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|  | **Properties of Matter** | **Changes in Matter** | **Forms of Energy** | **Energy Transfer and Conservation** | **Motion at the Macroscopic Level** | **Forces Affecting Motion** | **Objects In The Universe** | **History of the Earth** | |
| Standard | Students will develop an understanding of the characteristic properties of matter and the relationship of these properties to their structure and behavior. | Students will develop an understanding that interactions can produce changes in a system, although the total quantities of matter and energy remain unchanged. | Students will develop an understanding of the characteristics of energy and the interactions between matter and energy. | Students will develop an understanding of the transfer, transformation, and conservation of energy. | Students will understand how to describe the motion of an object. | Forces Affecting Motion Students will understand that the motion of an object is effected by external forces on it. | Objects In The Universe Students shall demonstrate and apply knowledge of objects in the universe using the appropriate equipment and technology. | History of the Earth Students will understand scientific theories of how the earth’s surface is formed and how those theories developed. | |
| EC1 | (Describing Matter) 3. Identify, compare, and sort objects by similar or different physical properties (e.g., size, shape, color, texture, smell, weight). |  | (Forms of Energy) 1. Observe how energy does things (e.g., batteries, the sun, wind, electricity).  (Forms of Energy) 5. Describe the usefulness of some forms of energy (e.g., electricity, sunlight, wind, sound) and how energy (e.g., heat, light,) can affect common objects (e.g., sunlight warms dark objects, heat melts candles).  (Light Energy) 1. Identify natural sources of light (e.g., sun, fireflies, deep sea creatures, fire, lightning) and artificial sources of light (e.g., light bulbs, matches, candles).  (Light Energy) 2. Observe and record shadows at different times of the day. |  |  |  | (The Solar System) 1. Identify objects in the day and night sky (e.g., moon, stars, or sun).  (The Moon) 1. Identify that the moon and stars are usually seen at night. |  | |
| EC2 | (Describing Matter) 1. Identify the materials that make up an object. (e.g., desk is made up of wood and metal, bike is made up of metal, rubber, and plastic)  (Describing Matter) 2. Describe objects in terms of what they are made of and their physical properties  (Describing Matter) 3. Compare, sort and group objects in terms of what they are made of (e.g., clay, cloth, paper, or metal)  (Describing Matter) 1. Identify the observable properties of different objects, such as color, size, shape, weight and texture.  (Describing Matter) 2. Use attributes of properties to state why objects are grouped together (e.g., things that roll, things that are rough).  (Describing Matter) 3. Identify, compare, and sort objects by similar or different physical properties (e.g., size, shape, color, texture, smell, weight).  (States of Matter) 1. Identify matter that can be a liquid or solid (e.g., water).  (States of Matter) 3. Investigate and recognize water can change from a liquid to a solid (freeze), and back again to a liquid (melt), as the result of temperature changes.  (Magnetic Properties) 1. Observe and sort objects that are and are not attracted to magnets. | (Physical and Chemical Changes) 2. Describe how the properties of certain materials can change when specific actions are applied to them, such as freezing, mixing, heating, cutting, dissolving and bending.  (Physical and Chemical Changes) 4. Investigate and explain that not all materials react the same way when an action is applied to them. | (Heat Energy) 1. Classify objects in terms of their relative temperature (e.g., hotter and colder).  (Light Energy) 3. Investigate the properties of transparent and opaque objects (e.g., plastic wrap and aluminum foil). |  | (Motion) 1. Describe spatial relationships (i.e., above, below, next to, left, right, middle, center) of objects.  (Motion) 2. Describe the ways things can be made to move (e.g. straight, zigzag, up and down, round and round, back and forth, or fast and slow). |  |  |  | |
| Kindergarten | (Describing Matter) 1. Identify the materials that make up an object. (e.g., desk is made up of wood and metal, bike is made up of metal, rubber, and plastic)  (Describing Matter) 2. Describe objects in terms of what they are made of and their physical properties  (Describing Matter) 3. Compare, sort and group objects in terms of what they are made of (e.g., clay, cloth, paper, or metal)  (Describing Matter) 1. Identify the observable properties of different objects, such as color, size, shape, weight and texture.  (Describing Matter) 2. Use attributes of properties to state why objects are grouped together (e.g., things that roll, things that are rough).  (Describing Matter) 3. Identify, compare, and sort objects by similar or different physical properties (e.g., size, shape, color, texture, smell, weight).  (Measuring Matter) 1. Use non- standard units of measure (e.g., string, paper clips) to compare the size and weight of non-living materials.  (Measuring Matter) 2. Use simple tools (e.g. balance scale, see-saw) to explore the property of weight.(Magnetic Properties) 1. Observe and sort objects that are and are not attracted to magnets.  (Magnetic Properties) 2. Predict whether or not an object will be attracted to a magnet.  (Magnetic Properties) 3. Describe what happens when like and opposite poles of a magnet are placed near each other.  (Magnetic Properties) 4. Describe the physical properties of magnets.  (Magnetic Properties) 5. Determine the relative strength of various magnets (e.g. size, number of paper clips attracted, etc.) | (Physical and Chemical Changes) 2. Describe how the properties of certain materials can change when specific actions are applied to them, such as freezing, mixing, heating, cutting, dissolving and bending. | (Forms of Energy) 1. Observe how energy does things (e.g., batteries, the sun, wind, electricity).  (Sound Energy) 1. Demonstrate and identify sounds as soft or loud.  (Sound Energy) 2. Demonstrate how sound is made in a variety of ways (e.g., singing, whispering, striking an object).  (Sound Energy) 3. Demonstrate how sound can change in pitch and volume.  (Sound Energy) 4. Compare and contrast the change in length, tension, or thickness of a vibrating object on the frequency of vibration (e.g., string, wire, or rubber band).  (Sound Energy) 5. Demonstrate that the pitch of a sound is dependent on the frequency of the vibration producing it.  (Light Energy) 3. Investigate the properties of transparent and opaque objects (e.g., plastic wrap and aluminum foil). |  | (Motion) 1. Describe spatial relationships (i.e., above, below, next to, left, right, middle, center) of objects.  (Motion) 2. Describe the ways things can be made to move (e.g. straight, zigzag, up and down, round and round, back and forth, or fast and slow).  (Motion) 3. Describe an objects position by locating it relative to another object or the background.  (Motion) 4. Demonstrate a variety of ways to make things move and describe what causes them to change speed, direction and/or stop. | (Effect of Forces) 1. Describe the position of an object by referencing its location in relation to another object or background.  (Effect of Forces) 2. Describe and demonstrate how the position and motion of an object can be changed by applying force, such as pushing and pulling.  (Effect of Forces) 3. Compare the effects of force (pushes or pulls) on the motion of an object.  (Effect of Forces) 4. Identify contact /non- contact forces that affect motion of an object (e.g., gravity, magnetism and collision).  (Effect of Forces) 5. Explain that the strength of a force and mass of an object influence the amount of change in an object’s motion.  (Effects of Forces) 2. Explore the effects some objects have on others even when the two objects might not touch (e.g., magnets).  (Effects of Forces) 3. Describe the properties of magnetism and demonstrate how magnets can be used to move some things without touching them.  (Effects of Forces) 4. Use observations of magnets in relation to other objects to describe the properties of magnetism (i.e., attract or repel certain objects or has no effect).  (Gravity and Friction) 2. Describe the ways that different objects may balance or topple in various situations.  (Gravity and Friction) 3. Describe and demonstrate that things close to the Earth drop to the ground unless something supports them.  (Gravity and Friction) 4. Describe the effect of retarding forces such as friction on the motion of objects.  (Gravity and Friction) 5.Describe the effects of variables on an object’s motion (e.g., incline angle, friction, gravity, applied forces). |  |  | |
| Grade 1 | (Describing Matter) 4. Describe features of the object or material that are only visible with the use of the magnifier.  (Measuring Matter) 4. Select the appropriate metric system tools for measuring length, width, temperature, volume, and mass. |  | (Forms of Energy) 1. Observe how energy does things (e.g., batteries, the sun, wind, electricity).  (Forms of Energy) 2. Explain that energy comes from different sources, such as electricity and water, and is utilized in many common objects.  (Solar Energy) 1. Describe the effects of the sun’s energy on different materials.  (Solar Energy) 2. Identify the sun as the main source of the Earth’s light and heat energy.  (Solar Energy) 5. Describe how the Sun, a major energy source for the Earth, affects the planet’s surface. |  |  | (Effect of Forces) 3. Compare the effects of force (pushes or pulls) on the motion of an object. |  |  | |
| Grade 2 | (Describing Matter) 1. Identify the materials that make up an object. (e.g., desk is made up of wood and metal, bike is made up of metal, rubber, and plastic)  (Describing Matter) 2. Describe objects in terms of what they are made of and their physical properties  (Describing Matter) 3. Compare, sort and group objects in terms of what they are made of (e.g., clay, cloth, paper, or metal)  (Describing Matter) 1. Identify the observable properties of different objects, such as color, size, shape, weight and texture.  (Describing Matter) 2. Use attributes of properties to state why objects are grouped together (e.g., things that roll, things that are rough).  (Describing Matter) 3. Identify, compare, and sort objects by similar or different physical properties (e.g., size, shape, color, texture, smell, weight).  (Describing Matter) 4. Identify, compare, and sort objects by similar or different physical properties (e.g., size, shape, color, texture, smell, weight, temperature, flexibility, odor, elasticity, length, mass, area, volume, perimeter).  (Describing Matter) 5. Collect and organize data about physical properties in order to classify objects or draw conclusions about objects and their characteristic properties (e.g., temperature, color, size, shape, weight, texture, flexibility).  (States of Matter) 1. Identify matter that can be a liquid or solid (e.g., water).  (States of Matter) 2. Identify and compare solids (e.g. have a definite shape) and liquids (e.g. take the shape of their containers).  (States of Matter) 3. Investigate and recognize water can change from a liquid to a solid (freeze), and back again to a liquid (melt), as the result of temperature changes.  (States of Matter) 4. Compare the observable physical properties of solids, liquids, or gases (air) (i.e., visible vs. invisible, changes in shape, changes in the amount of space occupied).  (States of Matter) 5.Make a prediction about what might happen to the state of common materials when heated or cooled; or categorize materials as solid, liquid, or gas.  (Measuring Matter) 2. Use simple tools (e.g. balance scale, see-saw) to explore the property of weight.  (Measuring Matter) 3. Use standard tools to measure objects or materials (e.g., ruler, meter stick, measuring tape, pan balance, thermometer, graduated cylinder).  [ Targeted Standards:1 ]  • (Measuring Matter) 4. Select the appropriate metric system tools for measuring length, width, temperature, volume, and mass. | (Physical and Chemical Changes) 2. Describe how the properties of certain materials can change when specific actions are applied to them, such as freezing, mixing, heating, cutting, dissolving and bending.  (Physical and Chemical Changes) 3. Demonstrate that when some substances combine, they may retain their individual properties (e.g. salt and pepper) and that some may lose their individual properties (e.g. powdered drink in water).  (Physical and Chemical Changes) 4. Investigate and explain that not all materials react the same way when an action is applied to them.  (Physical and Chemical Changes) 5. Differentiate between a physical change, such as melting, and a chemical change, such as rusting. | (Heat Energy) 4. Explain that thermal energy (heat) moves more rapidly in thermal conductors (e.g., metal pan) than in insulators (e.g., plastic handle).  (Interactions of Matter) 4. Classify a variety of materials as those that can reflect or absorb light.  (Solar Energy) 2. Identify the sun as the main source of the Earth’s light and heat energy. |  |  |  | (Stars and Galaxies) 1.Explain that there are more stars in the sky than anyone can easily count.  (Stars and Galaxies) 2. Explain that stars are not scattered evenly and they are not always the same brightness and color.  (Stars and Galaxies) 3. Explain that the patterns in the sky remain stable but appear to move across the sky because of the Earth’s motion.  (Stars and Galaxies) 4. Explain that stars are like the sun, some being smaller and some larger, but so far away that they look like points of light.  (Stars and Galaxies) 5.Investigate and describe how distance affects the brightness of any light source.  (The Solar System) 1. Identify objects in the day and night sky (e.g., moon, stars, or sun).  (The Solar System) 2. Observe that the sun can be seen only in the daytime, but the moon can be seen sometimes at night and sometimes during the day.  (The Solar System) 3. Observe and describe the sun, moon, planets, and stars.  Solar System) 4. Identify the sun, moon, and the Earth as components of our solar system.  (The Solar System) 5. Observe and describe properties, locations, and movements of the sun, moon, stars, and clouds.  (The Earth) 3. Describe Earth’s position and movement in the solar system.  (The Earth) 4. Use models to demonstrate how the rotation of the Earth on its axis every 24 hours produces the night-and-day cycle.  (The Earth) 5.Use models to demonstrate how the revolution of the Earth around the sun produces the yearly cycle.  [ Targeted Standards:1 ]  ESS.1.4C: By the end of Grade 4, students will describe the moon’s orbit around the Earth as once in about 28 days and our changing views of the moon allow us to see a changing portion of the lighted side of the moon, which we call “phases.”  • (The Moon) 1. Identify that the moon and stars are usually seen at night  [ Targeted Standards:1 ]  • (The Moon) 2. Observe and discuss the importance of objects in the day and night sky  [ Targeted Standards:1 ]  • (The Moon) 3. Observe and describe the changes of the moon’s appearance over a month. |  | |
|  | (Describing Matter) 3. Compare, sort and group objects in terms of what they are made of (e.g., clay, cloth, paper, or metal)  (Describing Matter) 5. Use measures of weight (data) to demonstrate that the whole equals the sum of its parts.  (Describing Matter) 1. Identify the observable properties of different objects, such as color, size, shape, weight and texture.  (Describing Matter) 5. Collect and organize data about physical properties in order to classify objects or draw conclusions about objects and their characteristic properties (e.g., temperature, color, size, shape, weight, texture, flexibility).  (States of Matter) 1. Identify matter that can be a liquid or solid (e.g., water).  (States of Matter) 3. Investigate and recognize water can change from a liquid to a solid (freeze), and back again to a liquid (melt), as the result of temperature changes.  (States of Matter) 4. Compare the observable physical properties of solids, liquids, or gases (air) (i.e., visible vs. invisible, changes in shape, changes in the amount of space occupied).  (States of Matter) 5.Make a prediction about what might happen to the state of common materials when heated or cooled; or categorize materials as solid, liquid, or gas.  Grade 4, Students will use measures of weight (data) to demonstrate that the whole equals the sum of its parts.  (Measuring Matter) 2. Use simple tools (e.g. balance scale, see-saw) to explore the property of weight.  (Measuring Matter) 3. Use standard tools to measure objects or materials (e.g., ruler, meter stick, measuring tape, pan balance, thermometer, graduated cylinder).  (Measuring Matter) 4. Select the appropriate metric system tools for measuring length, width, temperature, volume, and mass.  Matter) 5. Show that the weight of an object remains the same despite a change in its shape. | (Physical and Chemical Changes) 2. Describe how the properties of certain materials can change when specific actions are applied to them, such as freezing, mixing, heating, cutting, dissolving and bending.  (Physical and Chemical Changes) 3. Demonstrate that when some substances combine, they may retain their individual properties (e.g. salt and pepper) and that some may lose their individual properties (e.g. powdered drink in water).  (Physical and Chemical Changes) 4. Investigate and explain that not all materials react the same way when an action is applied to them. | (Forms of Energy) 1. Observe how energy does things (e.g., batteries, the sun, wind, electricity).  (Forms of Energy) 3. Describe how energy produces changes (e.g., heat melts ice, gas makes car go uphill, electricity makes TV work).  (Forms of Energy) 5. Describe the usefulness of some forms of energy (e.g., electricity, sunlight, wind, sound) and how energy (e.g., heat, light,) can affect common objects (e.g., sunlight warms dark objects, heat melts candles).  (Sound Energy) 1. Demonstrate and identify sounds as soft or loud.  (Sound Energy) 2. Demonstrate how sound is made in a variety of ways (e.g., singing, whispering, striking an object).  (Sound Energy) 3. Demonstrate how sound can change in pitch and volume.  (Sound Energy) 4. Compare and contrast the change in length, tension, or thickness of a vibrating object on the frequency of vibration (e.g., string, wire, or rubber band).  (Sound Energy) 5. Demonstrate that the pitch of a sound is dependent on the frequency of the vibration producing it.  (Solar Energy) 2. Identify the sun as the main source of the Earth’s light and heat energy.  (Solar Energy) 3. Compare the heating and cooling rates of air, land, and water.  (Solar Energy) 5. Describe how the Sun, a major energy source for the Earth, affects the planet’s surface. |  |  |  | (The Earth) 3. Describe Earth’s position and movement in the solar system.  (The Earth) 4. Use models to demonstrate how the rotation of the Earth on its axis every 24 hours produces the night-and-day cycle.  (The Earth) 5.Use models to demonstrate how the revolution of the Earth around the sun produces the yearly cycle.  (The Moon) 3. Observe and describe the changes of the moon’s appearance over a month.  (The Moon) 4. Describe the relative movement of the Earth and moon in relation to the sun  (The Moon) 5. Demonstrate the phases of the moon by showing the alignment of the earth, moon, and sun. | (Erosion and Weathering) 2. Identify the processes of physical weathering that break down rocks at Earth's surface (i.e., water movement, freezing,plant growth, wind).  (Erosion and Weathering) 3. Distinguish between weathering (i.e., wearing down and breaking of rock surfaces) and erosion (i.e., the movement of materials).  (Erosion and Weathering) 4. Model erosion of Earth materials and collection of these materials as part of the process that leads to soil (e.g., water moving sand in a playground area and depositing this sand in another area).  (Erosion and Weathering) 5.Explain how physical and chemical weathering leads to erosion and the formation of soils and sediments.  (Results of the Processes) 1. Observe seasonal and weather changes throughout the school year.  (Results of the Processes) 3. Investigate local landforms and how wind, water, or ice have shaped and reshaped them (e.g. severe weather).  (Results of the Processes) 4. Use or build models to simulate the effects of how wind and water shape and reshape the land (e.g., erosion, sedimentatio n, deposition, glaciation).  (Results of the Processes) 5.Identify sudden and gradual changes that affect the Earth (e.g. sudden change = flood; gradual change = erosion caused by oceans).  (Earth’s Features) 3. Describe land features (including volcanoes, mountains, valleys, canyons, caverns, and islands) by using pictures, diagrams, and maps.  (Earth’s Features) 4.Describe changes in Earth’s surface that are due to slow processes (including weathering, erosion, and deposition  (Earth’s Features) 5. Describe changes in Earth’s surface that are due to rapid processes (including landslides, volcanic eruptions, floods, and earthquakes).  (Interaction of Water with Earth Materials) 3. Conduct investigations and use observational data to describe how water moves rocks and soils.  (Interaction of Water with Earth Materials) 4. Examine materials that compose soil (i.e., sand, clay, humus, gravel, water) and describe these on the basis of their properties (i.e., color, luster, granularity, texture, mass relative to size, particle size, ability to absorb water, pore space, ability to compact).  (Interaction of Water with Earth Materials) 5.Explain how waves, wind, water, glacier movement, and ice, shape and reshape the Earth’s land surface by eroding rock and sand in some areas, and depositing them in other areas.  (Fossils) 2. Identify types of fossils (including molds, casts, and preserved parts of plants and animals).  (Fossils) 3.Identify features of fossils that can be used to compare them to living organisms that are familiar (e.g., shape, size and structure of skeleton, patterns of leaves). | |
| Grade 4 | States of Matter) 1. Identify matter that can be a liquid or solid (e.g., water).  (States of Matter) 5.Make a prediction about what might happen to the state of common materials when heated or cooled; or categorize materials as solid, liquid, or gas. | (Physical and Chemical Changes) 2. Describe how the properties of certain materials can change when specific actions are applied to them, such as freezing, mixing, heating, cutting, dissolving and bending. |  |  |  | (Simple Machines) 5. Illustrate quantitatively mechanical advantage of simple machines. |  |  | |
| Grade 5 |  |  | (Forms of Energy) 1. Observe how energy does things (e.g., batteries, the sun, wind, electricity).  (Forms of Energy) 2. Explain that energy comes from different sources, such as electricity and water, and is utilized in many common objects.  (Forms of Energy) 3. Describe how energy produces changes (e.g., heat melts ice, gas makes car go uphill, electricity makes TV work).  (Forms of Energy) 4. Identify the various forms of energy, such as electrical, light, heat, sound and explain that these forms of energy can affect common objects and are involved in common events.  (Forms of Energy) 5. Describe the usefulness of some forms of energy (e.g., electricity, sunlight, wind, sound) and how energy (e.g., heat, light,) can affect common objects (e.g., sunlight warms dark objects, heat melts candles).  (Heat Energy) 2. Identify some examples where heat is released (e.g., burning candles, rubbing hands, running).  (Heat Energy) 3. Describe that heat can be produced (e.g., burning, rubbing, and mixing some substances).  (Heat Energy) 4. Explain that thermal energy (heat) moves more rapidly in thermal conductors (e.g., metal pan) than in insulators (e.g., plastic handle).  (Heat Energy) 5. Describe the effectiveness of different insulating and conducting materials with respect to thermal energy (heat) flow.  (Interactions of Matter) 3. Classify a variety of materials on whether they conduct heat (conductors) or do not conduct heat (insulators).  (Interactions of Matter) 5. Classify a variety of materials on whether they conduct electricity (conductors) or do not conduct electricity (insulators).  (Light Energy) 4. Describe how light can be reflected by a mirror, bent by a lens, or absorbed by the object.  (Light Energy) 5. Describe ways light can interact with matter, such as transmission (which includes refraction), absorption, and scattering (which includes reflection).  (Solar Energy) 1. Describe the effects of the sun’s energy on different materials.  (Solar Energy) 2. Identify the sun as the main source of the Earth’s light and heat energy.  (Solar Energy) 3. Compare the heating and cooling rates of air, land, and water.  (Solar Energy) 4. Analyze data to explain the heating and cooling rates of air, land, and water.  (Solar Energy) 5. Describe how the Sun, a major energy source for the Earth, affects the planet’s surface. | (Electricity and Transformation of Energy) 3. Identify the use of electricity.  (Electricity and Transformation of Energy) 4. Construct and explain a simple electric circuit.  (Electricity and Transformation of Energy) 5. Demonstrate that electricity flowing in circuits can produce light, heat, sound, and magnetic effects.  (Electricity and Transformation of Energy) 6. Compare the following ways in which energy may be transformed: mechanical to electrical; electrical to thermal.  (Electricity and Transformation of Energy) 7. Trace energy transformation n in a simple closed system (e.g., a flashlight).  (Transmission of Energy) 6. Demonstrate that vibrations in materials may produce waves that spread away from the source in all directions (e.g., earthquake waves and sound waves. |  | (Effects of Forces) 5.Explain that electrically charged material pulls on all other materials and can attract or repel other charged materials. |  |  | |
| Grade 6 | (Describing Matter) 6. Explain that all matter is composed of minute particles called atoms; and explain that all substances are composed of atoms, each arranged into different groupings  (Describing Matter) 7. Identify elements as substances that contain only one kind of atom and explain that elements do not break down by normal laboratory reactions, such as heating, exposure to electric current, and reaction to acid.  (Describing Matter) 8. Use models or diagrams to show the difference between atoms and molecules.  (Describing Matter) 9. Given graphic or written information, classify matter as an atom / molecule or element/ compound (not the structure of an atom).  (Periodic Table) 6. Explain that over one hundred elements exist, and identify the periodic table as a tool for organizing the information about them.  (Periodic Table) 7. Explain that elements are organized in the periodic table according to their properties.  (Periodic Table) 9. Predict how an atom's electron arrangement influences its ability to transfer or share electrons and is related its position on the periodic table.  (Compounds) 7. Describe how elements can combine to form new substances that often have different properties.  (Compounds) 8. Demonstrate with atomic models (e.g., ball and stick) how atoms can combine in a large number of ways to form a molecule or formula unit (crystal).  (Compounds) 9. Use data to infer or predict that the total amount of mass in a closed system stays the same, regardless of how substances interact (conservation of matter).  (States of Matter) 7. Create diagrams or models that represent the states of matter at the molecular level.  (States of Matter) 9. Observe the physical processes of evaporation and condensation , or freezing and melting, and describe these changes in terms of molecular motion and conservation of mass.  (Changes of State) 6. Predict the changes in the state of matter when adding or taking away heat (e.g., ice melting, water boiling or freezing, condensation/ evaporation).  (Changes of State) 7. Describe how matter changes from one phase to another (e.g., condensation, evaporation).  (Changes of State) 8. Describe the movement of individual particles and verify the conservation of matter during the phase changes (e.g., melting, boiling, or freezing).  (Changes of State) 9. Explain that states of matter depend on the arrangement of the molecules and their motion.  (Measuring Matter) 6. Demonstrate that regardless of how parts of an object are arranged, the mass of the whole is always the same as the sum of the masses of its parts.  (Measuring Matter) 9. Differentiate between volume and mass and calculate the density of large and small quantities of a variety of substances (e.g., aluminum foil, water, copper, clay, rock).  [ Targeted Standards:1 Assessments:2 ] | (Physical and Chemical Changes) 6. Describe how energy has the ability to create change.  (Physical and Chemical Changes) 8. Identify characteristics of chemical changes: (e.g. burning, production of a new substance, production of light, color change, endothermic and exothermic reactions, reactivity).  (Chemical Reactions) 6. Identify the reactants and/or products in a chemical reaction. |  | (Potential and Kinetic Energy) 6. Describe how an object can have potential energy due to its position or chemical composition .  (Potential and Kinetic Energy) 7. Differentiate between kinetic energy, which is the energy of motion and potential energy, which depends on relative position.  (Potential and Kinetic Energy) 8. Compare the potential and kinetic energy within a system at various locations or times. | (Motion) 6. Describe variables that change an object’s speed, direction, or both and identify and describe the forces that cause the change in motion.  (Motion) 7. Explain motion in terms of frames of reference and analyze graphs depicting motion and predicted future motion.  (Motion) 8. Create a graph devised from measurement s of moving objects and their interactions, including: position-time graphs and velocity-time graphs.  (Motion) 9. Interpret the relationships of distance versus time, speed versus time, and acceleration versus time graphs. | (Effects of Forces) 6. Use data to predict how a change in force (greater/less) might affect the position, direction of motion, or speed of an object (e.g., ramps and balls).  (Effects of Forces) 7. Investigate and describe how the acceleration of a body is dependent on its mass and the net applied force (Newton’s Second Law).  (Effects of Forces) 8. Describe Newton’s Laws of Motion; identify examples, illustrate qualitatively and quantitatively drawing vector examples.  (Effects of Forces) 9. Demonstrate that an object in motion that is unaffected by a force will continue to move at a constant speed and in a straight line. (Newton’s First Law).  (Effects of Forces) 6. Explain that just as electric currents can produce magnetic forces, magnets can cause electric currents.  (Effects of Forces) 7. Explain that when a force is applied to an object, it reacts in one of three ways: the object speeds up, slows down, or goes in a different direction.  (Effects of Forces) 8. Describe the relationship between the strength of a force on an object and the resulting effect, such as the greater the force, the greater the change in motion.  (Effects of Forces) 9. Use data to determine or predict the overall (net) effect of multiple forces (e.g., friction, gravitational, magnetic) on the position, speed, and direction of motion of objects.  (Gravity and Friction) 6. Explain that the Earth’s gravitational force pulls any object toward it.  (Gravity and Friction) 7. Explain the effect of gravity on falling objects (e.g., g= 9.8m/s2 , object dropped on earth and on moon).  (Gravity and Friction) 8. Explain that the force of gravity gets stronger the closer one gets to an object and decreases the further away one gets from it.  (Gravity and Friction) 9. Predict the effect of gravitational forces between pairs of objects (i.e., earth and object’s on the surface, earth and moon, Earth and sun). | (Stars and Galaxies) 6. Describe how different stars can be seen at different times of the year and planets change their positions against the background of stars over time  (Stars and Galaxies) 7. Explain that the Sun is a star located within a galaxy of many other stars, “The Milky Way.”  (Stars and Galaxies) 8. Describe the position of the solar system in the Milky Way galaxy and the universe.  (Stars and Galaxies) 9. Explain that billions of galaxies form most of the visible mass in the universe.  (The Solar System) 6. Investigate and describe the basic components of our solar system (e.g., planets, moons, asteroids, comets, and the sun).  (The Solar System) 7. Give evidence for objects that orbit within the Solar System that impact Earth (e.g. asteroids, comets).  (The Solar System) 8. Explain that the sun’s gravitational pull holds the Earth and other planets in their orbits, just as the planets’ gravitational pull keeps their moons in orbit around them gravity is the force that governs the motion in the solar system.  (The Solar System) 9. Explain through words, charts, diagrams, and models the effects of distance and the amount of mass on the gravitational force between objects.  (Theories Origin of Universe) 8. Provide an example of how technology has helped scientists investigate the universe.  (Theories Origin of Universe) 9. Investigate and report how science has changed the accepted ideas regarding the nature of the universe throughout history.  (The Earth) 6. Explain the alignment of the earth, moon, and sun during solar and lunar eclipses. • (The Earth) 7. Use a model to demonstrate and explain that because the Earth is tilted relative to the plane of the Earth’s yearly orbit around the sun, sunlight falls more intensely on different parts of the Earth during the year.  (The Earth) 8. Explain that the difference in heating of the Earth’s surface produces the planet’s seasons and weather patterns.  (The Earth) 9. Relate the tilt of the earth to the distribution of sunlight throughout the year and its effect on climate.  (The Planets) 6. Explain that the Earth is one of several planets that orbit the sun, and the moon orbits around the Earth.  (The Planets) 7. Observe that different stars can be seen at different times of the year and planets change their positions against the background of stars over time.  [ Targeted Standards:1 ]  • (The Planets) 8. Explain that nine planets of varied size, composition, and surface features move around the sun in elliptical orbits.  [ Targeted Standards:1 Assessments:1 ]  • (The Planets) 9. Compare and contrast the planets in terms of size relative to the earth’s surface and atmospheric features, relative distance from the sun, and ability to support life. | |  |
| Grade 7 | (Compounds) 8. Demonstrate with atomic models (e.g., ball and stick) how atoms can combine in a large number of ways to form a molecule or formula unit (crystal). |  |  |  |  | (Gravity and Friction) 6. Explain that the Earth’s gravitational force pulls any object toward it. (Gravity and Friction) 7. Explain the effect of gravity on falling objects (e.g., g= 9.8m/s2 , object dropped on earth and on moon).  (Gravity and Friction) 8. Explain that the force of gravity gets stronger the closer one gets to an object and decreases the further away one gets from it.  (Gravity and Friction) 9. Predict the effect of gravitational forces between pairs of objects (i.e., earth and object’s on the surface, earth and moon, Earth and sun). | (Stars and Galaxies) 6. Describe how different stars can be seen at different times of the year and planets change their positions against the background of stars over time  (Stars and Galaxies) 7. Explain that the Sun is a star located within a galaxy of many other stars, “The Milky Way.”  (Stars and Galaxies) 8. Describe the position of the solar system in the Milky Way galaxy and the universe.  (Stars and Galaxies) 9. Explain that billions of galaxies form most of the visible mass in the universe.  (The Solar System) 6. Investigate and describe the basic components of our solar system (e.g., planets, moons, asteroids, comets, and the sun).  (The Solar System) 7. Give evidence for objects that orbit within the Solar System that impact Earth (e.g. asteroids, comets).  (The Solar System) 8. Explain that the sun’s gravitational pull holds the Earth and other planets in their orbits, just as the planets’ gravitational pull keeps their moons in orbit around them gravity is the force that governs the motion in the solar system.  (The Solar System) 9. Explain through words, charts, diagrams, and models the effects of distance and the amount of mass on the gravitational force between objects.  (Theories Origin of Universe) 8. Provide an example of how technology has helped scientists investigate the universe.  (Theories Origin of Universe) 9. Investigate and report how science has changed the accepted ideas regarding the nature of the universe throughout history. • (The Earth) 6. Explain the alignment of the earth, moon, and sun during solar and lunar eclipses.  (The Earth) 7. Use a model to demonstrate and explain that because the Earth is tilted relative to the plane of the Earth’s yearly orbit around the sun, sunlight falls more intensely on different parts of the Earth during the year.  (The Earth) 8. Explain that the difference in heating of the Earth’s surface produces the planet’s seasons and weather patterns.  (The Earth) 9. Relate the tilt of the earth to the distribution of sunlight throughout the year and its effect on climate.  (The Planets) 6. Explain that the Earth is one of several planets that orbit the sun, and the moon orbits around the Earth.  (The Planets) 7. Observe that different stars can be seen at different times of the year and planets change their positions against the background of stars over time.  (The Planets) 8. Explain that nine planets of varied size, composition, and surface features move around the sun in elliptical orbits.  [ Targeted Standards:1 ]  • (The Planets) 9. Compare and contrast the planets in terms of size relative to the earth’s surface and atmospheric features, relative distance from the sun, and ability to support life. | | (Fossils) 6. Describe and model the processes of fossil formation.  (Fossils) 7. Describe how fossils provide important evidence of how life and environmenta l conditions have changed.  (Fossils) 8. Explain why more recently deposited rock layers are more likely to contain fossils resembling existing species than older rock layers.  (Fossils) 9. Explain how rocks and fossils are used to understand the age and geological history of the earth (timelines and relative dating, rock layers). |
| Grade 8 | (Describing Matter) 6. Explain that all matter is composed of minute particles called atoms; and explain that all substances are composed of atoms, each arranged into different groupings  (Describing Matter) 7. Identify elements as substances that contain only one kind of atom and explain that elements do not break down by normal laboratory reactions, such as heating, exposure to electric current, and reaction to acid.  (Describing Matter) 8. Use models or diagrams to show the difference between atoms and molecules.  (Describing Matter) 9. Given graphic or written information, classify matter as an atom / molecule or element/ compound (not the structure of an atom).  (Periodic Table) 6. Explain that over one hundred elements exist, and identify the periodic table as a tool for organizing the information about them.  (Periodic Table) 7. Explain that elements are organized in the periodic table according to their properties.  (Periodic Table) 8. Use the periodic table to obtain information about a given element.  (Periodic Table) 9. Predict how an atom's electron arrangement influences its ability to transfer or share electrons and is related its position on the periodic table.  (Compounds) 7. Describe how elements can combine to form new substances that often have different properties.  (Compounds) 8. Demonstrate with atomic models (e.g., ball and stick) how atoms can combine in a large number of ways to form a molecule or formula unit (crystal).  (Compounds) 9. Use data to infer or predict that the total amount of mass in a closed system stays the same, regardless of how substances interact (conservation of matter).  (Mixtures) 7. Differentiate between a mixture and a pure substance.  (Mixtures) 8. Describe the different atoms and molecules in mixtures (e.g., dissolving carbon dioxide in water produces a type of mixture [solution] of CO2 and H2O molecules).  (Mixtures) 9. Demonstrate how mixtures can be separated by using the properties of the substances from which they are made, such as particle size, density, solubility and boiling point.  (Measuring Matter) 6. Demonstrate that regardless of how parts of an object are arranged, the mass of the whole is always the same as the sum of the masses of its parts. | (Physical and Chemical Changes) 7. Explain that oxidation involves combining oxygen with another substance, as in burning or rusting.  (Physical and Chemical Changes) 8. Identify characteristics of chemical changes: (e.g. burning, production of a new substance, production of light, color change, endothermic and exothermic reactions, reactivity).  (Physical and Chemical Changes) 9. Demonstrate how substances can react chemically with other substances to form new substances, known as compounds, and that in such re- combinations the properties of the new substances may be very different from those of the old.  (Chemical Reactions) 6. Identify the reactants and/or products in a chemical reaction.  (Chemical Reactions) 7. Classify chemical reactions by energy type ( e.g., endothermic and exothermic).  (Chemical Reactions) 8. Identify factors that affect reaction rates, such as temperature, concentration and surface area, and explain that dissolving substances in liquids often accelerates reaction rates.  (Chemical Reactions) 9. Determine the effect of various factors on reaction rate (e.g., temperature, surface area, concentration, agitation). | (Heat Energy)6. Explain that energy, in the form of heat, is usually a by-product when one form of energy is changed to another, such as when machines convert stored energy to motion.  (Heat Energy)7. Describe how thermal energy (heat) is transferred by conduction, convection, and radiation, and how heat conduction differs in conductors and insulators.  (Heat Energy)8. Explain how thermal energy (heat) consists of the random motion and vibrations of atoms and molecules and is measured by temperature.  (Heat Energy)9. Explain how thermal energy (heat) flows in terms of the transfer of vibrational motion of atoms and molecules from hotter to colder regions.  (Light Energy) 6. Demonstrate that visible light from the sun or reflected by objects may be made up of a mixture of many different colors of light.  (Light Energy) 7. Explain the relationship between an object’s color and the wavelength of light reflected or transmitted to the viewer’s eyes.  (Light Energy) 8. Describe thee relationship between frequency and wavelength of any wave.  (Light Energy) 9. Explain that the human eye can only detect wavelengths of electromagne tic radiation within a narrow range; and explain that the differences of wavelength within that range of visible light are perceived as differences in color. | (Electricity and Transformation of Energy) 6. Compare the following ways in which energy may be transformed: mechanical to electrical; electrical to thermal.  (Electricity and Transformation of Energy) 7. Trace energy transformatio n in a simple closed system (e.g., a flashlight).  (Electricity and Transformation of Energy) 8. Construct a model to explain the transformatio n of energy from one form to another. (e.g. an electrical circuit changing electrical energy to light energy in a light bulb, electrical energy to sound,, etc).  (Electricity and Transformation of Energy) 9. Identify various ways in which electrical energy is generated using renewable and nonrenewabl e resources (e.g. , wind, dams, fossil fuels, nuclear reactions).  (Potential and Kinetic Energy) 6. Describe how an object can have potential energy due to its position or chemical composition .  (Potential and Kinetic Energy) 7. Differentiate between kinetic energy, which is the energy of motion and potential energy, which depends on relative position.  (Potential and Kinetic Energy) 8. Compare the potential and kinetic energy within a system at various locations or times.  (Potential and Kinetic Energy) 9. Explain that chemical energy is produced by chemical reactions and is dependent upon the arrangements of atoms.  (Transmission of Energy) 6. Demonstrate that vibrations in materials may produce waves that spread away from the source in all directions (e.g., earthquake waves and sound waves.  (Transmission of Energy) 7. Explain that energy can be carried from one place to another by waves (e.g., water waves, sound waves), by electric currents, and by moving objects.  (Transmission of Energy) 8. Explain that some energy travels as waves (e.g., seismic, light, sound), including: the sun as source of energy for many processes on Earth, different wavelengths of sunlight (e.g., visible, ultraviolet, infrared), vibrations of matter (e.g., sound, earthquakes), different speeds through different materials.  (Transmission of Energy) 9. Differentiate between electromagne tic and mechanical waves and represent in diagrams, or other models the visible spectrum as a part of the electromagne tic spectrum (consisting of visible light, infrared, and ultraviolet radiation) and composed of all colors of light(Nuclear Energy) 6. Explain that solar energy reaches Earth through radiation, mostly in the form of visible light .  (Conservation) 6. Explain the relationship between the mass of an object and the sum of its parts.  (Conservation) 7. Describe how mass remains constant in a closed system and provide examples relating to both physical and chemical change.  (Conservation) 8. Explain that energy can change from one form to another (e.g., changes in kinetic and potential energy in a gravitational field, heats of reaction, hydroelectric dams) and that energy is conserved in these changes.  (Conservation) 9. Explain the law of conservation of matter and energy. |  |  |  | | (Erosion and Weathering) 6. Describe events and the effect they may have on climate (e.g. El Nino, deforestation, glacial melting, and an increase in greenhouse gases).  (Erosion and Weathering) 7. Evaluate slow processes (e.g. weathering, erosion, mountain building, sea floor spreading) to determine how the earth has changed and will continue to change over time.  (Erosion and Weathering) 8. Evaluate fast processes (e.g. erosion, volcanoes and earthquakes) to determine how the earth has changed and will continue to change over time.  (Erosion and Weathering) 9. Investigate the effect of flowing water on landforms (e.g. stream table, local environment).  (Results of the Pr0cesses) 6. Describe how the history of the Earth is influenced by occasional natural occurrences, such as the impact of an asteroid or comet .  (Results of the Pr0cesses) 7. Describe how energy from the Earth's interior causes changes to Earth’s surface (i.e., earthquakes, volcanoes).  (Results of the Pr0cesses) 8. Describe how earthquakes and volcanoes transfer energy from Earth's interior to the surface (e.g., seismic waves transfer mechanical energy, flowing magma transfers heat and mechanical energy).  (Results of the Pr0cesses) 9. Plot location of volcanoes and earthquakes and explain the relationship between the location of these phenomena and faults.  (Earth’s Features) 6. Illustrate the geologic landforms of the ocean floor (including the continental shelf and slope, the mid-ocean ridge, rift zone, trench, and the ocean basin.  (Earth’s Features) 7. Compare continental and oceanic landforms.  (Earth’s Features) 8. Explain how natural processes (including weathering, erosion, deposition, landslides, volcanic eruptions, earthquakes, and floods) affect Earth’s oceans and land in constructive and destructive ways.  (Earth’s Features) 9. Explain how waves, currents, tides, and storms affect the geologic features of the ocean shore zone (including beaches, barrier islands, estuaries, and inlets).  (Changes in Landforms) 7. Identify and illustrate the geologic features of the local region through the use of topographic maps.  (Changes in Landforms) 8. Identify and illustrate the geologic features of other regions of the world through the use of imagery (including aerial photography and satellite imagery) and topographic maps.  (Changes in Landforms) 9. Illustrate the creation and changing of landforms that have occurred through geologic processes (including volcanic eruptions and mountain- building forces).  (The Rock Cycle) 6. Identify common rock forming minerals (quartz, feldspar, mica, halite, hematite, hornblende).  (The Rock Cycle) 7. Classify rock samples as igneous (granite, basalt, obsidian, pumice), metamorphic (marble, slate, quartzite), and sedimentary (sandstone, limestone, shale, conglomerate ).  (The Rock Cycle) 8. Explain how igneous, metamorphic , and sedimentary rocks are interrelated in the rock cycle  (The Rock Cycle) 9. Compare and contrast the formation of the different rock types, and demonstrate the similarities and differences using a model.  (Fossils) 6. Describe and model the processes of fossil formation.  (Fossils) 7. Describe how fossils provide important evidence of how life and environmenta l conditions have changed.  (Fossils) 8. Explain why more recently deposited rock layers are more likely to contain fossils resembling existing species than older rock layers.  (Fossils) 9. Explain how rocks and fossils are used to understand the age and geological history of the earth (timelines and relative dating, rock layers). |
| Grade 9 | 1. Explain how we know that atoms exist?  2. Relate the kinetic- molecular theory to the properties of an ideal gas.  3. Relate verbally, mathematically, or graphically the behavior of the parameters that describe the physical behavior of gases.  4. List the conditions under which gases deviate from ideal behavior.  5. Interpret a phase diagram.  1. Describe the evidence for the existence of electrons and protons and their presence in atoms.  2. Relate the properties of the main-group elements to their electron arrangements.  3. Explain why metals are good conductors of electricity and heat.  4. Relate trends in the periodic table to the atomic structures of elements.  1. Describe the composition of atom.  2. Describe the results of Thomson, Rutherford, and Bohr models of the atom  3. Explain the differences between electrical and nuclear forces.  4. Describe how the strong nuclear force acts among nucleons. | 1. Explain interactions between atoms that hold them together in molecules or between oppositely charged ions are called chemical bonds  2. Explain how the configuration of atoms determine the molecular combinations.  3. Describe how bonds are created by sharing electrons | 1. Describe the kinetic energy of a particle.  2. Relate translational motion to average kinetic energy.  3. Demonstrate how energy can be transferred from one object to another during collisions.  4. Explain why molecule shape determines if rotational motion is significant.  1. Explain that moving electric charges produce magnetic fields.  2. Describe how changing magnetic fields can produce electric fields.  1. Describe the composition of the nucleus. | 1. Explain how translational energy is related to temperature.  2. Describe how crystalline structure breaking down results in solids melting when the vibrational energy becomes great enough.  3. Relate the specific heat of a substance to the distribution of its particulate energies between translational, rotational, and vibrational.  4. Describe the how the photoelectric effect supports the particle nature of light.  1. Describe potential energy.  2. Relate changes in potential energy with distance above the Earth’s surface.  3. Describe the energy of motion, kinetic energy.  4. Relate changes in the kinetic energy of a closed system with the potential energy of the system. | 1. Distinguish between average speed and instantaneous speeds.  2. Identify linear velocity and acceleration from table of data.  3. Deduce acceleration from a velocity versus time graph.  4. Demonstrate how acceleration can occur when an object changes direction but not speed. | 1. Describe a force as a vector.  2. Describe how unbalanced or net forces can change the motion of an object  3. Predict the forces on an object from observing its motion.  2. Describe how the force of one object on another is “mirrored” by a force on the first object  3. Describe momentum as a vector.  4. Explain the conservation of momentum within a closed system.  5. Show how the conservation of momentum allows one to know the velocities of interacting particles.  1. Subtract two velocity vectors to get a change in velocity.  2. Calculate the average acceleration of an object given the appropriate data.  3. Deduce the acceleration of an object knowing the forces on the object and its mass.  1. Explain that the weight of an object is due to the attraction to the Earth.  2. Demonstrate the connection between law of gravitational attraction and potential energy  3. Show that all objects fall at the same rate near the Earth’s surface.  4. Explain how an apple falling on Earth is similar to the Moon orbiting Earth.  5. Show how gravitational attraction explains the motion of planets around the Sun.  1. Understand the inverse-square law.  2. Use Coulomb’s law to compare electrical forces on an object at different distances from another charged object.  3. Compare the relative strengths of gravitational forces versus electrical forces. |  | |  |