

## Dropping the Ball



### What is Energy?

Scientists define energy as the ability to do work. Energy makes change possible. We use it to do things for us. We have learned how to transfer energy from one form to another and use it to do work for us and live more comfortably.

### Forms of Energy

Energy is found in different forms including light, heat, chemical, and motion. They can all be put into two categories: potential and kinetic.

Potential energy is energy that is stored, or not in motion.

Kinetic is energy at work, in action — for instance, that's the case with electricity, heat, light, motion, and sound.

### Collisions:

What happens to energy when objects collide, for instance if you drop a ball?

Energy cannot be created or destroyed, but can be transformed. If a ball drops, energy is transferred and transformed, in sound for instance, but the total amount of energy remains the same.

**Dropping the Ball:**

Before dropping a ball, you must lift it up from its resting surface. When you do this, you are transferring energy from your muscles to the ball and giving the ball potential energy: the higher you lift it, the more potential energy it has.

As the ball falls towards the ground, its potential energy is transformed into kinetic energy, which will continue increasing as it gains momentum, until it finally collides with a surface.

**Bouncing Back:**

Elastic potential energy is what causes a ball to bounce, or rebound, because it is transformed into kinetic energy, which is then used to bring the ball back up. However, the ball won't get as high as where it started from, because some of its energy has been transferred to the floor or transformed into sound (in the noise it makes upon impact) and thermal energy (friction with the table).

Furthermore, even though we can't see it, as the ball hits the ground, or a table, it changes shape for a split second, which requires energy.

This is why the height of each bounce is a little less than the height of the previous one. Some of the kinetic energy the ball has when it strikes the floor is retained, but other is transformed, so each time the ball bounces it loses a bit of its kinetic energy, and after several bounces it has so little of it left that it ceases to bounce.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. What is energy?

- A** change in motion
- B** light and heat that an object stores
- C** any work that an object does in motion
- D** the ability to do work

2. Why does the author describe what happens when a ball is dropped?

- A** to explain how energy is transformed
- B** to explain how energy is created and destroyed
- C** to explain that dropping a ball is not a real form of work
- D** to explain that the amount of energy in an object remains constant

3. The ball has less energy after it bounces than it does as it is falling to the ground. Which evidence from the text supports this statement?

- A** Elastic potential energy is what causes a ball to bounce, or rebound.
- B** Each time the ball bounces on the ground, it loses a bit of its kinetic energy.
- C** The higher the ball is lifted, the more potential energy it has.
- D** As the ball falls towards the ground, its potential energy is transformed to kinetic energy.

4. During the process of dropping a ball, when does the ball have the least amount of energy?

- A** as it is falling to the ground
- B** after the first bounce
- C** as it is being lifted in the air
- D** after the last bounce

5. What is "Dropping the Ball" mostly about?

- A** how energy is transferred when a ball is dropped
- B** how to drop a ball
- C** how potential energy is converted to kinetic energy
- D** why a ball changes shape for a split second after it hits the ground

6. Read the following sentence: "As the ball falls towards the ground, its potential energy is transformed into kinetic energy, which will continue increasing as it gains momentum, until it finally collides with a surface."

What does the word "momentum" mean?

- A the ability of an object to stay in one place
- B the ability of an object to change direction
- C the ability of an object to go slower in a certain direction
- D the ability of an object to go faster in a certain direction

7. Choose the answer that best completes the sentence below.

Energy cannot be created or destroyed; \_\_\_\_\_ , energy can be transformed.

- A however
- B therefore
- C furthermore
- D initially

8. After the ball hits the ground, why doesn't the ball rise to the height where it started?

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9. Explain how energy is transformed when a ball is dropped. Be sure to explain what happens when the ball is lifted, when a person lets go of the ball, when the ball collides with the ground, and bounces back up.

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10. Explain why the height at which the ball is dropped affects how high it bounces.

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## Teacher Guide &amp; Answers

Passage Reading Level: Lexile 1190

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3. The ball has less energy after it bounces than it does as it is falling to the ground. Which evidence from the text supports this statement?

- A Elastic potential energy is what causes a ball to bounce, or rebound.
- B Each time the ball bounces on the ground, it loses a bit of its kinetic energy.**
- C The higher the ball is lifted, the more potential energy it has.
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8. After the ball hits the ground, why doesn't the ball rise to the height where it started?

**Suggested answer:** Students should explain that some of the kinetic energy the ball has when it strikes the floor is retained but some of it is transformed. Some of the kinetic energy is used to make the ball bounce but not all of it. Some energy is used to change the shape of the ball, some of its energy has been transferred to the floor or transformed into sound and thermal energy. So each time the ball bounces it loses a bit of kinetic energy, and after several bounces it has so little of it left that it ceases to bounce.

9. Explain how energy is transformed when a ball is dropped. Be sure to explain what happens when the ball is lifted, when a person lets go of the ball, when the ball collides with the ground, and bounces back up.

**Suggested answer:** When the ball is lifted, the ball is storing potential energy. The higher the ball is lifted, the more potential energy is stored inside it. When the ball is let go, its potential energy is transformed to kinetic energy as the ball is moving. Kinetic energy builds up as the ball falls. When the ball collides with the ground, some kinetic energy is transformed into sound and thermal energy while some is used to change the shape of a ball for a split second. The ball bounces because elastic potential energy is transformed to kinetic energy but the ball doesn't get as high because it has less kinetic energy than it started with.

10. Explain why the height at which the ball is dropped affects how high it bounces.

**Suggested answer:** Students should explain that the higher the ball is raised, the more potential energy it has. The more elastic potential energy the object has the more this energy is transformed into kinetic energy which is then used to bring the ball back up. The greater the amount of kinetic energy, the higher up the ball will bounce.