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Space, Time and Matter

(Physical Science)

Essential Question: What are the different forms of energy, and what does 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 is the motion of molecules. b. Increased motion of the molecules in a system increases the heat energy of the system. c. Heat energy is transferred by: Conduction - collision of molecules in solids; Convection - organized flow of heat currents through a fluid; Radiation - transfer by waves that can travel through a vacuum. | 23 | <p>Creating a diagram, model, or analogy for a material in a warmer and cooler state showing or describing the motion of the molecules</p> <p>Creating a diagram, model, or analogy to explain the difference between conduction, convection, and radiation and using their visual to explain how heat energy travels in different directions and through different materials by each method of energy transfer</p> |
| <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. Electric circuits provide a means of transferring electrical energy when heat, light, and sound are produced. The electrical energy is spread out yet still conserved. b. Electric charges can have "potential" energy (voltage). The higher the potential energy of the charges, the higher the voltage. | 24 | <p>Building an electric circuit and explaining the transfer of electrical energy into heat, light, and sound, leaving the system but not destroyed</p> <p>Describing the effect of a change in voltage in the circuit system</p> |
| <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. Light is a form of radiant energy. b. Transmitted light can be refracted (change in direction of the light) when it passes from one medium into another. c. Visible light is part of the electromagnetic spectrum. Visible (white) light is made up of the colored light waves of the visible spectrum. | 28 | <p>Designing demonstrations that represent the characteristics of light energy transfer</p> <p>Explaining that visible light is made up of the colored light waves</p> |

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| Concepts in Detail | Potential Inquiries/Activities | Resources/Notes |
|--|---|-----------------|
| <ul style="list-style-type: none"> - Heat is the energy of moving molecules. - Increased motion of the molecules in a system increases the heat energy of the system. - Heat energy is transferred by: Conduction - collision of molecules in solids. As faster vibrating molecules collide w/ slower vibrating molecules, the slower vibrating molecules speed up, and the heat energy of that area of the solid increases; Convection - organized flow of heat currents through a fluid. As a fluid's temperature increases, its density decreases. This causes warmer areas of the total fluid to rise and cooler parts to sink; Radiation - heat transfer by infrared waves that can travel through a vacuum. A form of energy that travels in waves. When the waves encounter matter, they transfer their energy to that matter, causing it to heat up. | <ul style="list-style-type: none"> - Using your knowledge of conduction and radiation, describe how a cup of hot chocolate cools over time. (If possible, put hot chocolate under a bell jar with a thermometer, to measure temperature of surrounding air). - Activity: show students pencils that change color when heat of your hand is applied. | |
| <ul style="list-style-type: none"> - Electrical energy is a form of energy that can be transformed into heat, light, or sound. - Energy in the circuit is lost in the transformation, but has entered other systems. - An electrical circuit is a pathway that electrons flow through. - Appliances (light bulbs, fans) can be inserted into electric circuits, and this provides the means for the energy transformation. - Potential energy is stored energy that an object possesses because of its position with respect to other objects. - Voltage is the measure of the "push" transferred to electrons by the power source. - Describe the movement of electrons from areas of high potential energy to areas of low potential energy. - If a charge has a high potential energy, it has a high voltage. | <ul style="list-style-type: none"> - See Evidence of Understanding column. | |
| <ul style="list-style-type: none"> - Light is form of energy that travels in waves. - As light passes through different materials it changes direction and speed - this is refraction. - Light travels faster through air than water and travels faster through water than through glass. - Define the electromagnetic spectrum. - Visible (white) light is the part of the electromagnetic spectrum that is made up of colored light waves. It is called "The Visible Light Spectrum." | <ul style="list-style-type: none"> - Design a demonstration that shows how refraction of light causes an object to appear differently under water. Draw a labeled diagram explaining what an observer sees. - Activity: describe how a prism works. | |