Science Exemplary Text
Student Handout

The rides in an amusement park not only are fun but also demonstrate principles of physics. Among them are rotational dynamics and energy conversion. I have been exploring the rides at Geauga Lake Amusement Park near Cleveland and have found that nearly every ride offers a memorable lesson.

To me, the scariest rides at the park are the roller coasters. The Big Dipper is similar to many of the roller coasters that have thrilled passengers for most of this century. The cars are pulled by chain to the top of the highest hill along the track, released from the chain as the front of the car begins its descent, the un-powered cars have almost no speed and only a small acceleration. As more cars get onto the downward slope the acceleration increases. It peaks when all the cars are headed downward. The peak value is the product of the acceleration generated by gravity and the sine of the slope of the track. A steeper descent generates a greater acceleration, but packing the coaster with heavier passengers does not.

When the coaster reaches the bottom of the valley and starts up the next hill, there is an instant when the cars are symmetrically distributed in the valley. The acceleration is zero. As more cars ascend the coaster begins to slow, reaching its lowest speed just as it is symmetrically positioned at the top of the hill.

A roller coaster functions by means of transfers of energy. When the chain hauls the cars to the top of the first hill, it does work on the cars, endowing them with gravitational potential energy, the energy of a body in a gravitational field with respect to the distance of the body from some reference level such as the ground. As the cars descend into the first valley, much of the stored energy is transferred into kinetic energy, the energy of motion.

Walker, Jearl. (1985). “Amusement Park Physics.” Roundabout: Readings from the Amateur Scientist in Scientific American. New York: Scientific American.

This is an example of exemplary text found in *Common Core Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects: Appendix B Text Exemplars and Sample Performance Tasks.* Retrieved from http://www.corestandards.org/assets/Appendix_B.pdf

Science Exemplary Text
Teacher Resource

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To me, the scariest rides at the park are the roller coasters. The Big Dipper is similar to many of the roller coasters that have thrilled passengers for most of this century. The cars are pulled by chain to the top of the highest hill along the track, released from the chain as the front of the car begins its descent, the un-powered cars have almost no speed and only a small **acceleration**. As more cars get onto the downward slope the acceleration increases. It peaks when all the cars are headed downward. The peak value is the product of the acceleration generated by gravity and the **sine** of the slope of the track. A steeper descent generates a greater acceleration, but packing the coaster with heavier passengers does not.

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Teacher introduces the text with minimal commentary and students read it independently. Teacher then reads passage aloud. Give a brief definition to words students would likely not be able to define from context (underlined in text). Teacher guides the students through a series of text-dependent questions. Complete the performance task as a cumulative evaluation of the close-reading.

Text-Dependent Questions

1. In your own words, explain how the “Big Dipper” works.
2. What is the author’s point in this passage?
3. Explain how a roller coaster can go up hill.
4. The author states at one point during the roller coaster ride, “The acceleration is zero”. Explain how that can be based on what he tells you about how roller coasters work.
5. Does a roller coaster store energy? If so, how is that important?

Performance Tasks for Informational Texts
Students determine how Jearl Walker clarifies the phenomenon of acceleration in his essay “Amusement Park Physics,” accurately summarizing his conclusions regarding the physics of roller coasters and tracing how supporting details regarding the processes of rotational dynamics and energy conversion are incorporated in his explanation. [RST.9–10.2]

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EFL 5
Word Count 317

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