

Let's Play Some Kickball!

by Caitlyn Meagher



a man kicking a ball in a game of kickball

Cpl. Michelle Piehl

Have you ever played kickball? In a kickball game, players kick a large, rubber ball and run around four bases, similarly to in baseball. In this game, as in all sports, there are many invisible forces at play. A force is a push or pull in a specific direction. Although we cannot see these forces, they are interacting all around us. People are exerting forces on objects, and objects are exerting forces on people. Through these forces, energy can be transferred from one person or object to another. Let's explore some of the ways forces act and energy gets transferred in a game of kickball!

Two forms of energy are potential energy and kinetic energy. Potential energy is the energy stored in an object due to its position. Kinetic energy is the energy a moving object has due to its motion. To begin the kickball game, the pitcher lifts the ball from the ground. As the pitcher lifts the ball, they are transferring the energy from their muscles to the ball. This act of lifting the ball gives the ball potential energy. The pitcher pulls their arm back, then swings it forward to roll the ball to the kicker. By exerting this force on the ball, the pitcher transfers some of their energy to the ball through movement. As the ball rolls quickly down the pavement, it has kinetic energy.

Let's say the star kicker is up to kick. When she lifts her foot up behind her to kick the ball, her foot has a lot of potential energy. As she swings her foot down, that potential energy is becoming kinetic energy... fast! As soon as she kicks the ball, the energy from her foot transfers into the ball as kinetic energy. The force from her foot causes the ball to change direction. In fact, because of the angle of her kick, the ball sails into the air!

As the ball soars up into the sky, it begins to slow down. The force of gravity is pulling down on the ball, even though the force of the star kicker's foot sent the ball sky high. As the ball soars through the

air, its kinetic energy turns into gravitational potential energy; it slows down as it gets higher. When the ball reaches its highest point, it has its greatest amount of potential energy, and no kinetic energy at all. For just a moment, it's completely still, up in the air. At this point, the downward force of earth's gravitational pull has equaled the upward force of the star kicker's kick. Then, once the ball begins to arc downwards, the potential energy changes back into kinetic energy.

The ball may bounce a few times before being caught or picked up. When the ball finally hits the ground, a few things happen. First, some of the ball's kinetic energy turns into sound energy and heat energy from the impact. At the same time, because the ball is rubber, it gets pushed out of shape by the ground, which gives the ball another kind of potential energy. Then, that potential energy quickly turns back into kinetic energy as the ball bounces back up. But since some of the energy has been converted into heat and sound, the ball moves a little slower, and doesn't go as high. It bounces lower and lower to the ground, until it ultimately stops or is caught by someone in the field.

If a player catches the ball mid-bounce, the ball stops moving. The kinetic energy from the ball goes into the player's hands. Since the mass of the player is much larger than the ball, the player's body only moves a small amount. Although most of this energy transfers to the player, some of the energy is converted into sound energy. That is why there is a loud smacking sound when the ball meets a player's hands!

Throughout a kickball game, different forms of energy are all helping players roll, catch, and kick the ball. Some forces, like gravity, friction, and air resistance, are also at play. Next time you're on the field, know that many invisible forces are working to play the game with you!

Name: _____ Date: _____

1. What is a force?

- A. energy stored in an object
- B. a push or pull in a specific direction
- C. energy in a moving object
- D. the mass of a kickball player

2. The text contrasts potential and kinetic energy. How does potential energy differ from kinetic energy?

- A. Potential energy is stored in an object based on its position while kinetic energy is the energy an object has due to its motion.
- B. Potential energy is the position on a kickball team that rolls the ball to the kicker while kinetic energy is the person kicking the ball.
- C. Potential energy is any push or pull in a specific direction while kinetic energy is what makes everything fall towards the Earth's center.
- D. Potential energy is a force like gravity, friction, and air resistance, while kinetic energy is a push or a pull in a specific direction.

3. Read the following sentences from the text.

"As the ball soars up into the sky, it begins to slow down. The force of gravity is pulling down on the ball, even though the force of the star kicker's foot sent the ball sky high. As the ball soars through the air, its kinetic energy turns into gravitational potential energy; it slows down as it gets higher. When the ball reaches its highest point, it has its greatest amount of potential energy, and no kinetic energy at all. For just a moment, it's completely still, up in the air. At this point, the downward force of earth's gravitational pull has equaled the upward force of the star kicker's kick. Then, once the ball begins to arc downwards, the potential energy changes back into kinetic energy. "

What conclusion can you draw from this evidence?

- A. The ball has more kinetic energy when it is farther from the ground.
- B. The ball has more gravitational force because of the kicker.
- C. The ball has more kinetic energy when it is closer to the ground.
- D. The ball transfers its energy to the air around it as it goes up.

4. The star kicker transferred energy from her foot to the ball as she kicked it into the air. What happened to that energy?
- A. The energy stayed in the ball until it reached its highest point, and then the ball lost all of the energy, causing it to fall back down and bounce on the ground.
 - B. The ball gained potential energy as it rose, then lost additional kinetic energy as it fell, causing it to generate new sound and heat energy as it bounced and was caught.
 - C. The kinetic energy in the ball turned into potential energy and stayed as potential energy as the ball returned to the ground, bounced, and was caught by another player.
 - D. The energy stayed in the ball and changed between kinetic and potential energy, then left the ball as heat, sound, and kinetic energy in another player's body.
5. What is the main idea of this text?
- A. When a player catches a ball mid-bounce, the kinetic energy from the ball goes into their hands.
 - B. Kickball is a sport that uses a large, rubber ball and is similar to baseball because players run around four bases.
 - C. When a pitcher pulls their arm back and then swings it forward to roll a ball, they are exerting a force on the ball.
 - D. In a game of kickball, different forces help energy transform and transfer from one person or object to another.