

Physics in Motion: The Science of Thrills



Hook your high school students into learning by connecting classroom physics with the adrenaline of roller coasters, free falls, and spinning rides. In this lesson, students will apply Newton's Laws, energy transformations, and circular motion to real-world experiences at the amusement park. This plan gives physics teachers a roadmap for guiding students before, during, and after the trip.

Grade Level: 9 – 12

Subject: Physics

Learning Objectives

- By the end of this lesson, students will be able to:
 - Apply Newton's Laws of Motion to real-life examples on amusement park rides.
 - Analyze energy transformations (kinetic, potential, thermal) during ride experiences.
 - Explain the role of centripetal force and acceleration in circular motion rides.
 - Collect, record, and interpret data from field observations.
 - Collaborate with peers to solve problems and communicate findings.

Materials Needed

- Mobile devices (tablets, phones, or laptops) with the Goosechase app installed
- Field notebooks or worksheets
- Stopwatch or timing app
- Calculator
- Safety-appropriate writing tools (clipboards, pencils)

In-Class Preparation

- Setting the Stage: Why Physics at the Park?
 - Begin class with a short video or montage of amusement park rides to capture student interest.
 - Pose a few thought-provoking questions:
 - Why don't we fly out of our seats on a looping roller coaster?

- Why does your stomach drop on a free-fall tower?
 - How do rides keep people safe at such high speeds?
 - Explain that the field trip will let them answer these questions using real rides as physics “labs.”
- Review of Key Concepts
 - Newton’s Laws of Motion
 - Examples: bumper cars (action-reaction), roller coaster launch ($\text{force} = \text{mass} \times \text{acceleration}$).
 - Energy Transformations
 - Potential to kinetic energy on a coaster hill.
 - Circular Motion & Centripetal Force
 - How spinning rides keep students pressed into their seats.
 - Acceleration & G-Forces
 - Relating acceleration to the sensations they’ll feel on rides.
- Data Collection Skills
 - Teach students how to measure and record ride times using a stopwatch or phone app.
 - Practice estimating heights and speeds using scaling (for example, timing a toy car down a ramp and extrapolating).
 - Complete example calculations with mock data to ensure understanding of mathematical processes.
- Create an Experience on the Goosechase app with a series of Missions focussed on physics.
- Develop Missions that require students to demonstrate their understanding of what they have learned. Example Missions:
 - Newton in Action: Record a video explaining which of Newton’s Laws is demonstrated on a ride.
 - Energy Exchange: Take a photo of a roller coaster and describe where potential and kinetic energy are greatest.
 - Spin Science: Measure the time for one rotation of a spinning ride and calculate angular velocity.
 - Free Fall Fun: Estimate the height of a drop tower and calculate potential energy at the top.
 - Centripetal Force: Record yourself describing how you stay in your seat during a loop or turn.
- Adapt the difficulty of the Missions based on the proficiency levels of your students to keep the activity inclusive and engaging for everyone.
- Prepare hints or resources that might help students solve the Missions if needed.
- Run your Experience during one class period or longer
- Divide students into teams and assign each team a mobile device with the app, or have students complete the scavenger hunt individually.
- App Set-Up
 - Dedicate time to ensuring all students have the Goosechase app downloaded and joined to the Experience to avoid any tech issues.

Amusement Park Visit and Scavenger Hunt

- Upon Arrival at the Amusement Park
 - Gather students for a brief orientation
 - Review behavioral and safety expectations for the trip.
 - Review the amusement park map, highlighting any important areas
 - Remind students to balance fun with data collection and observation.
 - Emphasize the significance of teamwork and cooperation during the scavenger hunt.
 - Provide them with checklists or worksheets (ride name, data table, notes column) so they are ready to record during the trip.
 - Encourage students to ask questions to the staff and take advantage of any educational resources offered.
- Scavenger Hunt Exploration
 - Students explore the amusement park in their teams, completing various tasks and challenges related to the rides.
 - Encourage students to use their observation skills to answer questions and complete tasks on the Goosechase mission list that acts as a digital checklist or worksheet.
 - Students complete missions on Goosechase that prompt them to measure, observe, and reflect on rides.
 - Documentation of student observations are recorded within the Goosechase app and automatically saved to their camera roll.
 - Teachers circulate to support learning connections.
- Debrief and Reflection
 - Group discussion: Which rides best illustrated the concepts?
 - Data analysis: Calculate forces, accelerations, and energy conversions using collected data.

Next-Day Classroom Follow Up

- Group Discussion: Making Connections
 - Students return from the field trip and gather in small groups (3–5 students) with their notes, worksheets, and Goosechase submissions.
 - Teacher Prompts:
 - “Which ride gave you the clearest example of Newton’s Laws?”
 - “On which ride did you most strongly feel energy transformations happening?”
 - “Where did you experience the greatest acceleration and how do you know?”
 - “Which ride surprised you the most in terms of physics?”
- Group Activity:
 - Each group selects one ride that best illustrates a physics principle.
 - They create a short poster or whiteboard sketch that shows:
 - A diagram of the ride
 - Forces acting on riders
 - Points of greatest potential and kinetic energy
 - Observed accelerations or sensations

- Share-Out: Each group gives a 2–3 minute recap to the class.
- Data Analysis Workshop
 - Objective: Students turn raw field data (times, heights, observations) into meaningful calculations.
 - Example Tasks:
 - Forces & Acceleration: Using measured times and estimated distances:
 - Calculate average speed
 - Calculate acceleration
 - Energy Transformations
 - Estimate potential energy at the top of a hill
 - Compare to calculated kinetic energy at the bottom
 - Discuss how close values are, and what accounts for energy loss (sound, heat, friction).
 - Centripetal Force
 - For spinning rides:
 - Calculate the speed
 - Calculate centripetal acceleration
 - Determine centripetal force
- Whole-Class Synthesis
 - Guided Reflection Prompts:
 - “Which formulas were easiest to apply to your ride data? Which were hardest?”
 - “How do your calculations connect with the sensations you felt on the rides?”
 - “What real-world challenges did you encounter when trying to collect scientific data outside the classroom?”
 - “How did energy conservation or Newton’s Laws help explain safety design in rides?”
 - Encourage students to see how math validated their experiences and how their bodies became physics detectors.

Optional Post-Experience Physics Activities

- Reflection Essay
 - Students choose one ride and write a 1–2 page essay. They must describe their experience and connect it to at least three physics principles (e.g., Newton’s Laws, energy transformations, centripetal force). Include both what they *felt* and what the *physics* explains.
- Visual Creation
 - Students draw and label a diagram of a chosen ride. They should show key forces (gravity, normal force, centripetal force) and mark where potential and kinetic energy are greatest. A short written explanation accompanies the diagram.
- Group Presentation

- In small groups, students compare two or more rides. Their presentation should explain at least three physics concepts per ride, include data or observations from the field trip, and use a visual aid (poster, slides, or Goosechase submissions).

Assessment

- Participation in Goosechase missions.
- Accuracy of data collection and calculations.
- Quality of individual reflections (clarity, physics application).
- Group presentations assessed with rubric (teamwork, accuracy, depth).

Ready-Made Experience

- [Physics in Motion: Amusement Park Challenge](#)

Keep the Learning Rolling 🎢

Not heading to an amusement park? Bring the excitement to your classroom or schoolyard with these hands-on physics Goosechase Experiences — perfect for sparking curiosity, motion, and fun right where you are!

- [Physics on the Playground](#)
- [Physics Review](#)

More Where That Came From:

This is just one of many ready-to-run Goosechase lesson plans we've created. Explore them all and keep your students learning, laughing, and engaged year-round.

<https://blog.goosechase.com/tag/lesson-plans/>