

Chapter 13 – Energy and Energy Transformations

Study Guide

Lesson 1 – Forms of Energy

Energy – ability to cause change

- Fireworks release energy when they explode – energy changes shown in flashes of light and loud booms
- Energy also causes changes – photosynthesis

Kinetic energy – energy due to motion

- All moving objects have kinetic energy
- Kinetic energy depends on mass and speed. The more mass and speed an object has, the more kinetic energy it has.

Potential Energy – stored energy due to interactions between objects and particles (position)

- Book on a shelf, holding ball in hand, sitting at the top of a slide
 - Gravitational potential energy – energy between object and Earth; depends on height and weight
 - Elastic potential energy – stored in objects that are compressed or stretched; rubber band or spring
 - Chemical potential energy – energy stored in chemical bonds between atoms; gasoline in cars, food in body

The sum of the potential energy and kinetic energy of an object will always be the same.

Work – transfer of energy that occurs when a force makes an object move in the direction of the force while the force is acting on the object – the object must move in the direction the force is moving

Examples: a girl lifting a box transfers energy from herself to the box; a bowling ball has energy and does work when it collides with pins

Other Forms of Energy

- **Mechanical energy** – sum of potential energy and kinetic energy in a system of objects; shooting a basketball, blender cutting/chopping
- **Sound energy** – energy that sound carries; playing guitar the string vibrates and produces a sound
- **Thermal energy** – sum of kinetic energy and potential energy of the particles that make up an object; moves from warmer objects to cooler ones – burning logs to cooler air
- **Electric energy** – energy an electric current carries; electrical appliances that are plugged in, batteries
- **Radiant energy** – energy electromagnetic waves carry; light waves, radio waves, & microwaves
- **Nuclear energy** – energy that is stored and released in the nucleus of an atom; Sun, atoms

Lesson 2 – Energy Transformations

When energy changes from one form to another, for example, electric energy to thermal energy that is called an energy transformation.

Radiant – energy transmitted by electromagnetic waves

Law of conservation of energy – energy can be transformed from one form to another or transferred from one region to another, but it cannot be created or destroyed.

The total amount of energy in the universe does not change.

Friction – force that resists the sliding of two surfaces that are touching

- Example – riding a bike, when you apply brakes mechanical energy transforms to thermal energy because the friction of the brake pads and wheels

All forms of energy can be transformed into thermal energy (heat energy). Energy is lost through thermal energy transformations.

Chemical energy can be photosynthesis or your body converting food into kinetic energy for movement.

Radiant energy can be cell phone use because of microwaves. When speaking into a cell phone, sound energy transforms into electric and radiant energy.

Electric energy can be appliances, video games, MP3 players. Can be plugged in or use batteries.

Waste energy – thermal energy that cannot be used

- Example – a lightbulb transforms some electric energy into thermal energy – some of this thermal energy moves into the air and cannot be used.