Energy Screams

Click......click......click.

You're on a roller coaster.
It's climbing slowly up a hill.
All you see is the top of the hill and open sky.

"Ugh," you think to yourself.

Click...click...click.

You're 40 stories up.
With only a metal bar for safety.

CLICK, CLICK, CLICK!

You're at the very top of the hill.

Silence.

All you see is the bottom of the hill.
It's very far away.
You're scared.

"I want to go home."

WHOOOOOOOOOOOOOOOOOOOOOSSSSSSSSSSSSSHHHHHHHHH!!!!!!!!!!!!!!!!!!!!!!!!!!!

You pick up speed as your stomach lifts up and out of its usual, happy place.

Halfway down the hill, you're already going 70 miles per hour. Your screams (if they can claw their way out of your mouth) are almost behind you by the time they leave your mouth.

You reach the bottom of the hill but immediately start to climb another big hill. Your stomach takes a second to feel alright again.

You drop again, and your intestines also take a stroll.

The bottom of this hill yields no breathing room as you realize you are about to go upside down.

A loop-the-loop.

Yes, your feet are now above your head and you're so disoriented you don't see what the loop-the-loop feeds into.

A corkscrew. Not only are you upside down again, but you're spinning at the same time.

The corkscrew feeds into a spiral, which pins you to the seat. It's a good thing because you're sideways.

"I waited in line for 50 minutes to be tortured?!"

When you come out of the spiral, you shoot straight back up and down a smaller hill.

This hill is child's play, but uh-oh, you can't see the bottom.

All you see is a black hole.

Lights flash.
People scream.
You scream.
All the screams bounce around inside the dark, cramped tunnel.

It's loud.
It's scary.
More lights flash.

"Why am I here?!"

You see a light at the end of the tunnel. It's above you.

You shoot up and out of the tunnel.
You hear brakes activate, and you slow to a stop.

The ride is over.
You're alive.

You're back where you first got into this death trap and see a hungry line of people salivating over your seat.

"You can have it."

The amusement park tries to sell pictures of you screaming your head off.

"You can have them."

You need to sit down.
In a chair that doesn't move.

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After surviving a roller coaster, most riders would say they just had a thrilling ride. Some would mention how scary it was. Some wouldn't say anything as they focused on racing back to the end of the line, ready to wait 50 minutes for another chance to feel like their stomach was in their mouth.

But how many riders would mention the great application of potential energy to generate a massive amount of kinetic energy with the sole intention of delivering an exhilarating two-minute roller coaster ride?

Very few, and yet, that's all a roller coaster is.

As you go up and down, you and the roller coaster are just experiencing changes in potential energy and kinetic energy.

As you click up the first big hill, you are moving forward and have a certain amount of kinetic energy. As you climb, you are also building potential energy. The higher you go, the greater your potential energy. If the roller coaster never went down the hill and just stayed up there, your potential energy would still be there, but it would never be converted to kinetic energy.

Don't worry. Almost all roller coaster designers build a track that brings you back down.

At the top of the first and tallest hill, your potential energy is at its highest it will ever be on this ride. As you begin to descend, your potential energy decreases until it's all gone at the bottom of the hill.

At the bottom of the first hill, your kinetic energy is at its highest point. You're going as fast as you'll ever go on this roller coaster ride.

To ensure the fun keeps going, the roller coaster's designers put in the second hill. If the first hill were the ride's only one, the fun would be over sooner. Without going back up another hill to increase potential energy again, this gravity-driven roller coaster could still do a few things with its remaining kinetic energy, but just not as much. One of the marvels of a well-designed roller coaster is its ability to harness the energy built with the first hill as long as possible. The second hill picks up where the first one left off and builds potential energy on the way up, and converts that to kinetic energy on the way down.

The loop-the-loop works the same way in that the highest point of the loop is where the roller coaster's potential energy is at its highest. On the way down and out of the loop-the-loop, it converts into kinetic energy and rolls onto the next stomach-churning thrill.

That last hill with the dark tunnel-bottom is a segment of the roller coaster designed to extract one last scream, but to also burn off some kinetic energy. The fact that you are looking up at the exit of the tunnel means you've hit the bottom of that hill. Once you're past the bottom, the roller coaster is fighting gravity to go up and therefore decreasing in kinetic energy. This helps lower the power and energy to slow the roller coaster to a smoother stop.

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Some people love roller coasters. Others loathe them. Wherever you fall on the roller coaster love/loathe spectrum, it is this mix of potential energy and kinetic energy that affects your feelings toward roller coaster rides. Whether the roller coaster is made out of metal or wood, or you're sitting, standing, or lying on your stomach, the roller coaster is still delivering that mix.

Different materials or where you're sitting on the roller coaster do actually affect how you experience the potential energy and kinetic energy. Roller coaster tracks made of steel, as opposed to wood, can create less friction and therefore offer a smoother ride. This means that the potential and kinetic energies created are delivered more efficiently to the roller coaster and ultimately, to you. Where you are sitting in the roller coaster can affect your ride as well. If you're sitting in the back, you will feel weightless. If you're sitting in the front, you will see everything that's designed to make you scared, like the first big drop.

All of the rides at amusement parks have a mix of potential energy and kinetic energy. It's just that with roller coasters, the extreme heights and speeds make the energies extremely apparent and unforgettable.

Make sure you're healthy enough to ride a roller coaster. Some people's bodies aren't fit to experience a roller coaster and that's fine. If you can ride a roller coaster, try to enjoy it!

Name: ______________________________ Date: ______________________

1. How does the passage define a roller coaster?

- **A** the application of kinetic energy to generate massive amounts of potential energy in order to create an exciting experience
- **B** an amusement park ride that does not rely on gravity
- **C** a thrilling ride that almost everyone enjoys
- **D** the application of potential energy to generate massive amounts of kinetic energy in order to create an exciting experience

2. What does the author describe in the passage?

- **A** a merry-go-round ride
- **B** potential and kinetic energy in a roller coaster ride
- **C** the rising popularity of amusement parks
- **D** famous roller coasters around the world

3. Read the following sections from the passage:

"At the top of the first and tallest hill, your potential energy is at its highest it will ever be on this ride. As you begin to descend, your potential energy decreases until it's all gone at the bottom of the hill."

"At the bottom of the first hill, your kinetic energy is at its highest point. You're going as fast as you'll ever go on this roller coaster ride."

Based on this evidence, what conclusion can be made?

- **A** A roller coaster is fastest at the front of the train.
- **B** The shorter the hill the roller coaster climbs, the greater its kinetic energy.
- **C** Potential energy is converted to kinetic energy as the roller coaster goes down the hill.
- **D** No conclusion can be made from this evidence.

4. Why is it necessary for a roller coaster to go up a hill?

- **A** The potential energy of the roller coaster increases as the coaster goes up a hill and can be converted to kinetic energy. This kinetic energy allows the coaster to do different things.
- **B** The kinetic energy of the roller coaster increases as the coaster goes up a hill and can be converted to potential energy. This potential energy allows the coaster to do different things.
- **C** The kinetic energy and potential energy increase as the coaster goes up a hill. This increase in kinetic and potential energy allows the coaster to do different things.
- **D** The kinetic energy and potential energy decrease as the coaster goes up a hill. This decrease in kinetic and potential energy allows the coaster to do different things.

5. What is this passage mostly about?

A a day at an amusement park
B a boy who hates roller coasters
C how to build a roller coaster
D how roller coasters use potential and kinetic energy

6. In the first section of the passage, what does the author use to create a sense of momentum and to mimic the motions of a roller coaster?

A the author's internal monologue
B short sentences and active verbs
C different images of roller coasters
D long, run-on sentences

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

All of the rides at an amusement park have a mix of potential and kinetic energy, ________ the energies are most noticeable on roller coasters due to their extreme heights and speeds.

A finally
B thus
C although
D certainly

8. Where is the kinetic energy of a roller coaster at its highest?

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9. Why do roller coaster designers include a second hill on the ride? What would happen to the ride if there were only one hill?

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10. Explain how potential energy converts to kinetic energy in the loop-the-loop section of the roller coaster. Make sure to note when the potential energy of the coaster is at its lowest in the loop-the-loop and when the kinetic energy of the coaster is at its highest.

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Teacher Guide & Answers

Passage Reading Level: Lexile 990

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

All of the rides at an amusement park have a mix of potential and kinetic energy, ________ the energies are most noticeable on roller coasters due to their extreme heights and speeds.

- **A** finally
- **B** thus
- **C** **although**
- **D** certainly

8. Where is the kinetic energy of a roller coaster at its highest?

Suggested answer: The kinetic energy of a roller coaster is at its highest at the bottom of the first hill.

9. Why do roller coaster designers include a second hill on the ride? What would happen to the ride if there were only one hill?

Suggested answer: Roller coaster designers include a second hill to build up more potential energy that can be converted to kinetic energy as the roller coaster goes down the hill. If there were only one hill, the ride would have less energy and would be shorter.

10. Explain how potential energy converts to kinetic energy in the loop-the-loop section of the roller coaster. Make sure to note when the potential energy of the coaster is at its lowest in the loop-the-loop and when the kinetic energy of the coaster is at its highest

Suggested answer: Potential energy builds as the coaster is going up the loop-the-loop and converts to kinetic energy on the way down and out of the loop-the-loop. The potential energy of the coaster is at its lowest and the kinetic energy is at its highest as the coaster moves in the lowest point of the loop-the-loop.