Grade Eight
Physical Science Standard

<table>
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<th>Benchmark B:</th>
<th>In simple cases, describe the motion of objects and conceptually describe the effects of forces on an object.</th>
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| Grade Level Indicator | 1. Describe how the change in position (motion) of an object is always judged and described in comparison to a reference point.  
3. Explain that unbalanced force acting on an object changes that object’s speed and/or direction. |

Teacher Information
A real world example of the brachistochrone curve as described in the video is through the use of roller coasters. The conversion of potential energy to kinetic energy is what drives the roller coaster, and all of the kinetic energy you need for the ride is present once the coaster descends the first hill. On a coaster ride, energy is rapidly transformed from potential energy to kinetic energy when falling and from kinetic energy to potential energy when rising.

Acceleration is the rate at which the speed or direction changes. Some amusement park rides (such as roller coasters) are characterized by rapid changes in speed and or direction, while others, such as the carousel have small accelerations; the speed and direction changes gradually.

Materials needed for each group or student:
- Student Assessment journal

Developed by TLC for WOSU Public Media
Below are sections of track from a new rollercoaster. On which of the sections will the riders be going the fastest? Use the terms potential energy and kinetic energy to explain your answer in your journal.

A.

B.

C.
Frictionless Ramp Rubric

2 point response:
Student identifies the correct track and provides a correct explanation.

1 point response:
Student correctly identifies the correct track but explanation is weak and does not contain proper terminology.

0 point response:
Student does not correctly identify correct track and/or does not provide correct explanation.

CORRECT EXPLANATION:

Track C is the fastest. When the car starts it has stored energy, or potential energy because of its height. As it travels down the track because of gravity, some of the potential energy is converted into the energy of movement, kinetic energy. The car will be going the fastest when it has converted the most energy from potential to kinetic. Because on Track C, the car spends most of the time at the lowest point (where the most potential energy has been converted to motion), it has the greatest speed.