>Item Types: <i>MC = multiple choice with or without stimulus</i></p> <hr/> <p>Sample Question:</p> <p>Which of the following is the attractive force between two objects that is dependent on their masses and the distance between them?</p> <p style="padding-left: 40px;">A) electromagnetic force B) strong nuclear force C) weak nuclear force D) gravitational force*</p> <p><i>Standard: II.I.III.1</i> <i>DOK Level: 1</i></p>
<p>II.I.III.2</p> <p>Strand II: The Content of Science</p> <p>Standard I (Physical Science): Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.</p> <p>Benchmark III: Understand the motion of objects and waves, and the forces that cause them.</p>	<p>Standard with Test Item Specifications:</p> <p><u>Forces</u></p> <p>2. Know that every object exerts gravitational force on every other object, and how this force depends on the masses of the objects and the distance between them</p> <p>Specifications:</p> <ul style="list-style-type: none"> • Use the speed (formula) of gravity • Understand that gravity depends on size and distance between the objects <hr/> <p>Item Types: <i>MC = multiple choice with or without stimulus</i></p> <hr/> <p>Sample Question:</p> <p>Which body exerts the strongest gravitational force on a person?</p>

	<p>A) the moon B) the Sun C) the Earth* D) a chair</p> <p><i>Standard: II.I.III.2</i> <i>DOK Level: 1</i></p>
<p>II.I.III.6</p> <p>Strand II: The Content of Science</p> <p>Standard I (Physical Science): Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.</p> <p>Benchmark III: Understand the motion of objects and waves, and the forces that cause them.</p>	<p>Standard with Test Item Specifications:</p> <p><u>Forces</u> 6. Represent the magnitude and direction of forces by vector diagrams.</p> <p>Specifications:</p> <ul style="list-style-type: none"> • Calculate displacement vectors using basic math <p>Item Types: <i>MC = multiple choice with or without stimulus</i></p> <p>Sample Question:</p> <p>If an object is acted upon by a force of 14N to the east, and a second force of 15 N to the east, calculate the magnitude and direction of the resultant force.</p> <p>A) 421 N, E B) 29 N, E * C) 210 N, E D) 21 N, E</p> <p><i>Standard: II.I.III.6</i> <i>DOK Level: 2</i></p>
<p>II.I.III.7</p>	<p>Standard with Test Item Specifications:</p>

<p>Strand II: The Content of Science</p> <p>Standard I (Physical Science): Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.</p> <p>Benchmark III: Understand the motion of objects and waves, and the forces that cause them.</p>	<p><u>Forces</u></p> <p>7. Know that when one object exerts a force on a second object, the second object exerts a force of equal magnitude and in the opposite direction on the first object (i.e., Newton’s Third Law).</p> <p>Specifications:</p> <ul style="list-style-type: none"> • Identify the 4 types of friction (static, sliding, rolling, and fluid friction) • Using a real-life example, be able to describe how friction affects motion
	<p>Item Types: <i>MC = multiple choice with or without stimulus</i></p> <p>Sample Question:</p> <p>Which type of friction is in play when a force is applied to an object but the object is not in motion?</p> <p>A) rolling friction B) sliding friction C) static friction* D) fluid friction</p> <p><i>Standard: II.I.III.7</i> <i>DOK Level: 1</i></p>
<p>II.I.III.8</p> <p>Strand II: The Content of Science</p> <p>Standard I (Physical Science): Understand the structure and</p>	<p>Standard with Test Item Specifications:</p> <p><u>Motion</u></p> <p>8. Apply Newton’s Laws to describe and analyze the behavior of moving objects, including:</p> <ul style="list-style-type: none"> • displacement, velocity, and acceleration of a moving object • Newton’s Second Law, $F = ma$ (e.g., momentum and its conservation, the

<p>properties of matter, the characteristics of energy, and the interactions between matter and energy.</p> <p>Benchmark III: Understand the motion of objects and waves, and the forces that cause them.</p>	<p>motion of an object falling under gravity, the independence of a falling object's motion on mass)</p> <ul style="list-style-type: none"> • circular motion and centripetal force <p>Specifications:</p> <ul style="list-style-type: none"> • Calculate acceleration given force and mass
	<p>Item Types: <i>MC = multiple choice with or without stimulus</i></p>
	<p>Sample Question:</p> <p>Using Newton's second law, when a force of 350 N is applied to a 125 kg object, calculate the object's acceleration. (Disregard friction)</p> <p>A) 0.36 m/s^2 B) 3.6 m/s^2 C) 12.5 m/s^2 D) 2.8 m/s^2*</p> <p><i>Standard: II.I.III.8</i> <i>DOK Level: 2</i></p>
<p>II.I.III.10</p> <p>Strand II: The Content of Science</p> <p>Standard I (Physical Science): Understand the structure and properties of matter, the</p>	<p>Standard with Test Item Specifications:</p> <p><u>Motion</u> 10. Describe wave propagation using amplitude, wavelength, frequency, and speed.</p> <p>Specifications:</p> <ul style="list-style-type: none"> • Understand that wavelength and frequency are inversely related

<p>characteristics of energy, and the interactions between matter and energy.</p> <p>Benchmark III: Understand the motion of objects and waves, and the forces that cause them.</p>	<ul style="list-style-type: none"> ● Know that the speed of light is equal to frequency x acceleration ● Conceptual questions, no calculations
	<p>Item Types: <i>MC = multiple choice with or without stimulus</i></p>
	<p>Sample Question:</p> <p>The speed of a wave is dependent upon which of the following?</p> <p>A) frequency and amplitude B) wavelength and amplitude C) frequency and wavelength* D) wavelength and velocity</p> <p><i>Standard: II.I.III.10</i> <i>DOK Level: 1</i></p>
<p>II.I.III.11</p> <p>Strand II: The Content of Science</p> <p>Standard I (Physical Science): Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.</p> <p>Benchmark III: Understand the motion of objects and waves, and the forces that cause them.</p>	<p>Standard with Test Item Specifications:</p> <p><u>Motion</u> 11. Explain how the interactions of waves can result in interference, reflection, and refraction.</p> <p>Specifications:</p> <ul style="list-style-type: none"> ● Given a variety of real-life examples, identify which type of wave interaction occurs
	<p>Item Types: <i>MC = multiple choice with or without stimulus</i></p>
	<p>Sample Question:</p>

Which of the following describes what happens to the wave that travels around obstacles or through openings in obstacles?

- A) reflection
- B) deflection
- C) refraction
- D) diffraction*

Standard: II.I.III.11

DOK Level: 1

Physical Science EoC Reporting Category Alignment Framework					
Reporting Category	Standard	DOK (Count by DOK)			Grand Total
		1	2	3	
Scientific Thinking & Practice	I.I.I.1		1		1
	I.I.I.2		1		1
	I.I.I.4	1			1
	I.I.II.2	1			1
	I.I.III.4		1		1
	I.I.III.5	2			2
Properties of Matter	II.I.I.1	1	2		3
	II.I.I.2	3	1		4
	II.I.I.4	1	1		2
Structure of Matter	II.I.I.6	1	1		2
	II.I.I.8	1	1		2
	II.I.I.10	2			2
Chemical Reactions	II.I.I.13	2			2
	II.I.I.14	2			2
Energy Transformation	II.I.II.1	1	2		3
	II.I.II.4	1	1		2
Interactions of Energy & Matter	II.I.II.8	3	2		5
Forces	II.I.III.1	1			1
	II.I.III.2	1	1	1	3
	II.I.III.6	1	1		2
	II.I.III.7	2	1		3
Motion	II.I.III.8		1		1
	II.I.III.10	1	1		2
	II.I.III.11	2			2
	Grand Total	30	19	1	50

NMPED Reference Sheet

Physical Science

Acceleration = $\frac{\text{final velocity} - \text{initial velocity}}{\text{time}}$ ($a = \frac{v_f - v_i}{t}$)

Speed = $\frac{\text{distance}}{\text{time}}$ ($v = \frac{d}{t}$)

Density = $\frac{\text{mass}}{\text{volume}}$ ($D = \frac{m}{V}$)

Force = mass \times acceleration ($F = ma$)

Kelvin = $^{\circ}\text{Celsius} + 273$ ($K = ^{\circ}\text{C} + 273$)

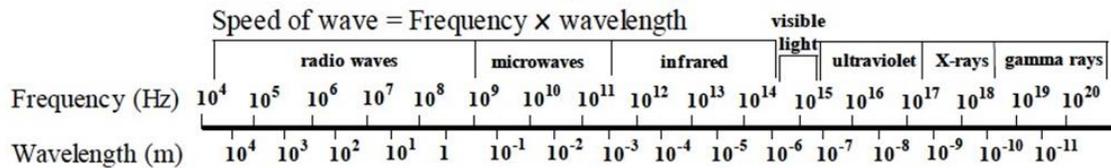
Acceleration of gravity = $g \approx 10 \frac{\text{m}}{\text{sec}^2}$

Weight = mass \times acceleration of gravity ($w = mg$)

Volume of a rectangular solid = length \times width \times height ($V = lwh$)

Electromagnetic Spectrum

Speed of wave = Frequency \times wavelength



Periodic Table of the Elements

1 IA 1A																	18 VIIIA 8A						
1 H Hydrogen 1.008																	2 He Helium 4.003						
3 Li Lithium 6.941	4 Be Beryllium 9.012																	5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180
11 Na Sodium 22.990	12 Mg Magnesium 24.305	3 IIIB 3B	4 IVB 4B	5 VB 5B	6 VIB 6B	7 VIIB 7B	8 VIII 8	9 VIII 8	10 VIII 8	11 IB 1B	12 IIB 2B	13 Al Aluminum 26.982	14 Si Silicon 28.086	15 P Phosphorus 30.974	16 S Sulfur 32.066	17 Cl Chlorine 35.453	18 Ar Argon 39.948						
19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.867	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.631	33 As Arsenic 74.922	34 Se Selenium 78.971	35 Br Bromine 79.904	36 Kr Krypton 83.798						
37 Rb Rubidium 85.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.95	43 Tc Technetium 98.907	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.906	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.414	49 In Indium 114.818	50 Sn Tin 118.711	51 Sb Antimony 121.760	52 Te Tellurium 127.6	53 I Iodine 126.904	54 Xe Xenon 131.294						
55 Cs Cesium 132.905	56 Ba Barium 137.328	57-71	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.217	78 Pt Platinum 195.085	79 Au Gold 196.967	80 Hg Mercury 200.592	81 Tl Thallium 204.383	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium [208.982]	85 At Astatine 209.987	86 Rn Radon 222.018						
87 Fr Francium 223.020	88 Ra Radium 226.025	89-103	104 Rf Rutherfordium [261]	105 Db Dubnium [262]	106 Sg Seaborgium [266]	107 Bh Bohrium [264]	108 Hs Hassium [269]	109 Mt Meitnerium [278]	110 Ds Darmstadtium [281]	111 Rg Roentgenium [280]	112 Cn Copernicium [285]	113 Nh Nihonium [286]	114 Fl Flerovium [289]	115 Mc Moscovium [289]	116 Lv Livermorium [293]	117 Ts Tennessine [294]	118 Og Oganesson [294]						

Lanthanide Series	57 La Lanthanum 138.905	58 Ce Cerium 140.116	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.243	61 Pm Promethium 144.913	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.500	67 Ho Holmium 164.930	68 Er Erbium 167.259	69 Tm Thulium 168.934	70 Yb Ytterbium 173.055	71 Lu Lutetium 174.967
Actinide Series	89 Ac Actinium 227.028	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium 237.048	94 Pu Plutonium 244.064	95 Am Americium 243.061	96 Cm Curium 247.070	97 Bk Berkelium 247.070	98 Cf Californium 251.080	99 Es Einsteinium [254]	100 Fm Fermium 257.095	101 Md Mendelevium 258.1	102 No Nobelium 259.101	103 Lr Lawrencium [262]