

Accelerometer on Vertical Ride

This worksheet is designed to accompany electronic data collection on a vertical (free fall) ride. It can be used with Vernier or PASCO data collection equipment. Note that while we call the basic unit an "accelerometer", it actually responds to forces. Data you obtain in m/s^2 can also be expressed in N/kg , emphasizing the force nature of the measurement.

Before you ride

- The name of the ride you went on was: _____
- On the back of this page, sketch the sequence that the rider goes through, making note of the approximate times they are at extreme positions (very top, bottom, etc.)
- In the space below, describe your data collection strategy for this ride. Will you collect data for the entire ride, or concentrate on a specific portion? Which portion? How long does it take to go through the ride or that part of the ride, and how many data points would you like to acquire?
- Notice the launch sequence. When should you initiate data collection in order to gather data over the entire run?
- Secure the accelerometer in a fixed orientation relative to your body. The preferred axis would be straight up and down (vertical).

When you ride

When you reach the point in time where you want to begin collecting data, press the [Start/Stop] button once. For some equipment, you will need to press the [Start/Stop] button to cease collecting once you're finished.

After you ride

Return the data collection unit back to the Electronic Data Center, EDC, or to your teacher. Download the data so it can be saved. If possible, print the graphs of your Force (acceleration) vs. Time and Altitude vs. Time so you can do onsite analysis or even analysis after returning to school.

Questions:

Use additional pages to answer the questions below. Use the Altitude vs. Time graph to determine where you were on the ride. Also note any peculiar accelerations encountered.

1. On the graph of Altitude vs. Time, indicate 3 places that stand out with circled letters. Describe where each is on the ride and what is happening to the rider at each place.

2. For each of the 3 locations you chose in Step 1, locate the corresponding points in the Force (acceleration) graph. Describe the force you recorded in each location. For example, your statement might be, "I felt an upward (vertical) force of 35 N/kg which is about 3.5 g's."
3. For each of these 3 locations, explain why you felt the forces you did, accounting for the direction of the force and the magnitude.
4. The larger the acceleration, the larger the net force acting on your body. Are the places where the instruments recorded the largest values the same places you felt the largest forces? Why or why not?

Ride Profile:

- In this area, sketch the position of the rider at various times. A typical free-fall ride might show movement from the bottom to top taking 15 seconds or so, a rest at the top of about 5-10 seconds, while requiring only 5 seconds to actually fall from top to bottom.
- Indicate on your ride profile the approximate location of a passenger every 5 seconds. This will enable you to match up your accelerometer data with your location on the ride.

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