Team
Names_____Date_____Hour_____

Roller Coaster Design and Build

Goal: To build a complex marble roller coaster & calculate the marble's average speed.

Final Product: A graphical representation of your group's roller coaster, including all of its important concepts and measurements.

Procedure:

1. Get 3 foam tubes & a bag of supplies (marble, plastic cup, measuring tape, masking tape). Careful, your group is responsible for returning everything just as you received it.

2. How long is the track? Measure the length in METERS (hint: each one is 6 feet).

- Total Track Length: _____meters

3. Find an empty section of the room. Use masking tape to connect the 4 pieces together to make a track. BE CAREFUL ABOUT THE TAPE: please don't put it on anything that will rip (like paper.) The end of the coaster must empty into the cup.

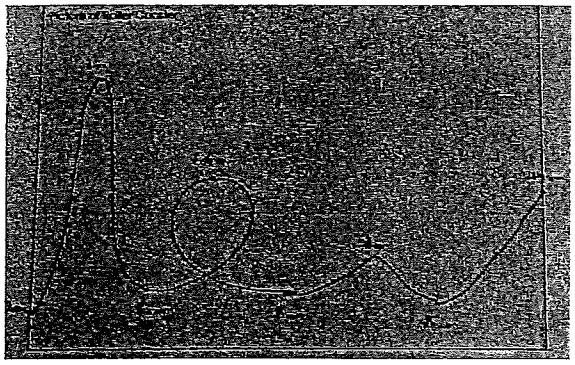
4. Release the marble down the track. Play around with the coaster to get the biggest, fastest, best one you can.

5. Draw and color code your coaster on one 8 1/2 x 11 piece of paper following specifications.

6. Measure each part of the coaster. Record the measurements on your drawing & be sure to measure in centimeters or meters!!

Use the example below. Include the following:

- **Starting & ending height**
- **Height & width of each loop and/or hill**



7. Release the marble down the track & time how long it takes to complete the track. Run at least 5 trials

- **Time:**

1._____ 2._____ 3._____ 4._____ 5._____

8. Determine the average speed of your marble (average speed = total distance/total time).

- **Average Speed of Marble:** _____

9. Identify on your drawing the following concepts with a color code

- ✓ The area where there is **the most potential energy**
- ✓ 2 more areas where there is **potential energy**
- ✓ The area where there is **the most kinetic energy**
- ✓ 2 more areas where there is **kinetic energy**
- ✓ 1 area where there is **acceleration (speed up)**
- ✓ 1 area where there is **negative acceleration (slow down)**

Analysis and Conclusion

1. Why did you label the most potential energy where you labeled it? Explain

2. Why did you label the most kinetic energy where you labeled it? Explain

3. What happened to the PE and KE of the marble as it traveled through the track? Explain

4. Which force opposed the motion of the marble as it moved? Explain

5. What happened to the velocity of the marble as it accelerated down its first hill?

6. Would a marble ever be able to get over a hill higher than its initial starting height? Why or Why Not (Use the terms potential energy and kinetic energy in your answer

7. List 3 important rules about building a successful roller coaster.

Roller Coaster RUBRIC

CATEGORY	4	3	2	1
Design Build	RC has 2 hills and a loop or 3 hills and a turn	RC has 1 hill and a loop or 2 hills and a turn	RC has 1 hill and no loop or 2 hills and no turn	RC has no hill, loop, or turn
Design Graphics **Color Code Key**	All concepts are in the design and are accurate.	Most of the concepts are in the design and are accurate.	Some of the concepts are in the design and are accurate.	Few of the concepts in the design are accurate.
Measurement (cm or m)	100% of the track is measured accurately	1- 2 areas of the track is not measured	2 - 3 areas of the track is not measured	There are no measurements
Design Test	Marble stays on the track from the beginning to the end without bouncing, skipping, or falling off	Marble stays on 75% the track without bouncing, skipping, or falling off	Marble stays on 50% the track without bouncing, skipping, or falling off	Marble does not stay on the track
Physics Calculations	The correct formula is used and the answer is correct.	The correct formula is used but the answer is incorrect.	The incorrect formula is used and the answer is incorrect.	There is no calculation
Student Collaboration	Tasks are appropriately divided among team members, ideas are shared and accepted, class time is used efficiently by all members of the team, safety protocol is followed by all members of the team	Some team members ideas are shared and accepted, class time is used efficiently by all members of the team	Minimal collaboration is evident	Class time was not used efficiently