

PHENOMENA, DRIVING QUESTIONS AND SEPUP STORYLINE

ENERGY

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Unit Issue: Energy-efficiency and energy use.

Anchoring Phenomenon: Some energy transfers and transformations are more efficient than others. When a device uses energy, some of the energy is changed into a form that is not useful. This “wasted” energy reduces the efficiency of the device. Examples: Some appliances (such as refrigerators) and devices (such as certain lightbulbs) use less energy than others; some devices transform energy from the sun. Students generate and answer questions such as: Why are some devices more efficient than others? What can people do to reduce energy use? How can people manipulate energy transfer and transformation to use energy more efficiently?

Investigative Phenomena	Driving Questions	Guiding Questions	Activities	Storyline
Some devices are less efficient than others. For example, some light bulbs get hotter than others.	Why do some light bulbs get hotter than others?	What does it take to reduce energy use in a home? (Activity 1)	1 (10, 11, 12, 13, 14, 15)	If we want to be able to use energy more efficiently, we need to understand how it behaves.
Objects are more likely to break if they are dropped from higher up.	Why does my cell phone break when it falls from my hand while I am walking but is less likely to break when it falls from my pocket when I am sitting?	How can you track the transfer of energy in a system? (Activity 2)	2, 3, 4	All types of energy can be classified as either kinetic (energy of motion) or potential (energy of position)—a simple system helps us understand how energy can be transformed.
		How is energy transformed on a roller coaster? (Activity 3)		Energy can be transformed over and over again.
		How can kinetic energy of motion be transformed into another kind of kinetic energy: thermal energy? (Activity 4)		One kind of kinetic energy can be transformed into another kind of kinetic energy—thermal energy.
We encounter many types of energy on a daily basis.	What are the similarities and differences among different types of energy?	How can you use the law of conservation of energy to describe energy transformations? (Activity 5)	5, 6	Energy is conserved—whenever it is transferred or transformed, the total energy at the start is the same as the total energy at the end.
		How can you use the law of conservation of energy to describe energy transformations? (Activity 6)		There are many kinds of energy transformations, and all of them follow the law of conservation of energy.

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ENERGY (continued)

Investigative Phenomena	Driving Questions	Guiding Questions	Activities	Storyline
Substances get warmer or colder depending on their environment.	What is happening when a substance gets warmer or cooler?	What happens to thermal energy when hot and cold water are combined? (Activity 7)	7, 8	Energy can be transferred from one object to another.
		What affects how much thermal energy can be stored in or released from an object? (Activity 8)		We can quantify the transfer of energy.
There is energy in food, fuel, weather systems, and many other substances and situations.	Do we mean the same thing when we talk about energy transfer and transformation in other fields of science?	How does an understanding of energy help scientists explain phenomena in all fields of science? (Activity 9)	9	Energy in living systems is the same as energy in physical systems and has the same behavior—it can be transformed and transferred.
Some devices are less efficient than others.	Why do some light bulbs get hotter than others?	How can you increase or decrease the rate of thermal energy transfer? (Activity 10)	(1) 10, 11, 12, 13, 14, 15	We can do things to speed up or slow down energy transfer.
		What properties of matter affect how it interacts with solar energy? (Activity 11)		The sun's energy is transferred to materials differently depending on their properties.
		What are the different ways that thermal energy is transferred? (Activity 12)		Thermal energy can be transferred three different ways.
		How can you engineer a device to maximize its ability to transfer solar energy? (Activity 13)		We can use different materials to maximize energy transfer from the sun to serve a purpose.
		How can we measure the efficiency of a light bulb? (Activity 14)		Sometimes energy transformations are not useful to us.
		How can different features in a home affect the energy-efficiency of the home? (Activity 15)		We can do things to change the efficiency of desirable energy transformations.