![MCj02869410000[1]]()

**LET’S MAKE A COASTER!**

**Purpose and Goal for this Project:**

1. The design of your team’s coaster will demonstrate that you understand forces, motion, and energy scientific concepts.
2. Your team will use and apply scientific methods that we’ve learned this year to solve a problem.
3. To continue to improve on cooperative lab group skills and learn the value of teamwork. Your success and grade will depend on how well your construction team can manage the time and materials given.

**Parts of the Project:**

1. Asking the question and/or defining the problem
2. Doing background research and developing a hypothesis
3. Designing an experiment to test the hypothesis
4. Conducting the experiment and collecting data
5. Analyzing the data
6. Communication of the results of the experiment

**Individual Requirements (Everyone must do their part):**

1. Research all topics on force, motion, and energy concepts, plus roller coaster history and amusement parks.
2. Collaborate information found and write a background information report and works cited page, that consists of at least 1 paragraph per topic and a works sited page listing all of the sources used in the preparation of the report. **Will be included in formal lab write up. Each student will write their own lab write up for their groups roller coaster.**

**Team Requirements:**

1. Build a roller coaster that meets all criteria using only the required materials.
2. Test your roller coaster
3. Write an individual lab report.

**Design and Construction Teams:**

* Each team should have 4 members. Each member is responsible for the development and construction of the roller coaster including:
	+ Creating a unique name for the roller coaster
	+ Creating unique names/designs for important curves/loops/hills, etc.
	+ Creating a company name and logo, then submits both for approval

**Job Descriptions and Responsibilities**

**Construction Superintendent** (highly organized/a leader/writer/planner/ reads and follows directions well) **(Organizes and Communicates)**

* Oversees and directs the entire project
* Responsible for daily organization and plan for each member
* Helps build/type reports/problem solve/clean up
* The **only** person that reports to the C.E.O (the teacher)

**Building Foreman** (math and computer skills) Responsible for management of materials and proper storage of construction project. **(Set-up and Clean-up)**

* Responsible for getting materials and supplies out and put away each day
* Reports any problems to construction superintendent
* Helps build/type reports/problem solve/clean up

**Financial-Operations Manager** (math/computer/hands-on/measurement skills) **(Financial data entry)**

* Writes out daily materials list
* Measures out materials and collects data on use of materials
* Helps build/type reports/problem solve/clean up
* Reports any problems to construction superintendent

**Jobsite Worker** (great typing skills, following written directions, computer use)

* Main typist for reports
* Helps build/type reports/problem solve/clean up
* Reports any problems to construction superintendent

**Part One: Asking the Question and Defining the Problem**

**The Problem:**

1. To design and build a roller coaster from paper towel and foam insulation tubes that will sustain multiple “rides” and that will hold up as the number of passengers increases.
2. To determine the effect that the number of passengers has on the speed of a roller coaster.

**The Question:**

1. How does the number of riders on a roller coaster affect the speed that it can archive? Another way to say this is: “As you increase the mass of an object rolling downhill, does it affect the overall speed that can be achieved?”

**Part Two: Doing Background Research and Developing Hypothesis (Everyone Must do their own research)** Using the following terms as keywords, locate information and examples on each.

**History of Roller Coasters: Write 1 paragraph on each bullet below**

* History of Roller Coasters
* How roller coasters work (the physics involved)
* Roller Coaster Safety
* Famous Roller coasters

**Writing the background information portion of your experiment**: The background information is at least 4 paragraphs. Write at least one paragraph on each of the topics you researched. You must also include a **works cited** page.

**Writing the Hypothesis**: Your experiment is an attempt to answer this question: As you increase the mass of a moving object, does the mass affect the speed of the object? Now that you have some background research, **what do you think the answer to this question will be? Why do you think so?**

**Part Three: Designing an Experiment to Test your Hypothesis**

Design and build a model roller coaster to test your hypothesis.

**Follow these guidelines:**

1. The roller coaster must be reasonable and successful.
2. Passenger safety (simulated by stainless steel marbles) is most important. It cannot come off the track.
3. The roller coaster may not exceed construction base size.
4. Be constructed using only approved materials.
5. Be totally built in less than 3 days and completed in to collect data on the performance of the roller coaster by the due date.
6. Make up a unique name for your roller coaster.
7. Name 2 important or interesting features like curves, hills, loops
8. Have an attached starting gate and ending gate to catch the “car”
9. Identify and label on the roller coaster the following physics concept:
	1. A change in speed
	2. A change in velocity
	3. A section of the track showing mass decreasing speed
	4. A section of the track showing mass increasing speed
	5. A point showing potential energy
	6. A point showing kinetic energy
	7. An example of action-reaction
	8. A point showing momentum either increasing or decreasing

**Construction Materials:**

* Tube insulation
* Paper towel tubes
* Masking tape
* Duct tape
* Glue (not hot glue)
* Modeling clay
* Popsicle sticks
* Any other materials needed by your company must be approved by your teacher first.

Some of the materials you use are limited. Time to build is limited. The size of your roller coaster is limited. The base of the roller coaster will be 3 feet by 1 foot or 91.5 cm by 31 cm. The roller coaster cannot be more than 80 cm in height.

**Part Four: Conducting the Experiment and Collecting Data**

After the roller coaster is built you will be given five ball bearings of different masses. These bearings will represent the masses of the roller coaster cars.

**Ask yourself these questions:**

1. What am I trying to find out?
2. How sill I measure what I find out?
3. How will I record what I measure?

Make a chart to record the data you collect as you test your roller coaster **before** you begin collecting data. Have your teacher initial the chart.

**Procedure for testing the roller coaster:**

1. Begin with the smallest bearing.
2. Place the bearing at the starting point on your roller coaster.
3. At the signal, release the bearing and time how long it takes to move from the starting point to the end point of the roller coaster.
4. Record this data in your chart.
5. Repeat steps 2-4 four more times.
6. Repeat steps 2-5 with each bearing.

**Part Five: Communicating the Results/Write your own lab report**

The results of the investigation will be communicated in a Formal Lab Report.

The lab report consists of:

1. Title page – team member names and class period
2. Testable Question
3. Introduction- paragraph on roller coasters
4. Background Information
5. Hypothesis (if then and because)
6. Materials List
7. Building paragraph
	1. Includes statement of variables
8. Testing Procedures
9. Data Chart
10. Data Graph
11. Conclusion – restate question and hypothesis, complete data analysis ,Works Cited
12. Share Results- Discussion of errors, what would you change? What would you keep?

**Requirements:**

* Blue or black ink
* Write on one side of the paper
* If you word process the report, use Comic Sans or Times New Roman, 12 font