

Energy Objectives

Following the general objectives for this unit study, objectives are listed by lesson. Objectives with an asterisk (*) are intended for grades 9-12. Upon completion of this unit your student should:

- Develop a spirit of scientific inquiry.
- Use the language of science to communicate understanding and knowledge.
- Gain an understanding of God's creations.
- Understand the nature of energy and power.
- Be able to identify the sources of energy.
- Understand the fundamental laws of energy.
- Understand how energy is generated and used.
- Be able to explain how energy is transformed from one form to another in simple situations.
- Be able to identify the change of form of energy when a substance undergoes a chemical or physical change.
- Be able to communicate investigations and explanations.
- Understand and appreciate the need for conservation of energy.
- Understand different sources of energy.
- Be able to define, label, and apply the Vocabulary words.
- Be able to conduct a thorough scientific study: Compose questions for study, write a hypothesis, conduct an experiment, set procedure, observe findings, analyze, and report results.
- Be able to prepare a laboratory sheet to record observations.

Above All Power

- Recognize that God is the primary source of power in the universe.
- Understand that God created the world and is the primal source of all energy in this world.
- Understand that God's power is at work daily within His children.
- Understand that the gospel is God's power resulting in salvation to the one who believes.

Types of Energy

- Understand the basic processes of generation of energy.
- Understand and demonstrate the difference between stored (potential) and moving (kinetic) energy and their interaction.

Energy

- Demonstrate an understanding that energy can be changed from one form to another.

Energy Sources

- Be able to describe several energy sources.
- Understand and distinguish between renewable and non-renewable sources of energy.
- Be able to give examples of the various sources of energy: Mechanical, thermal, solar, chemical, nuclear, and electrical.
- Be able to recognize alternative energy sources to fossil fuels—geothermal, hydroelectric, solar, garbage incineration, wind, and nuclear—and their appropriateness in different situations.
- Be able to assess the needs, benefits, distribution, pollution, and cost associated with society's use of energy.*

Potential Energy

- Understand that God is the supreme power and the creator of all energy forms.
- Be able to define and identify the potential energy in a body.
- Be able to distinguish potential energy from kinetic energy.
- Be able to measure the potential energy of a body.*
- Understand that gravitational potential energy of an object is a result of its acceleration and height.*

Kinetic Energy

- Understand that *kinetic energy* is the energy of motion.
- Investigate the principles of kinetic energy.
- Be able to compare and contrast the potential and kinetic energy of a body.
- Understand the change of energy from potential energy to kinetic energy in a freely falling body.
- Be able to measure the kinetic energy of a body.*
- Understand that the kinetic energy of an object is a result of its velocity.*

Thermal or Heat Energy

- Be able to recognize the importance of heat energy in various natural phenomena.

Underlined text refers to Internet link.

- Understand the concepts of conduction, convection, and radiation.
- Be able to define *thermal energy* and distinguish it from other forms of energy.
- Understand that every object has thermal energy and how it is related to the degree of hotness or coldness of an object.
- Be able to define the various forms of heat energy and their uses.
- Realize how friction can cause heat energy.
- Understand the importance of specific heat, latent heat, and heat capacity.*
- Understand that the supply of heat energy causes an increase in temperature.*

Thermodynamics or Heat Transfer

- Realize how heat is transferred from one substance to another.
- Understand how heat as a source of energy helps in movement of molecules.
- Be able to explain how temperature is related to kinetic energy.*
- Be able to describe three scales used for measuring temperature.*
- Understand the concept of thermal capacity.*
- Recognize the first and second laws of thermodynamics.*
- Understand what happens to a substance when heat transfer takes place between two bodies at different temperatures.*

Energy Conservation

- Recognize the need for conservation of energy.
- Be able to differentiate between renewable and non-renewable sources of energy and their uses.
- Gain an understanding of the law of conservation of energy.
- Recognize and appreciate the need for efficient consumption of energy.

Steam and Geothermal Energy

- Understand that energy of steam is one of the most widely used forms of energy.
- Gain an understanding of the process of formation of steam.
- Gain an understanding of geothermal energy.
- Understand the workings of a steam engine.*
- Understand the latent heat of fusion and the latent heat of vaporization.*

Energy

Energy for Transport

- Understand the different transport mechanisms of energy.
- Understand that fossil fuels are primarily burned to produce energy for transportation.
- Be able to recognize the advantages and disadvantages of energy derived from fossil fuels.
- Gain an understanding of the process of combustion.*
- Understand how a diesel engine works.*

Nuclear Energy

- Understand how an atom is a source of an enormous amount of energy.
- Study the nuclear chain reaction and how it occurs.
- Discuss the use of nuclear energy in different forms.
- Understand the advantages and disadvantages of nuclear energy.
- Understand how nuclear energy is used as a fuel to generate heat energy.
- Discuss how nuclear energy is converted into mechanical and electrical energy.
- Be able to compare the ways in which the nuclear fission and fusion processes generate energy.*

Solar Energy

- Understand that the sun is the main source of energy of the earth and the solar system.
- Investigate how the water cycle transforms solar energy into hydroelectric power.
- Understand the process of photosynthesis.
- Investigate the different methods of direct collection of solar energy.*
- Be able to recognize the use of photovoltaic cells in transforming the energy received from the sun into electrical energy *

Energy from Wind and Water

- Understand that wind and water are major energy sources of life on earth.
- Be able to identify several sources of wind and water energy as alternative forms of energy.

Underlined text refers to Internet link

- Determine the advantages and disadvantages of using alternative energy sources.
- Investigate the working of windmills and how they are used to obtain energy from wind.
- Understand the working of modern wind turbines and modern wind energy systems.*
- Understand how alternative forms of energy are directly or indirectly converted into other forms of energy, such as heat and electricity.*
- Investigate the process of obtaining energy from water waves.*

Energy from Food

- Have an understanding of the importance of food as a source of energy.
- Understand food chains and food webs, showing the transfer of energy and matter among organisms.
- Be able to recognize how food is used to provide energy to the body to maintain activity.
- Be able to identify how food is used to generate mechanical and heat energy.
- Be able to trace the path of conversion of energy in an organism (e.g., sunlight—light energy to plants by photosynthesis to sugars—stored chemical energy to respiration in muscle cell—usable chemical energy to muscle contraction—mechanical energy).

Energy from Fossil Fuels

- Be able to define fossil fuels as prime sources of energy as distinct from other sources of energy.
- Be able to understand how fossil fuels are formed.
- Understand the different properties of three main fossil fuels: Coal, petroleum, and natural gas.
- Understand the different uses of these fossil fuels.
- Gain an understanding of the phenomena of acid rain and global warming caused by use of fossil fuels.*
- Gain an understanding of the need for using non-renewable sources of energy.*