SECTION 1 (PP. 71-77): ENERGY EXISTS IN DIFFERENT FORMS.

Georgia Standards: S8P2b – *Explain the relationship between potential and kinetic energy;* S8P2c – *Compare and contrast the different forms of energy (heat, light, electricity, mechanical motion, sound) and their characteristics.*

1. **Different forms of energy have different uses.**
   Energy is the ability to cause change. Different forms of energy cause different changes to occur.
   - ***Mechanical energy*** involves the position and motion of objects. Mechanical energy is a combination of potential energy and kinetic energy; it may be either or both.
   - ***Sound energy*** is energy associated with the transfer of vibrations through a solid, liquid, or gas.
   - ***Chemical energy*** is energy stored in the chemical composition of matter due to the atoms, bonds, and arrangements of atoms in substances.
   - ***Thermal energy*** is the total amount of energy within an object due to the motion of all of the object's particles.
   - ***Electromagnetic energy*** is energy in electromagnetic waves; including visible light, ultraviolet light, x-rays, and microwaves.
   - ***Nuclear energy*** holds atomic nuclei together.

2. **Kinetic energy and potential energy are the two general types of energy.**
   Kinetic energy (KE) is the energy of motion. The amount of kinetic energy that an object has depends on its mass and speed. An increase in speed causes a much larger increase in kinetic energy than does an increase in mass.
   Potential energy (PE) is the energy that is stored in an object as a result of its position, shape, or chemical composition.
   - ***Gravitational potential energy*** (GPE) is due to an object's position above Earth's surface. Gravitational potential energy is related to an object's mass and its height above the ground.
   - ***Elastic potential energy*** is due to position and shape in an object being compressed or flexed. Examples include a compressed spring or a stretched rubber band. Not every object that is compressed will contain elastic potential energy, for example, aluminum foil crumpled into a ball.
   - ***Chemical potential energy*** is due to a substance's chemical composition – the atoms and bonds contained within the substance. Different substances contain different amounts of chemical potential energy. Examples include energy stored in fossil fuels and in molecules of foods.

SECTION 2 (PP. 78-85): ENERGY CAN CHANGE FORMS BUT IS NEVER LOST.

Georgia Standards: S8P2a – *Explain energy transformation in terms of the Law of Conservation of Energy*; S8P2b – *Explain the relationship between potential and kinetic energy.*

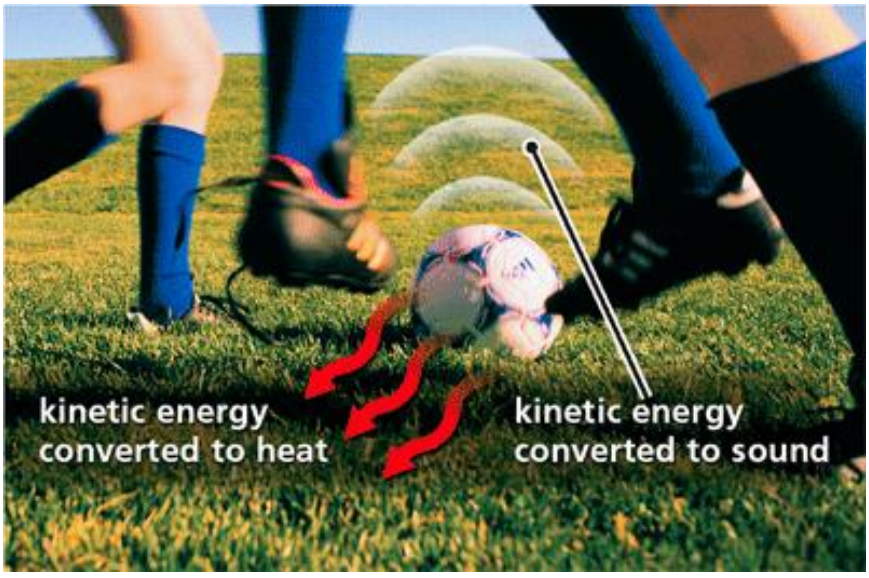
1. **Energy changes forms.**
   Energy can be converted from one form to another. Often, energy must change forms in order for it to be useful. Many energy transformations occur between potential and kinetic energy.

   A ski jumper at the top of the slope has gravitational potential energy, which is converted into kinetic energy as the ski jumper moves down the slope. The ski jumper can regain potential energy through the kinetic energy of the chairlift that carries the skier back up the hill.

   When gasoline is burned in a car's engine, the chemical potential energy of the fuel is converted into the car's motion, and energy released as heat from the car's engine is the kinetic energy of particle motion.

2. **Energy is always conserved.**
   The ***law of conservation of energy*** states that energy is neither created nor destroyed, but it can change form. When it appears that energy is lost, it has simply changed form or been transferred to another object.

   In the soccer ball photograph below, the soccer ball's kinetic energy decreases, but the energy is converted into sound and heat. As a result, the total amount of energy never changes.



3. **Energy conversions may produce unwanted forms of energy.**
   When energy changes forms, the total amount of energy does not change, but some of the energy may convert to unusable or unwanted forms. ***Energy efficiency*** is a measure of usable energy after an energy conversion. The more energy efficient the energy conversion, the more energy is changed into the desired form.

SECTION 3 (PP. 86-91): TECHNOLOGY IMPROVES THE WAYS PEOPLE USE ENERGY.

Georgia Standards: S8P2c – ***Compare and contrast the different forms of energy (heat, light, electricity, mechanical motion, sound) and their characteristics;*** **S8CS6c –** ***Organize scientific information in appropriate tables, charts and graphs, and identify relationships they reveal.***

1. **Technology improves the ways people use energy.**
   Because most energy conversions are very inefficient, an important goal of technology is to improve energy efficiency.
   - LED's convert almost all the electricity they use into light.
   - Hybrid cars, which use both a gasoline engine and electrical energy from batteries, are more efficient than conventional gasoline-powered cars.

2. **Technology improves the use of energy resources.**
   Fossil fuels, the most commonly used energy source, are a non-renewable resource. A major goal of technology research is a more efficient usage of other energy sources.
   - Solar cells convert sunlight to electrical energy. Solar energy is available in unlimited amounts, is quiet and clean, and is non-polluting. It is inefficient, however, and the materials used to make solar cells are expensive.
   - Windmills are used to convert the kinetic energy of wind into electrical energy. Like solar energy, wind energy is an inexhaustible source of energy that is non-polluting. However, there are limitations to the usefulness of wind power. It takes a large number of windmills to produce enough electrical energy to make a wind farm economically viable. Also, wind power is limited to regions of the world where wind is relatively constant.