“Scream Machines”-Roller Coaster

Read the following passage.

Today’s roller coasters are “scream machines,” breaking world records for fastest, highest, and craziest.

The world's newest roller coaster is one wild ride. As you wait in line, you hear the screams of people riding “Kingda Ka”.

The Kingda Ka coaster or the “King of Coasters”, at New Jersey’s Six Flags Great Adventure in the United States is the fastest and tallest roller coaster on Earth. It shoots riders from 0 to 206 kilometers per hour in 3.5 seconds, then sends them flying 139 meters into the sky!

Part of you can't wait to ride the roller coaster; another part of you wants to bolt in the opposite direction. Before you know it, it's your turn to board. You brace yourself. The jaw-dropping thrill ride shatters the world's record for roller coaster speed and height. Of the more than 1,000 roller coasters in the United States, it is the latest "extreme" coaster to be built.

The Steel Dragon 2000 coaster at Nagashima Spa Land in Japan is the longest steel roller coaster in the world. It sends its riders on a journey of over 2,479 meters of looping, twisting track!

Although roller coasters have changed quite a bit since the ride first became popular, the basic design principles remain the same. Whether the ride consists of an old wooden track with a few hills and turns, or a modern steel track with a variety of corkscrews and loops, all roller coasters rely on the **conservation of energy.**

Changes in **energy** enable roller coasters like Kingda Ka to move for most of the ride. According to scientists, energy is the ability to do work.

The **law of conservation of energy states that within a closed system, energy can change form, but it cannot be created or destroyed.** In other words, the **total amount of energy remains constant**. On a roller coaster, energy changes

from potential to kinetic energy and back again many times over the course of a ride.

Kinetic energy is energy that an object has as a result of its motion. All moving objects possess kinetic energy, which is determined by the mass and speed of the object. **Potential energy is the energy an object has as a result of its position.** Potential energy is stored energy that has not yet been released.

For example, a book placed on a shelf possesses gravitational potential energy because of Earth's gravity. If the book were moved to a higher shelf, it would gain potential energy.

For most roller coasters, the gravitational potential energy of the cars at the peak of the first hill determines the total amount of energy that is available for the rest of the ride.

Traditionally, the coaster cars are pulled up the first hill by a chain; as the cars climb, they gain potential energy. At the top of the hill, the cars have a great deal of gravitational potential energy.

When the cars are released from the chain and begin coasting down the hill, potential energy transforms into kinetic energy until they reach the bottom of the hill. As the cars ascend the next hill, some kinetic energy is transformed back into potential energy. Then, when the cars descend this hill, potential energy is again changed to kinetic energy.

This conversion between potential and kinetic energy continues throughout the ride. In reality, the conversion between potential and kinetic energy (both are forms of mechanical energy) is not perfect.

The force of **friction** acts on the moving cars, decreasing the total amount of mechanical energy in the system. **The mechanical energy is not lost, however. It is transformed into thermal energy, which can be detected as an increase in the temperature of the roller coaster's track and car wheels**. **Because of friction between the coaster cars and the track** , **the amount of mechanical energy available decreases** throughout the ride, and that is why the **first hill of a roller coaster must always be the tallest.**