Name _____ Class _____ Date _____

Chapter 15 Energy

Summary

15.1 Energy and Its Forms

Work is a transfer of energy.

- **Energy** is the ability to do work.

The kinetic energy of any moving object depends upon its mass and speed.

- The energy of motion is called **kinetic energy.**
- To calculate the kinetic energy of an object, multiply half the object's mass (m) by its speed (v) squared: Kinetic energy = $\frac{1}{2}mv^2$.
- **Potential energy** is energy that is stored as a result of position or shape.
- The potential energy of an object that is stretched or compressed is known as **elastic potential energy**.

An object's gravitational potential energy depends on its mass, its height, and the acceleration due to gravity.

- Potential energy that depends upon an object's height is called **gravitational potential energy.**
- Gravitational potential energy = mgh, where m is mass, g is acceleration due to gravity, and h is the object's height.

The major forms of energy are mechanical energy, thermal energy, chemical energy, electrical energy, electromagnetic energy, and nuclear energy.

- The energy associated with the motion and position of everyday objects is **mechanical energy.**
- The total potential and kinetic energy of all the microscopic particles in an object make up its **thermal energy.**
- **Chemical energy** is the energy stored in chemical bonds.
- **Electrical energy** is the energy associated with electric charges.
- **Electromagnetic energy** is a form of energy that travels through space in the form of waves.
- The energy stored in atomic nuclei is known as **nuclear energy.**

15.2 Energy Conversion and Conservation

Energy can be converted from one form to another.

- The process of changing energy from one form to another is **energy conversion.**

The law of conservation of energy states that energy cannot be created or destroyed.

- When energy changes from one form to another, the total amount of energy stays the same.

The gravitational potential energy of an object is converted to the kinetic energy of motion as the object falls.

Einstein's equation, $E = mc^2$, says that energy and mass are equivalent and can be converted into each other.

15.3 Energy Resources

Nonrenewable energy resources include oil, natural gas, coal, and uranium.

- **Nonrenewable energy resources** exist in limited quantities and, once used, cannot be replaced except over the course of millions of years.
- Oil, natural gas, and coal are known as **fossil fuels.** They formed underground from the remains of once-living organisms.

Renewable energy resources include hydroelectric, solar, geothermal, wind, biomass, and, possibly in the future, nuclear fusion.

- **Renewable energy sources** are resources that can be replaced in a relatively short period of time.
- Energy obtained from flowing water is known as **hydroelectric energy.**
- Sunlight that is converted into usable energy is called **solar energy.**
- **Geothermal energy** is thermal energy beneath Earth's surface.
- The chemical energy stored in living things is called **biomass energy.**
- A **hydrogen fuel cell** generates electricity by reacting hydrogen with oxygen.

Energy resources can be conserved by reducing energy needs and by increasing the efficiency of energy use.

- Finding ways to use less energy or to use energy more efficiently is known as **energy conservation.**