

### Topic 3.1: What are the properties of energy?

Energy can produce \_\_\_\_\_ in a system.

There are different \_\_\_\_\_ of energy.

Energy can be \_\_\_\_\_ or \_\_\_\_\_.

\_\_\_\_\_ quantities contribute to different forms of energy.

#### Concept 1: Energy can produce change in a system.

- There are \_\_\_\_\_ forms of energy that exist.
- These forms of energy can be \_\_\_\_\_ to an object or \_\_\_\_\_ into another form of energy.
- \_\_\_\_\_ : anything that is under observation
  - Defined by the observer
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- \_\_\_\_\_ : anything that is not part of a system
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- Universe = \_\_\_\_\_ + \_\_\_\_\_

1. a) Why can it be a challenge to observe energy directly?  
b) How can this challenge be overcome?

2. a) Describe a system that could be applied to your classroom.  
b) What makes up the surroundings of the system you defined?

#### Concept 2: There are different forms of \_\_\_\_\_.

- There are two main types of energy:
  - 1) \_\_\_\_\_ **energy**: the energy of motion
  - 2) \_\_\_\_\_ **energy**: the stored energy of an object as a result of its condition or its position

Types of kinetic energy:

- 1) \_\_\_\_\_ **energy**: energy of an object that is in motion
- 2) \_\_\_\_\_ **energy**: energy of electromagnetic waves from an energy source

- 3) \_\_\_\_\_ **energy:** energy of random motion of particles in a substance
- 4) \_\_\_\_\_ **energy:** energy of vibrations of particles
- 5) \_\_\_\_\_ **energy:** energy of electrons moving along a wire

Types of potential energy:

- 1) \_\_\_\_\_ **potential energy:** energy stored in a stretched or compressed object
- 2) \_\_\_\_\_ **potential energy:** energy stored in chemical bonds
- 3) \_\_\_\_\_ **potential energy:** energy due to the position of an object
- 4) \_\_\_\_\_ **energy:** energy stored in the nucleus of an atom
- 5) \_\_\_\_\_ **potential energy:** energy is stored by a separation of positive and negative charges
- 6) \_\_\_\_\_ **potential energy:** energy stored in a magnetic field

1. Use a Venn diagram to compare kinetic and potential energy.
2. Give one example of each of the following:
  - a) a form of kinetic energy
  - b) a form of potential energy
  - c) a form of energy that has both kinetic and potential energy

**Concept 3:** Energy can be \_\_\_\_\_ or \_\_\_\_\_.

**Law of \_\_\_\_\_ of energy:** law stating that energy is neither created nor destroyed, but is transformed from one form of energy to another or transferred from one object to another

When energy transformations occur, some of the energy is \_\_\_\_\_ into a form that is not useful and it is considered to be “ \_\_\_\_\_

There are three types of systems:

- 1) \_\_\_\_\_: a system that can exchange both energy and matter with its surroundings
- 2) \_\_\_\_\_: a system that can exchange only energy but not matter with its surroundings
- 3) \_\_\_\_\_: a system that cannot exchange energy nor matter with its surroundings

When energy is \_\_\_\_\_, it stays in the same \_\_\_\_\_.

When energy is \_\_\_\_\_, it changes into another \_\_\_\_\_ of energy.

1. Describe the law of conservation of energy.
2. How do energy transfer and transformation differ? How are they similar?
3. Use an example from your everyday life showing how you could change an open syst To:

- a) a closed system
- b) an isolated system

**Concept 4:** \_\_\_\_\_ quantities contribute to different forms of energy.

\_\_\_\_\_ quantities (e.g., \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, etc.) can affect different forms of energy.

For example, the \_\_\_\_\_ the object is above the ground, the \_\_\_\_\_ gravitational potential energy it has.

Equation for \_\_\_\_\_ energy (KE):

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$E_k$     mechanical kinetic energy (J)  
 $m$      mass (kg)  
 $v$       velocity (m/s)

Equation for \_\_\_\_\_ energy (GPE):

\_\_\_\_\_

$E_g$  gravitational potential energy (J)  
 $m$  mass (kg)  
 $g$  acceleration due to gravity ( $m/s^2$ )  
 $h$  height (m)

1. What physical quantities affect
  - a) mechanical kinetic energy and
  - b) gravitational potential energy?
2. Why might it appear that the law of conservation of energy does not apply to the sled in Figure 3.11?

**Topic 3.1 Summary: What are the \_\_\_\_\_ of energy?**

\_\_\_\_\_ can produce change in a system.

There are \_\_\_\_\_ forms of energy.

Energy can be \_\_\_\_\_ or \_\_\_\_\_.

\_\_\_\_\_ quantities contribute to different forms of energy.