

NAME: \_\_\_\_\_

## ROCKIN' ROLLER COASTERS!

Congratulations! You have been hired by Wesleyan University to design and build your very own roller coaster!



You will be given all the supplies you need, but first let's make sure you know some key things:

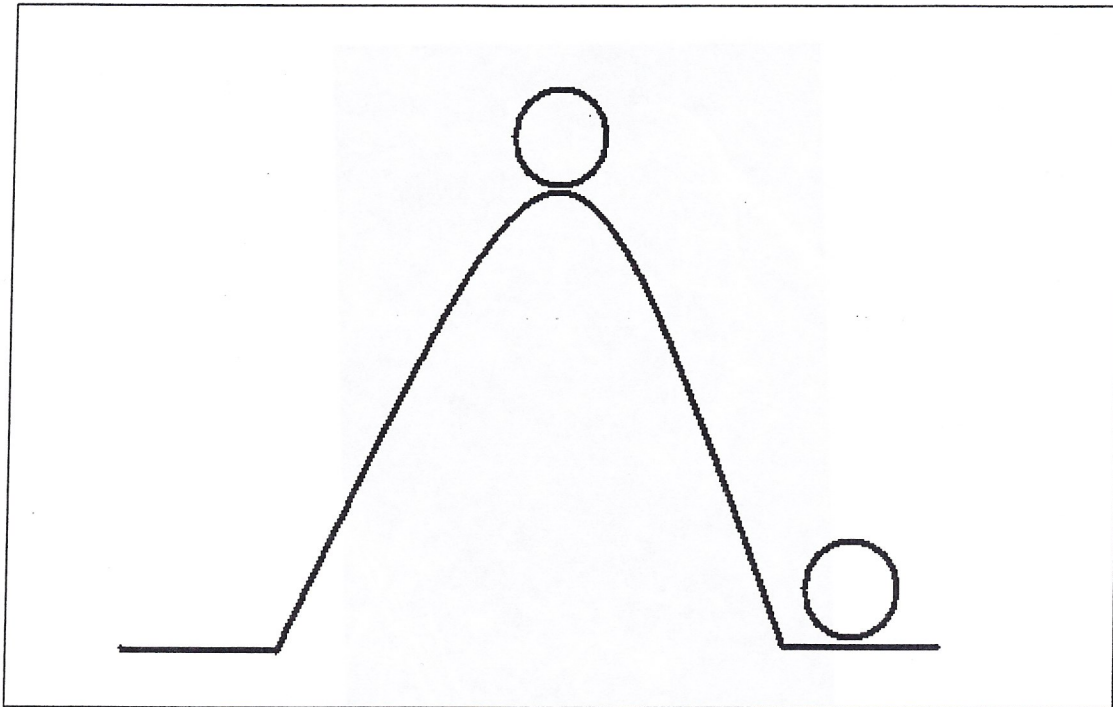
Roller coasters need **energy** in order to move, turn, and flip!  
There are two main types of energy.

**Potential Energy** is the energy stored in an object. A roller coaster cart will have the most potential energy at the **top** of a hill!

**Kinetic Energy** is the energy an object has while it is moving. A roller coaster cart will have the most kinetic energy at the **bottom** of a hill!

### Step 1: Understanding roller coaster energy

On the diagram below, label where the ball has the most **potential** and **kinetic** energy:



### Step 2: Team up!

Get into groups and come up with a name for your Rockin' Roller Coaster! You will cooperate and work together to build the best ride for Wesleyan!

### Step 3: Build your first track

Let's start off with the basics. Build a track that has a **hill**. Try and get the marble to go from start to finish without falling off.

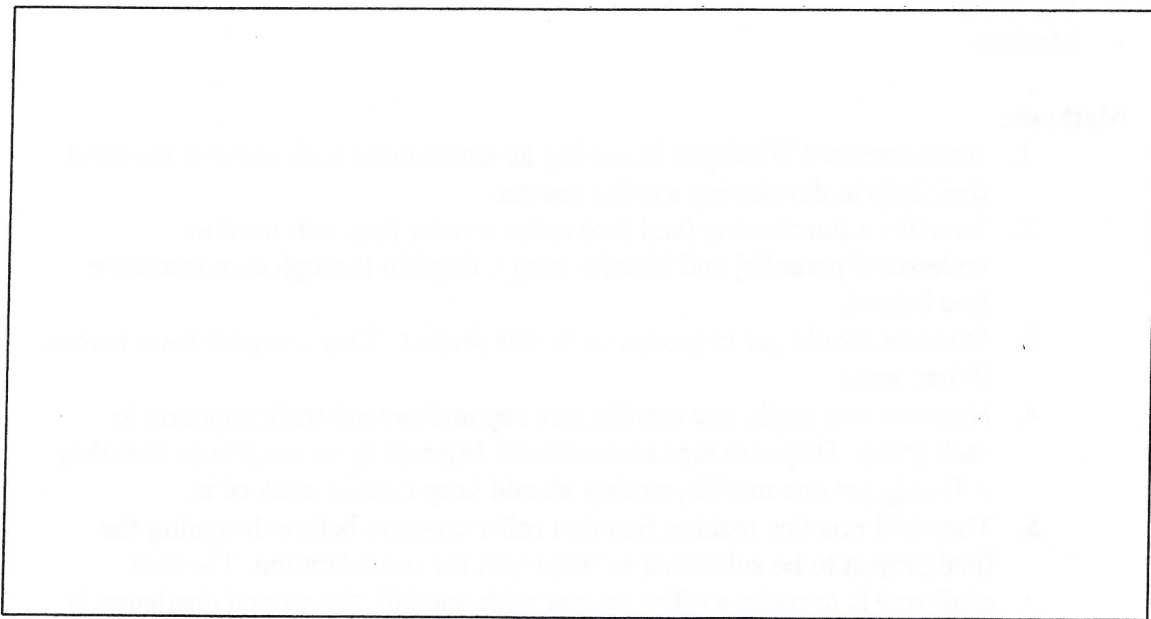
**Step 4: The loop!**

Next, try and build a track with a **loop!**

**Step 5: Design and build your very own roller coaster!**

Now that you've been fully trained, its time to make your roller coaster! Build a track with both a **hill** and a **loop!**

First, sketch your rollercoaster:



Name of your Roller Coaster: \_\_\_\_\_

**BONUS:** Can you label where your cart has the most **potential** and **kinetic** energy on your roller coaster sketch?

Now, **BUILD** your roller coaster and present it to the rest of science club!

Good luck, and stay energized!

## Wesleyan Science Outreach Lesson Plan

### Rockin Roller Coaster Design

**Purpose:** Introduce potential and kinetic energy, use creative design and problem solving skills, teamwork

#### **Materials:**

- Pipe insulation, cut in half length-wise (roller coaster track)
- Recyclables (serve as track supports)
- Marbles
- Painters tape
- Cups (put one at end of track to catch the marble)
- Cardstock
- Markers

#### **Methods:**

1. Announce that Wesleyan is making an amusement park and that we need their help in developing a roller coaster
2. To make a functioning (and fun) roller coaster they will need to understand potential and kinetic energy. Explain through demonstration (see below).
3. Students should get in groups to do this project. They can pick team names if they want.
4. Hand out one track, one marble, one cup and several track supports to each group. Dispense tape as necessary. Impress upon the groups that they will only get one marble, so they should keep careful track of it.
5. They will practice making function roller coasters before designing the final project to be submitted to Wesleyan for consideration. The first challenge is to make a roller coaster with one hill, the second challenge is to make a rollercoaster with a loop and the third challenge is to make a rollercoaster with both a loop and hill.
6. They will then use their worksheet to sketch out their proposed roller coaster, and then construct.
7. If time, have them make a poster for their rollercoaster that includes the rollercoaster's name (this will be the sign out in front of the rollercoaster)
8. Take pictures during the process, and final photos of each team with their final product and sign.

#### **Potential and Kinetic Energy Demonstration:**

- **Kinetic/Potential Energy Dance:** tell them to freeze when you say 'potential' and dance when you say 'kinetic'. The reason they freeze when you say potential is because they are storing their energy and when you say 'kinetic' they will move because they are displaying energy in motion. (You can choose to either begin or end with this dance depending on the energy level of the kids – sometimes it's nice to dispel energy first. Some rules so that the dance does not get out of hand:

1) Have the kids spread out so they do not touch each other. 2) Tell them they must not move from their spot (so they are not running around the room). 3) This is a SILENT game – no yelling etc.

- **Marble Demonstration:**

- Put marble on ground and ask if it will move. Children may respond that it will move if you push it. Then explain that nothing will happen if you don't push it because it doesn't have potential energy
- Hold marble in air and ask again if the marble will move. The children may respond that if you let go of the marble it will drop. Explain that indeed this is true. The marble in the air doesn't require the force of a push because it has potential energy due to its height.
- Explain the potential energy is stored energy – energy that is about to be used
- Explain that kinetic energy is energy in motion