PGA STAY-HOME LAB
THE PHYSICS OF AMUSEMENT PARK RIDES

- **Lab requirements:** Full group report due **Friday May 10**, worth 45 points. Groups of 3-4. Use metric units!
  - → Cover page with student/hour and teacher names (2 points)
  - → Purpose and procedure (1 point)
  - → Research of rides (6 points)
  - → Gravitron (10 points) typed on clean, unlined paper; calculations can be done by hand in pencil
  - → K'Nex coaster (12 points) typed on clean, unlined paper; calculations can be done by hand in pencil
  - → Scavenger hunt tabulated (10 points)
  - → Group conclusion and summary (4 points)

- **Purpose:** To apply the laws of physics to amusement park rides.

- **Research:**
  - On the Great America web site (www.sixflags.com) research 2 rides which your group would ride if you could make the trip. Create a table listing the maximum velocity, track length, maximum height, and total time of each ride. Be sure to convert all data to metric.

  - Discuss why you picked these 2 rides.

- **Jearl Walker's Gravitron Ride**

1. View the video of Jearl Walker riding the gravitron. Use a stopwatch to measure the period of rotation T after the floor drops away. Average the time over 5 revolutions if possible.

2. If the ride has a radius of 2.5 meters, calculate Jearl's velocity and centripetal acceleration as he rotates on the gravitron. How many "g's" does this represent?

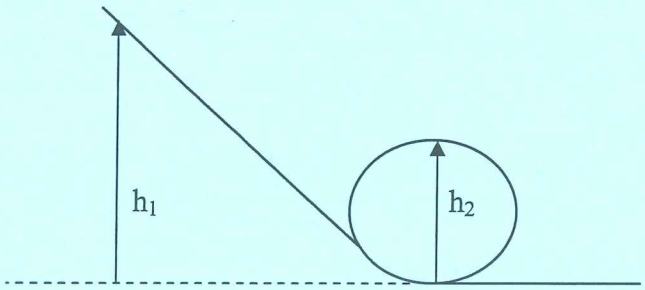
3. What prevents Jearl from falling when the floor drops?

4. What 4 forces (horizontal and vertical, real and fictitious) act on Jearl as he rotates? In what direction do they act (up/down, inward/outward)?

5. If Jearl's mass is 65 kg, how much centripetal force does he experience?

6. Jearl is in some discomfort during the ride. Why is the ride limited to a radius of 3 meters? What would the riders feel (in terms of "g's") if the ride had a radius of, say, 5 meters (show calculation!)?

- **K'NEX scale model coaster**



All units metric (MKS):

1. Measure the mass of the model coaster car: _____ kg
2. Measure the height (h_1) of the first hill: _____ m
3. Measure the total length of track with tape measure: _____ m
4. Time the total round trip: _____ s
5. Time the climb to the top of the first hill: _____ s
6. Measure the diameter of the loop (h_2): _____ m

Calculations:

1. Calculate the potential energy (J) of the car at the top of the first hill.
2. Calculate the power (W) to lift the car to the top of the first hill.
3. Calculate the average velocity (m/s) for the entire trip.
4. Calculate the maximum velocity (m/s) at the bottom of the first hill (before entering the loop). Compare to average velocity from step 3 above.
5. Calculate the height (m) necessary for the car to get around the loop. Compare to measured height of first hill.

- **Six Flags Great America scavenger hunt**

Round off to nearest whole number. Think metric!

1. Number of theme parks owned by Six Flags, Inc., in North America: _____
2. Price of online special single daily ticket (without tax): _____
3. Number of "Family Rides" listed on website: _____
4. Advertised approximate driving time (minutes) from Milwaukee to Six Flags: _____
5. Last 2 digits of zip code for Six Flags Great America location: _____
6. Maximum velocity (m/s) for Batman: _____
7. Minimum height (cm) required for a passenger to ride Vertical Velocity: _____
8. Price of individual Six Flags ticket for groups of 20 or more (without tax): _____
9. Advertised ride duration for Raging Bull (sec): _____
10. Height of first drop on Superman (m): _____

Total: _____

- **Type a group conclusion/summary**