

Topic 3.1 Assessment

Check Your Understanding Answers

Understanding Key Ideas

1. a) Students might identify any four of the following. Examples of possible sources are given in brackets. Mechanical kinetic energy (motion of people, clouds), radiant energy (light from stars, fire), thermal energy (anything in the photo), sound energy (crackling fire, people talking), electrical kinetic energy (light in tent), chemical potential energy (battery in light in tent, cells in people, firewood), elastic potential energy (stretched poles and materials in tent, soles of hiking boots), gravitational potential energy (anything above a

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BC Science Connections 10 Teaching Notes Topic 3.1 What are the properties of energy?

selected reference point to such as the ground, including clouds), nuclear energy (stars), electrical potential energy (battery for light in tent), magnetic potential energy (Earth's magnetic field).

b) Mechanical kinetic energy, radiant energy, thermal energy, sound energy, and electrical kinetic energy are forms of kinetic energy. Chemical potential energy, elastic potential energy, gravitational potential energy, nuclear energy, electrical potential energy, and magnetic potential energy are forms of potential energy. Students should refer to the definitions of kinetic energy and potential energy when they explain why they categorized each format of energy as they did.

2. Thermal energy is a form of kinetic energy because kinetic energy is the energy of motion, and thermal energy is the random motion of particles that make up a substance.
3. Sample answer: a) When I turn on a light, electrical kinetic energy is transformed into radiant energy and thermal energy. b) When I hold a cup of hot chocolate, thermal energy is transferred from the cup to my hand. c) The transfer of energy I described differs from the transformation because energy is not being changed from one form to another. It is only transferred from one object to another.
4. No process of energy transformation is 100% efficient because each time energy changes form some of it becomes unusable.
5. Sketches and captions should explain that an open mug is an open system because both energy and matter can be exchanged with the surroundings. The travel mug covered by a lid is a closed system because energy but not matter can be exchanged with the surroundings. The insulated, closed travel mug would be an isolated system because neither energy nor matter are transferred from the system, or at least much less energy is transferred because a travel mug is not a perfectly isolated system.
6. a) The ball's gravitational potential energy would be at a maximum at the highest point it reaches above the ground.

b) The ball would have no gravitational potential energy when it hit the floor, using the floor as the reference position.
c) The ball's mechanical kinetic energy would be at a maximum the instant before it hits the floor.
d) The ball would have no mechanical kinetic energy when it was not moving. This occurs both when the referee is holding the ball before it is thrown and when it hits the floor and has stopped rolling or bouncing.

Connecting Ideas

7. Sample answer:

- a) A system would be the lamp and the cord. The surroundings are everything else in the universe.
- b) Energy enters the system through the electrical outlet as electrical kinetic energy.
- c) The diagram could show electrical kinetic energy being transformed into radiant energy and thermal energy.
- d) Energy leaves the system as radiant energy (light energy, ultraviolet radiation, and infrared radiation) and thermal energy from the bulb.

e) The law of conservation of energy applies to the system because energy is not created or destroyed but transformed from electrical kinetic energy to radiant energy and thermal energy.

Making New Connections

8. The amount of electrical kinetic energy generated by the hydro dam depends on both the gravitational potential energy and mechanical kinetic energy of the water because the transfer of mechanical kinetic energy of the water to the turbine of the generator generates the electrical energy, but the gravitational potential energy of the water must first be transformed into mechanical kinetic energy before that can happen.