Chapter 2 Energy



Introduction

Chapter 2 reviews energy. The various forms of energy fall into two states: kinetic and potential energy. Kinetic energy is the energy of motion. Potential energy is stored energy. There are different forms of energy, such as mechanical, chemical, nuclear, sound, heat, electric, and light. Any form of energy can be transformed into any other form of energy without any net loss. However, at times, some energy may be transformed into heat that is undesired and unusable. The Law of Conservation of Energy explains that energy, like matter, cannot be created nor destroyed.

Heat is a form of energy produced by vibrating molecules. Heat causes most substances to expand. Heat is transferred by **conduction**, **convection**, and **radiation**.

Light and **sound** are forms of energy that travel in waves. The characteristics of **waves** (**wavelength**, **amplitude**, and **frequency**) are introduced as well as transverse and longitudinal waves.

The chapter reviews magnetism, static electricity, and electricity. Electrical energy can be channeled through electrical circuits (**series** and **parallel**) to power electrical devices.

Students Should Understand the Following Concepts

- Energy is defined as the ability to do work. Energy can be classified as either potential or kinetic. Energy comes in various forms, such as mechanical, chemical, nuclear, sound, heat, light and electricity.
- The Law of Conservation of Energy states that energy cannot be created nor destroyed,

- but it can be transformed into other forms of energy.
- Heat is a form of energy produced by vibrating molecules.
- Light and sound are forms of energy that travel in waves.
- An electrical circuit must contain a source of electrons, a conducting path, and a device that uses the energy. The electrical circuit is a pathway for the flow of electrons.

Activities to Develop the Topic

Use one or more of the following activities to help your students review this topic.

Start the class by asking the students how many forms of energy they used to get ready for school. If they have trouble getting started, ask them if they used an alarm (electric) to get up, if they took a shower (heat in hot water), or if they ate breakfast (chemical energy in food). This should provide a jumpstart for the class discussion. Make sure that all the forms of energy mentioned in the text are covered. Give the class some examples of kinetic energy and potential energy.

One common example for potential energy is a boulder on top of a mountain. The boulder on the mountain has energy stored in the form of gravitational potential energy. If the boulder falls off the top of the mountain and rolls down the mountain, the potential energy is converted into kinetic energy. There are many other examples of converting energy from one form to another. Automobiles are excellent examples of machines that convert energy from one form to many other forms of energy. Have the students list the conversions of energy that take place in a typical automobile.

Explain the Law of Conservation of Energy to the class. Ask what other law sounds similar to this law. Students should come up with the Law of





Conservation of Matter. Ask them to combine them into one law. This might make it easier for the students to remember.

Have the students build basic circuits in class. The circuits can be very simple with a few pieces of wire, a battery, and small lightbulbs. Building simple circuits will reinforce the concept that the circuit must be complete for the electrons to flow. The students will be able to observe that for an electri-

cal device to work the electrons must be given a complete path to flow through.

The behavior of waves can be demonstrated with water waves. Use a clear pan of water on an overhead projector to show the class how waves travel through a medium, how they are reflected, refracted, and absorbed. The behavior of light and sound can be compared with the behavior of water waves.

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(4) glass

(2) water

- 9. Warm air will rise above cooler air because
 - (1) warm air is less dense than cool air
 - (2) warm air is more dense than cool air
 - (3) molecules in cold air move more rapidly than those in warm air
 - (4) cool air has fewer molecules than warm air
- 10. Heat can be transferred by all of the following methods except
 - (1) transformation

(3) convection

(2) conduction

(4) radiation

- 11. Which item is not affected by a magnet?
 - (1) paper clip

(3) ceramic bowl

(2) carpenter's nail

(4) safety pin

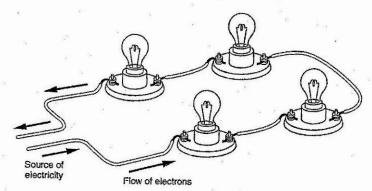
- 12. On a magnet, the magnetic fields are most concentrated
 - (1) at the south pole of a magnet only
 - (2) toward the middle of a magnet
 - (3) at both poles of a magnet
 - (4) at the north pole of a magnet only
- 13. An insulator does not allow electricity to pass through it. Which item can act as an insulator?
 - (1) an iron nail

(3) a rubber tire

(2) a steel beam

(4) a metal fork

- 14. Batteries produce electricity by
 - (1) spinning a magnet inside a coiled wire
 - (2) running electrons through a wire
 - (3) combusting fossil fuels
 - (4) combining chemicals to produce an electrical current
- 15. What type of circuit is illustrated in the diagram?



(1) a series circuit

(3) an open circuit

(2) a parallel circuit

(4) a magnetic circuit

- 16. Fuses work by
 - (1) grounding the electrical circuit to prevent electrocution
 - (2) breaking the circuit to interrupt the flow of electricity
 - (3) regulating the flow of electrons through the appliance
 - (4) turning the electricity on and off to prevent overheating
- 17. Due to the Doppler effect,
 - (1) sounds of approaching objects appear to have a higher pitch
 - (2) the speed of sound increases
 - (3) the speed of sound decreases
 - (4) sounds of approaching objects appear to have a lower pitch
- 18. How does the speed of sound compare with the speed of light?
 - (1) the speed of light is a little faster than the speed of sound
 - (2) the speed of sound is a little faster than the speed of light
 - (3) the speed of light is much faster than the speed of sound
 - (4) the speed of sound is much faster than the speed of light
- 19. A material that does not allow light to pass through it is said to be
 - (1) magnetic

(3) translucent

(2) opaque

- (4) transparent
- 20. The type of lens that causes light rays to converge is
 - (1) electromagnetic

(3) convex

(2) concave

(4) prism