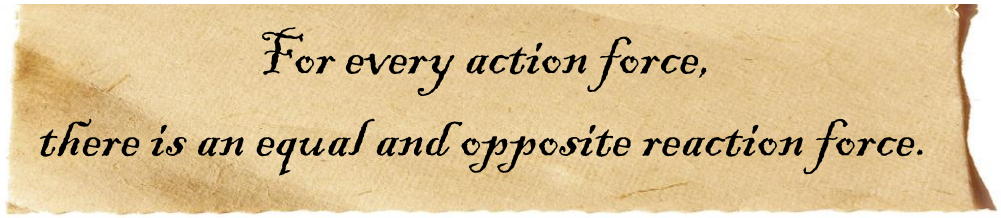
Reaction Rocket

RKT-625, RKT-630

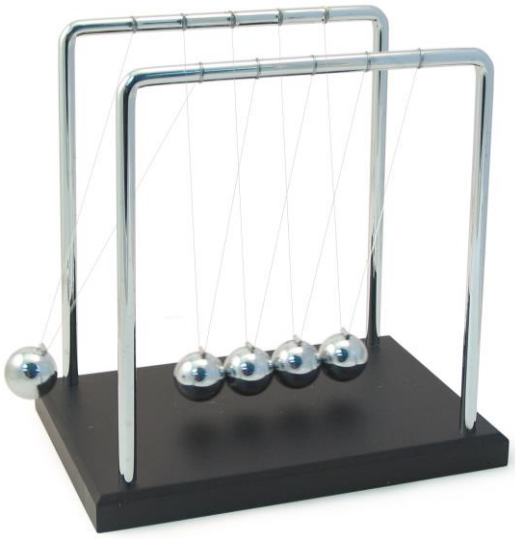
Introduction

Newton's Third Law states,



The Reaction Rocket is an excellent activity to drive this concept home! Before introducing the Reaction Rocket to your students, you may want to first introduce the Newton's Cradle.

The Science behind Newton's Cradle



By pulling the action sphere back, you are storing energy in the sphere (potential energy). When the sphere is released, the potential energy is converted into kinetic energy and the ball stops only when it hits the next stationary ball in line.

The force is transmitted through the spheres and the energy eventually reaches the last sphere (the reacting sphere) in line, and because of the energy it receives from the adjacent sphere, it moves up and away from the other spheres. You can point out that the reacting sphere moves almost as high as the action sphere but no higher.

In theory, because all the metal spheres have the same mass, the reaction sphere should move just as high as the action sphere, but it doesn't. As a matter of fact, over time, the motion of the spheres on the Newton's Cradle will stop altogether. Ask your students for their ideas as to why this is the case.

The reason the reaction sphere doesn't go as high as the action sphere started out is because some of the energy was transferred to friction, heat, and sound.

Ask your students what they think would happen if the reaction sphere were significantly larger than the action sphere? *(It wouldn't move as high.)* What do you think would happen if the reaction sphere had only a fraction of the mass of the action sphere? *(It would move much higher.)*

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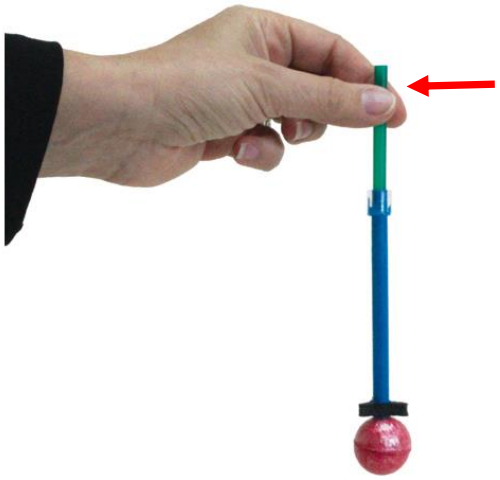
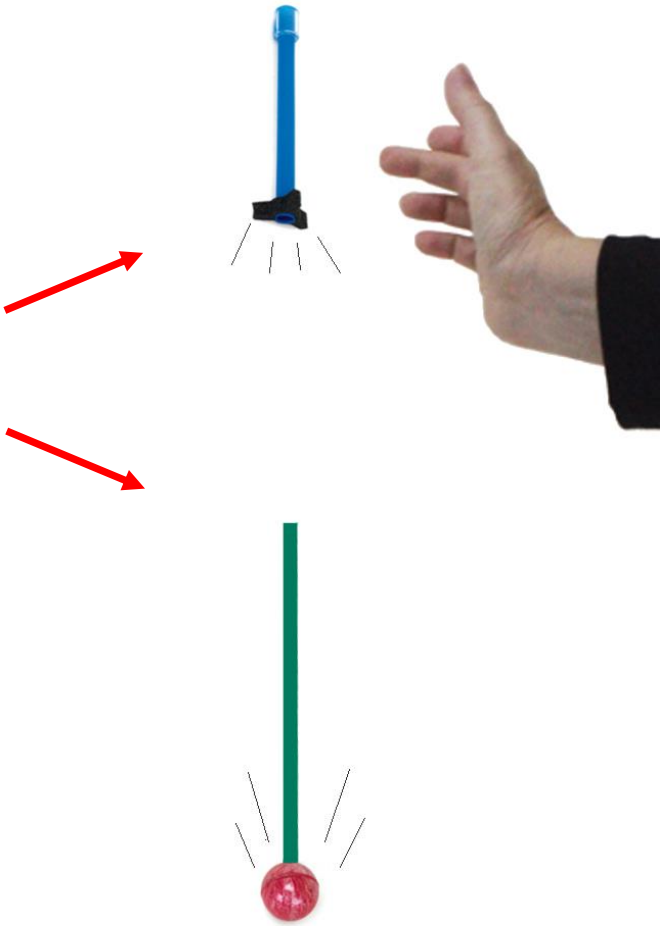
Activity 1
Introducing the Reaction Rocket

Now, on to the Reaction Rocket!

1. Note that the small rocket has only a fraction of the mass of the rubber ball. Slide the rocket onto the straw so that the fins are next to the ball.



2. Lightly grasp the thin straw of the launcher between your thumb and forefinger, and hold the launcher at arm's length with the rubber ball pointing downward.



3. Let go! The rocket went higher than the starting height, didn't it?

Activity 2
Reaction Rocket Experiment

Instructions

It is best to work in teams of two.

1. Set up a measure tape next to a wall.

2. While one person holds the launcher, the other person makes sure the bottom of the ball is at the desired height. We recommend starting with a drop point of 6" or higher for your first test. Working in pairs, drop the launcher and rocket. Record the highest point the rocket flew on the data sheet (see next page).

3. Repeat step 2 above two more times so you have a total of three drops. Calculate the average height of the drops.

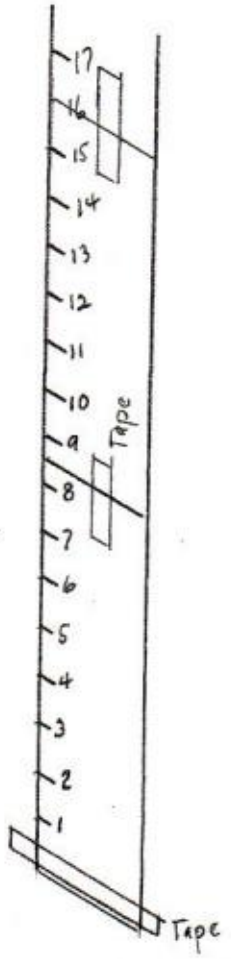
4. Repeat at increasing heights. Stop when the rocket hits the ceiling.

5. Graph the results, using the graph sheet on page 5.

Optional:

Each team can make its own measuring tape using strips of paper (calculator tape will work well).

Mark increments on the strips and tape them to the wall. This will make collecting data easier.



Question:

Was the increase constant or did it change? Why?

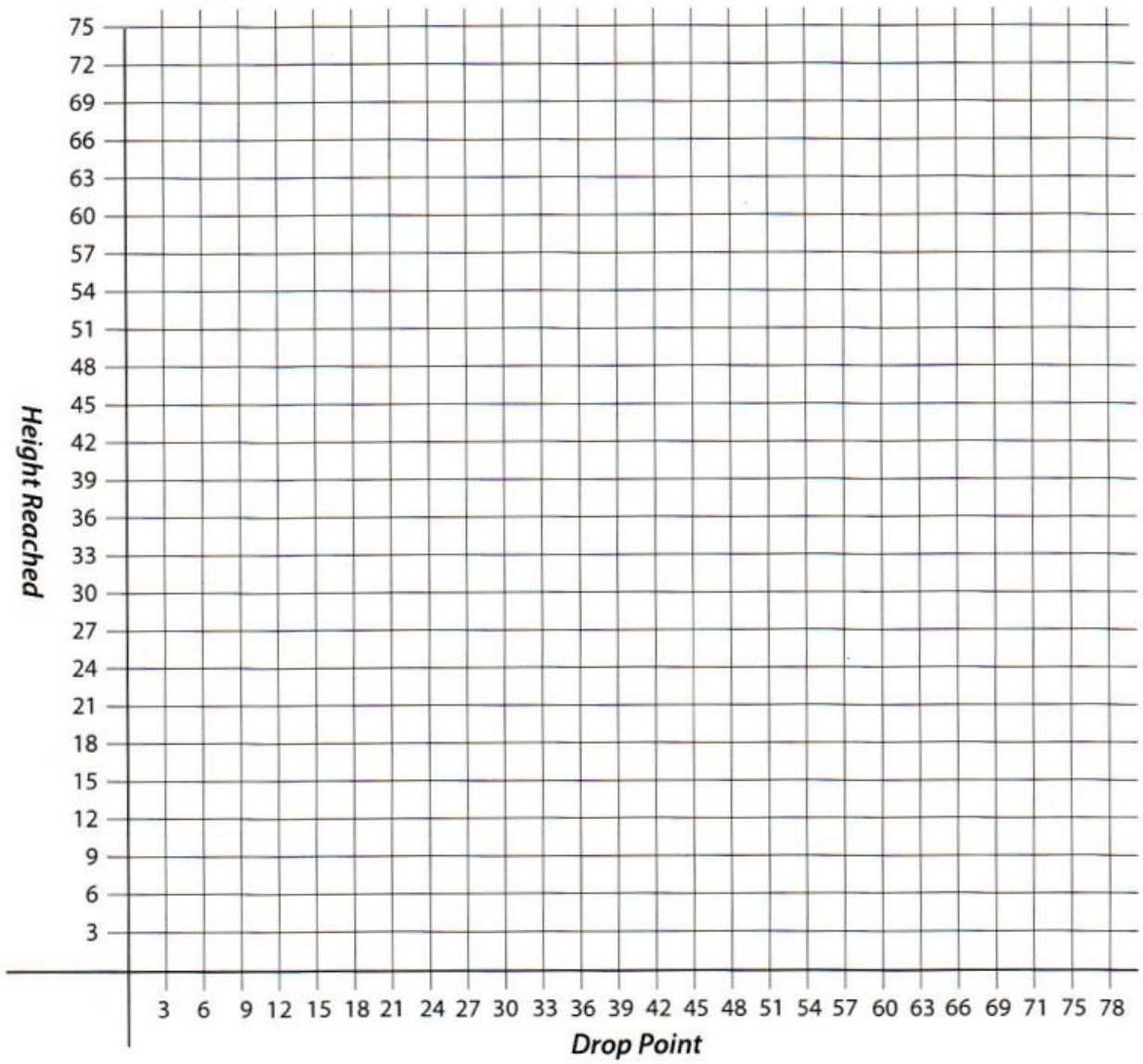
Activity 2 (continued)

Reaction Rocket Experiment Data Sheet

	Rocket Height			
Drop Height: Data	1st drop	2nd drop	3rd drop	Average
6"				
9"				
12"				
15"				
18"				
21"				
24"				
27"				
30"				
33"				
36"				
39"				
42"				
45"				
48"				
51"				

Activity 2 (continued)

Reaction Rocket Experiment Graph



Observations:

Take Your Lesson Further

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To extend your lesson, consider this Educational Innovations product:

Seismic Accelerator (SS-150)

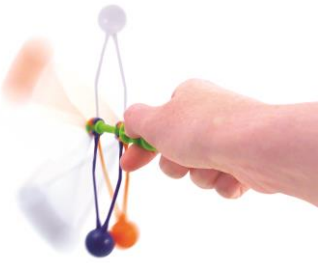
Several balls are threaded on a wire. When the apparatus is dropped straight down onto a hard surface, the top ball can rebound to a height equal to five times the original drop. Leads into an interesting discussion of what has happened due to the Law of Conservation of Energy. Safety glasses included.

Newton's Cradle (NEW-100)

Find hours of entertainment in this chic, easy to assemble Newton's Cradle! Perfect for teaching your students about Newton's laws of motion, Newton's Cradle makes a great addition to any classroom.

Newton's Kinetic Yo-Yo (NE-120)

Demonstrate Newton's classic laws of physics! With a flick of the wrist, set the spheres in motion. It really is "all in the wrist!" As the first sphere swings around, it stops and transfers its energy to the second ball, forcing it to swing around. With practice, students can even make the spheres ricochet off one another above and below the handle.



Dropper Popper (POP-107)

This incredible device seemingly defies the laws of physics by bouncing higher than where you dropped it from! Requires a small amount of activation energy to work. It is molded into a special shape that allows it to store elastic potential energy and then convert it to kinetic energy with a POP when dropped from a low height. Makes a great activation energy demonstration.