

6

Space, Time and Matter

(Physical Science)

Essential Question: What are the different forms and characteristics of matter, and

Enduring Knowledge	Science Concepts	GE	Evidence of Understanding
<u>Properties of Matter:</u> All living and non-living things are composed of matter having characteristic properties that distinguish one substance from another.	a. All substances have a unique density that depends on the volume (amount of space) that the substance is packed into. b. The relative densities of substances can be observed and described.	9	Investigating and explaining how the relative volume or mass of an object affects the density of the object
<u>Properties of Matter:</u> All living and non-living things are composed of matter having characteristic properties that distinguish one substance from another.	a. Gas is a state of matter that has mass.	13	Measuring the mass of a gas (e.g., air in a basketball)
<u>Physical Change:</u> A transfer of energy can result in the physical change of state of a substance .	a. Energy is required to transform the physical state of a substance from solid to liquid to gas, while conserving mass. Physical changes are reversible.	14	Predicting the effect of heating and cooling on the physical state and the mass of a substance
<u>Chemical Change:</u> When matter undergoes a chemical change it turns into a new and different substance whose properties are different than the original. No matter how substances interact with one another, the total mass of the system remains the same.	a. Simple chemical reactions will produce new substances that might be indicated by a different state of matter, a color change, or a temperature change of the substances.	15	Observing evidence of simple chemical change to identify that new substances are formed when a chemical reaction has occurred (e.g., rusted nail, vinegar combined with baking soda)

how does matter change due to different conditions?

Concepts in Detail	Potential Inquiries/Activities	Resources/Notes
Density = mass ÷ volume (D = M/V)	Do a clay ball and a clay pancake have the same density? How do you know? What do you notice when you put together liquids such as rubbing oil, vegetable oil, corn syrup, water, alcohol and how can you explain it? Find the densities of different pure substances to show that density is a characteristic property.	
- The atmosphere is comprised of gases. - Our breath is comprised of gases.	Does inflating a balloon change its mass? How do you know?	
- There are 3 states of matter: solid, liquid, gas. - The density of a substance changes in predictable ways as it changes from a solid to a liquid to a gas. - The mass of a given amount of a substance stays the same in each state of matter. - Change of state is a type of physical change. - Movement and heat are types of energy.	How does changing the amount of energy (temperature) a stove gives off affect the time it takes 100 grams of ice to melt? If an ice cube in a plastic bag melts, would the water in the bag have a different mass?	
- All substances have chemical properties.	What liquid (water, oil, lemon juice, vinegar, etc.) has a chemical reaction with baking soda and how do you know? What material (wood ash, flour, baking soda, baking powder) has a chemical reaction with vinegar and how do you know?	

6

Space, Time and Matter

(Physical Science)

Essential Question: What are different forms of energy, and what does the energy do?

Enduring Knowledge	Science Concepts	GE	Evidence of Understanding
<p>Energy: Energy is necessary for change to occur. It is the ability of matter to bring about change.</p> <ul style="list-style-type: none"> - There are many forms of energy. - The total energy in the universe is constant. - Energy can be transformed and transferred, but not destroyed. (Conservation of Energy) - Energy transfers and transformations exhibit the characteristics of systems with inputs, processes and outputs as well as connections to other systems. 	<ul style="list-style-type: none"> a. Heat energy only flows from high temperature to lower temperature in order to reach equilibrium (same temperature). b. Heat can move from one object to another by conduction. 	23	Identifying real world applications where heat energy is transferred and showing the direction that the heat energy flows
<p>Energy: Energy is necessary for change to occur. It is the ability of matter to bring about change.</p> <ul style="list-style-type: none"> - There are many forms of energy. - The total energy in the universe is constant. - Energy can be transformed and transferred, but not destroyed. (Conservation of Energy) - Energy transfers and transformations exhibit the characteristics of systems with inputs, processes and outputs as well as connections to other systems. 	<ul style="list-style-type: none"> a. Unbalanced charges produce a potential for a flow of electricity. (Static). b. Unbalanced charges will move toward equilibrium because like charges repel and opposite charges attract. 	24	Investigating charged objects (static electricity) and describing their observations in terms of behavior of charges and equilibrium
<p>Energy: Energy is necessary for change to occur. It is the ability of matter to bring about change.</p> <ul style="list-style-type: none"> - There are many forms of energy. - The total energy in the universe is constant. - Energy can be transformed and transferred, but not destroyed. (Conservation of Energy) - Energy transfers and transformations exhibit the characteristics of systems with inputs, processes and outputs as well as connections to other systems. 	<ul style="list-style-type: none"> a. Magnetism is a force field that acts over a distance. 	25	Identifying real world objects that demonstrate and utilize a magnetic force field acting over a distance Distinguishing between objects affected by magnetic force and objects affected by other non-contact forces
<p>Energy: Energy is necessary for change to occur. It is the ability of matter to bring about change.</p> <ul style="list-style-type: none"> - There are many forms of energy. - The total energy in the universe is constant. - Energy can be transformed and transferred, but not destroyed. (Conservation of Energy) - Energy transfers and transformations exhibit the characteristics of systems with inputs, processes and outputs as well as connections to other systems. 	<ul style="list-style-type: none"> a. Moving electrical charges [electricity] produce magnetic force [magnetism] (i.e., electromagnet, motor). b. Moving magnets produce electricity (e.g., generator). 	26	Investigating devices that demonstrate the magnetic effects of electricity and the electric effects of moving magnets Identifying the relationship between the device and the magnetic or electric effect it produces

Space, Time and Matter
(Physical Science)

6

Concepts in Detail	Potential Inquiries/Activities	Resources/Notes
<ul style="list-style-type: none"> - Objects can hold heat energy. - Heat energy can be transferred. - Heat energy moves in one direction, from highest to lowest concentration. - Temperature is the measure of heat energy. - Closed systems move toward equilibrium. - Conduction is one process by which heat energy moves. 	<p>Using a cup of ice in an insulated bag, record the temperature of the ice/water and air in the bag every hour until both reach equilibrium. Where did the ice get the energy to melt? Why did the temperature of the air in the insulated bag decrease?</p>	
<ul style="list-style-type: none"> - Equilibrium means balance. - Objects can have positive and negative charges. 	<p>How do objects having unbalanced charges react to one another? Use a charged balloon and running water or wall, charge comb and small bits of paper, etc. to investigate this question. (Use the concept of equilibrium to explain why they react in this way.)</p>	
<ul style="list-style-type: none"> - A magnet pulls on all things made of iron, nickel, and cobalt. - Not all materials that are attracted by magnetic force have magnetic force themselves. - Many materials are not magnetic or attracted to magnetic force. - Objects don't have to touch to be affected by magnetic force. - Electromagnets and gravity are the 2 natural forces that don't require contact to influence objects over a distance. 	<p>What size, type, or orientation of a magnet moves a paperclip, or other magnet, a greater distance (either toward or away)?</p>	
<ul style="list-style-type: none"> - Electricity is moving electrical charges. - Electrical mechanisms can act as magnets. - Electrical charges are polar. - The flow of electricity requires a closed circuit. - Only some materials (conductors) allow the flow of electricity. Other materials (insulators) will not allow the flow of electricity. - Magnets are polar. - Like poles repel and un-like poles attract. - Magnets can be caused to move because of their polarity. - There are variables such as the number of coils, strength of electrical flow, etc. that affect the magnetic force. - There are variables such as size of magnet, strength of electromagnet, etc. that will affect the amount of electricity produced. 	<p>What variables affect the strength of an electromagnet? Activity: "Fishing Derby." Students create an electromagnet in form of a fishing pole. Cover the floor with paperclips. Students compete by picking up the paper clips. Students need a way to turn their electromagnet off and on.</p>	