

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.

Name _____

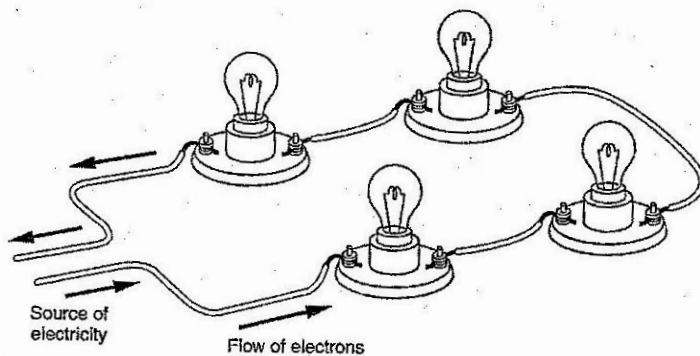
Date _____

Class _____

Review of Chapter 2

- An example of potential energy is
 - a baseball rolling through the infield
 - a rock rolling down a hillside
 - gasoline in a car's gas tank
 - rain falling on a meadow
- The molecules in all matter are in motion. Molecular motion in matter is an example of
 - heat energy
 - electric energy
 - light energy
 - chemical energy
- The type of energy found in gasoline is
 - light energy
 - electric energy
 - heat energy
 - chemical energy
- The types of energy that travel in waves are
 - chemical and heat energy
 - light and heat energy
 - heat and sound energy
 - sound and light energy
- An object that can be used to demonstrate a longitudinal wave is
 - a long, coiled spring
 - a yo-yo
 - a basketball
 - a jump rope
- Charging a rechargeable battery is an example of transforming
 - chemical energy into heat energy
 - electric energy into chemical energy
 - sound energy into nuclear energy
 - mechanical energy into heat energy
- When a pot is taken off the stove, the metal begins to cool. As the metal cools, the
 - electrons stop orbiting around the nuclei of the atoms
 - molecules continue vibrating at the same rate
 - amount of heat energy increases
 - vibration of the molecules slows
- Most substances contract when they freeze. A substance that expands when it freezes is
 - wax
 - water
 - steel
 - glass

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
 - (2) conduction
 - (3) convection
 - (4) radiation
11. Which item is not affected by a magnet?
- (1) paper clip
 - (2) carpenter's nail
 - (3) ceramic bowl
 - (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
 - (2) a steel beam
 - (3) a rubber tire
 - (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
- (2) a parallel circuit
- (3) an open 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 |