

# COASTER KINGDOM

## Extra Credit in Exactly 6 Seconds

For Advanced and Honors physics

### **Purpose:**

To build a roller coaster to allow a sphere to travel a student designed and student built course in **exactly** 6 seconds.

### **Rules/Procedures:**

- 1) Entries may be designed and built by either an individual or a team of 2 students from any of the above classes.
- 2) You are limited to materials on the materials list. Multiple mediums for the track are encouraged with extra points.
- 3) You must **try** to include at least vertical **one loop** on the track. Massive points will be given for successfully completing a loop. More loops, more points. If you are not able to build with a loop, at least build the track! (You just won't get the maximum amount of points)
- 4) Track must have at least **1 hill** for the "BB" to go **up**. Massive points will be given for this hill. More hills, more points.  
**Hills must be a minimum of 4 cm above the tracks lowest point prior to climbing the hill.**
- 5) You must be able to see the "BB" on the track for AT LEAST **1/2 of the total trip**. Looking through clear tubing does not count.
- 6) You must name your roller coaster and have a theme. Tunnels and scenery are a must--you will get points for decorations such as small signs, mountains, trees, random people, miniature models etc..... Think about the Matterhorn or Thunder Mountain, or the Pirates of Caribbean at Disneyland.
- 7) The roller coaster's height is only limited by the ceiling in the class room and the vehicle you are using to get it here. **Hint:** The taller it is, the more energy you have to start out with and more speed at the bottom!
- 8) A "BB" may be obtained from the teacher or you may supply your own.
- 9) The roller coaster is to have a base no larger than the size of an OPEN manila folder laid flat on the table. The manila folder will be supplied by the teacher or you may supply your own -18" x 11 1/2" when opened.

- 10) The roller coaster MUST be stable.
- 11) The "BB" must go through the roller coaster and be done by **exactly** 6 seconds. +/- 0.20 second increments will cause deduction in points.
- 6) Timing will be done by stopwatch by the teacher
- 13) Timing will start when the student releases the ball.
- 14) Timing will stop when the ball reaches the end of the track at the diagonally opposite corner.
- 15) If the ball flips off of the track, the timing will stop.
- 16) **You may not touch the device at any time.** Once the ball is let loose and is going down the track or you will lose 2 points each time.
- 17) The roller coaster's track length may be as long as you wish in length.
- 18) You must have **at least 2 curved turns**. Other turns are ok:
  - Drops (through a funnel)
  - zig zag sections
  - 90 degree angle turns
  - Spirals
- 19) The "BB" must only go through the track via the force of gravity.
- 20) You will get 2 tries to make it work. The best score of 2 will be used.
- 21) The roller coaster's track **MUST** end at the diagonally opposite corner from where it began.

## **Due Date:**

Wednesday, May 29th and May 30th during class.

# Points and Grading:

Grade: 50 point test grade

## The entry with the maximum number of points wins the contest.

1. Building a feasible "BB" track on the board that takes a "BB" a minimum of **6 seconds** to go through.....15 points
2. Decorations, scenery, painted/colorful, with trees etc..... 4 points  
(subjective score--judged by the teacher-Impress the teacher.)
3. 1 loop **with success**..... 4 points.  
(extra loops with success.....2 points each)
4. 1 hill **with success** (Minimum of 10 cm tall)..... 4 points  
(extra hills with success.....2 points each)
5. Time for completion---6 sec (when light is lit or ball stops)..... 15 points  
\*minus 1 point for every 0.10 sec above or below 6 sec.
8. Minimum of two curved turns.....4 points  
(Unlike hills and loops, extra curves do not add extra points.)
9. Track and ball end at the diagonally opposite corner to the starting point..... 4 points
10. Not being able to see the "BB" for 1/2 of the total time  
(example: "BB" is inside of straw pipe the whole trip)..... - 8 points

**With multiple hills and loops, an entry can earn up to 10 more points above the 50 listed above.**

**3 Bonus points for winning.**

**3 Bonus points for having built a coaster that can fit in the smallest rectangular volume.**

**This will count as an extra 50 point grade. You may not earn more than 62 points.**

### **Suggested Construction Materials**

Pipe cleaners, bendi straws, aluminum foil, plastic drinking cups, film canisters, wire, lots of duct tape, hot glue, imagination