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## Seismic Accelerator

SS-150

### How does it work?

Four rubber spheres are threaded on a plastic shaft. You will notice that the largest sphere is permanently affixed to the shaft and the next two are held on because the shaft widens at the end, allowing only the smallest sphere (on top) to remain unattached.

Using the Seismic Accelerator is simple: just hold it by the top of the plastic shaft and drop it! The Laws of Physics will take care of the rest.

Be sure your students understand this process:

The Seismic Accelerator has the maximum amount of potential energy BEFORE it is dropped.

As the Seismic Accelerator begins to fall—due to gravity—its potential energy decreases and its kinetic energy increases.

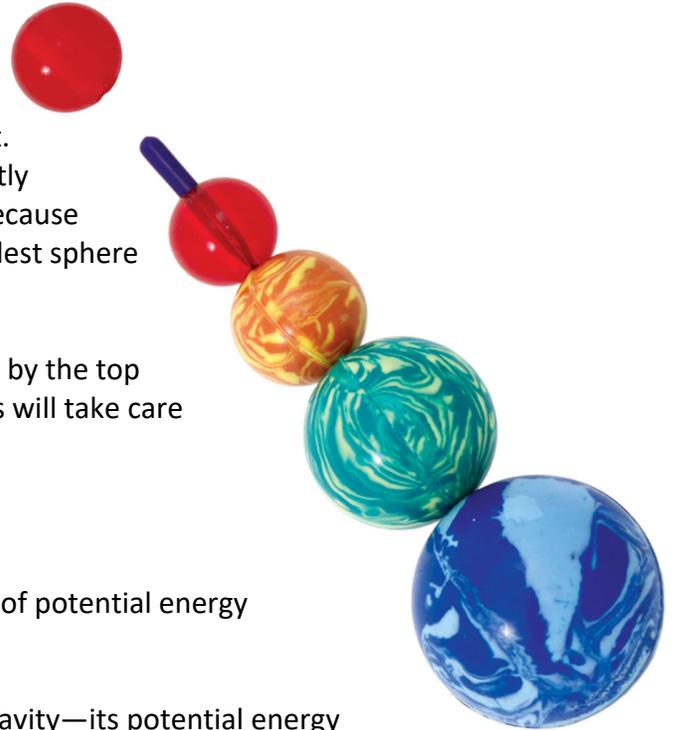
When the Seismic Accelerator hits a solid surface (such as the ground or a tabletop), it no longer has any potential energy. In fact, we could say that the Seismic Accelerator is now at its maximum kinetic energy.

What happens next is the fun part!

When the bottom sphere hits the table, it begins to compress. Because it is made out of rubber, that energy is stored in the sphere. Then, as the sphere expands, the energy is re-emitted.

The energy that is re-emitted from the bottom sphere transfers up to each of the subsequent spheres until it is transmitted to the top sphere, which will rebound to a height significantly higher than the original drop.

And there you have it!



# NGSS Correlations

Our Seismic Accelerator and these lesson ideas will support your students' understanding of these Next Generation Science Standards (NGSS):

## Elementary

### **K-PS2-1**

Students can use the Seismic Accelerator to plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

### **4-PS3-4**

Students can use the Seismic Accelerator to design, test, and refine a device that converts energy from one form to another.

### **3-5-ETS1-3**

Students can use the Seismic Accelerator to plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

## Middle School

### **MS-PS3-5**

Students can use the Seismic Accelerator to construct, use and present arguments or experiments to support the claim that when the motion energy of an object changes, energy is transferred to or from the object.

### **MS-ETS1-4**

Students can use the Seismic Accelerator to develop a model or experiment to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

## High School

### **HS-PS3-4**

Students can use the Seismic Accelerator to design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

*\* NGSS is a registered trademark of Achieve. Neither Achieve nor the lead states and partners that developed the Next Generation Science Standards were involved in the production of, and do not endorse, this product.*

## Suggested Science Idea(s)

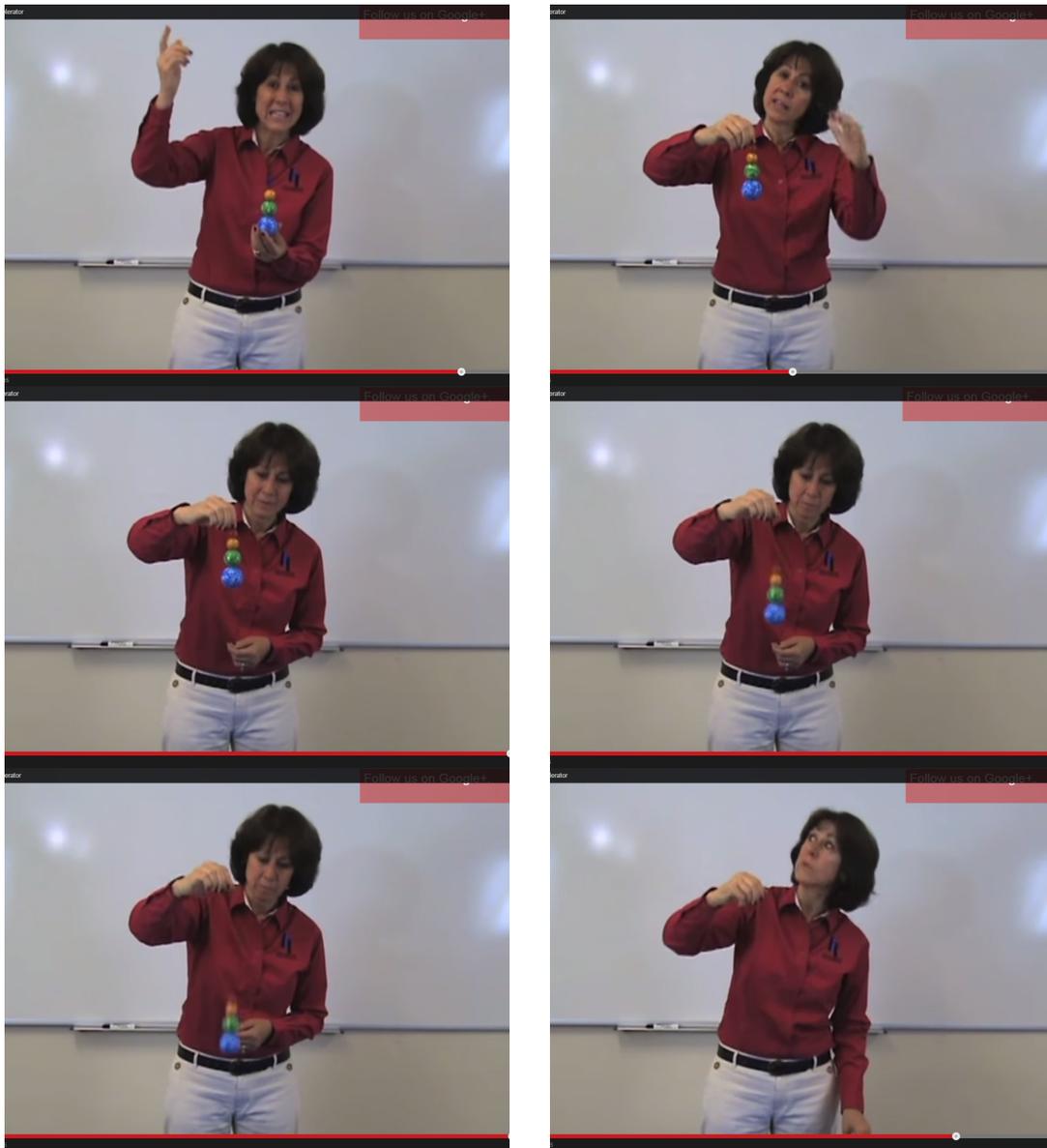
**K-PS2-1 • 3-5-ETS1-3 • 4-PS3-4 • MS-PS3-5 • MS-ETS1-4 • HS-PS3-4**

Using a Seismic Accelerator in combination with a ping pong ball creates a dramatic demonstration of energy transfer—and much more.

# Introducing the Seismic Accelerator

## Preview the Seismic Accelerator in action:

Our YouTube channel includes a video explaining how the Seismic Accelerator can be used to demonstrate the Law of Conservation of Energy:



[www.youtube.com/watch?v=ZqN7q0awP8Q](http://www.youtube.com/watch?v=ZqN7q0awP8Q)

## Activity 2

# Seismic Accelerator Experiment

### Instructions

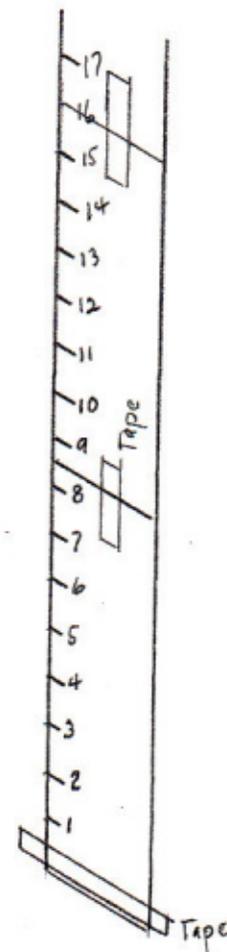
It is best to work in teams of two.

1. Set up a measure tape next to a wall.
2. Work in pairs. While one person holds the Seismic Accelerator, the other person makes sure the largest sphere is at the desired height. Drop the Seismic Accelerator. Record the highest point the top sphere 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 smallest sphere hits the ceiling.
5. Graph the results, using the graph sheet on page 6.

### 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)

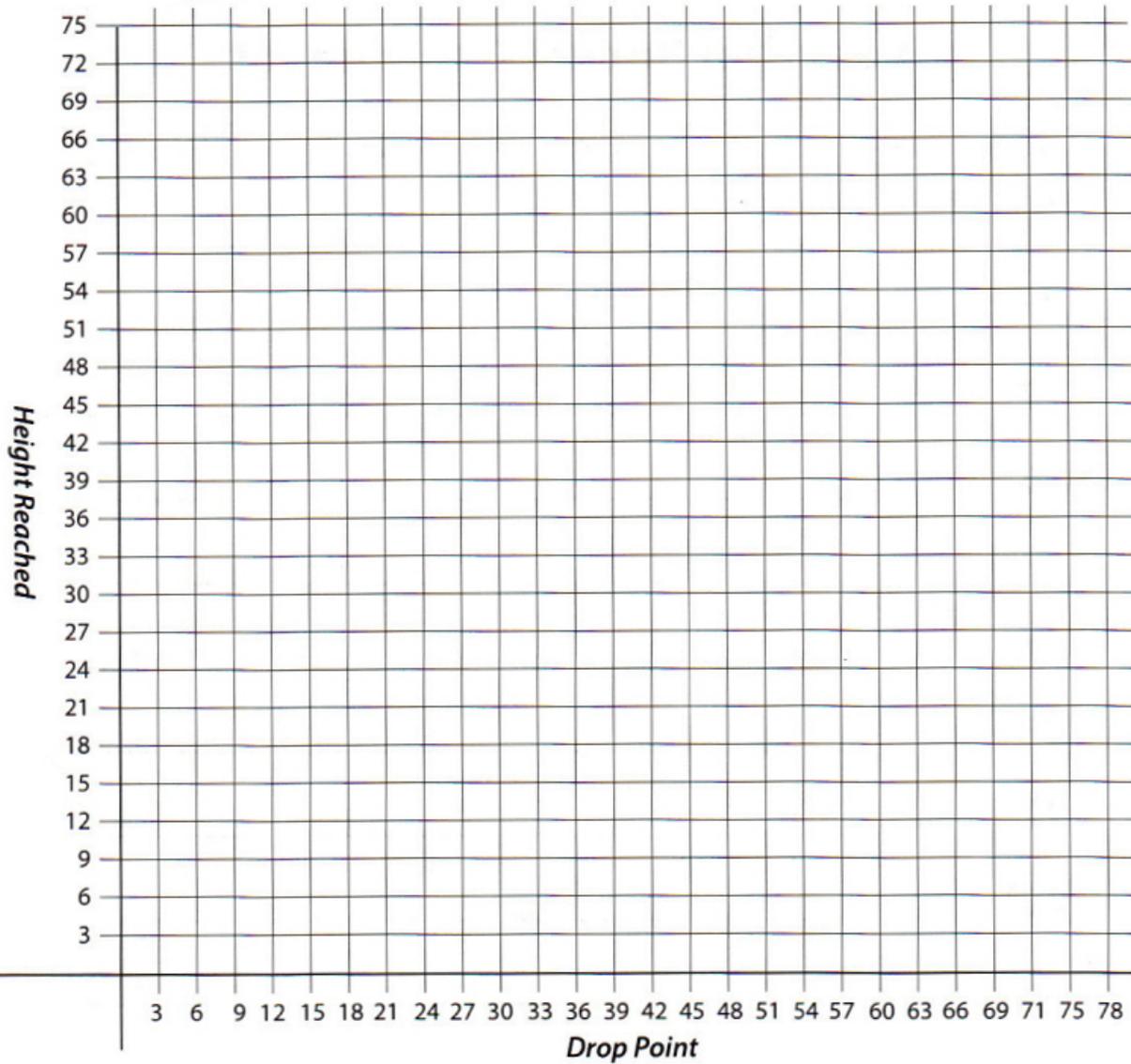
# Seismic Accelerator Experiment Data Sheet

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



## Activity 2 (continued)

# Seismic Accelerator Experiment Graph



### Observations:

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# Take Your Lesson Further

As science teachers ourselves, we know how much effort goes into preparing lessons. For us, “*Teachers Serving Teachers*” isn’t just a slogan—it’s our promise to you!

Please visit our website  
for more lesson ideas:

[www.TeacherSource.com](http://www.TeacherSource.com)

Check our blog for classroom-tested  
teaching plans on dozens of topics:

<http://blog.TeacherSource.com>

To extend your lesson, consider these Educational Innovations products:

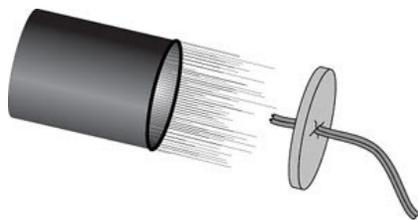


## 3-2-1 Blast Off! Kit (KIT-321)

Over the years, hundreds of teachers have asked us to develop a kit that bundles our much-loved demonstrations of things that go “bump” in the day! Kit includes comprehensive teaching instructions and enough hands-on components for up to 10 students. (Safety glasses recommended.) We’ve also created memory-refresher videos that walk you through each of the demonstrations, so you’ll be up to speed and ready to Blast Off in just minutes!

## Reaction Rocket (RKT-625)

This rubber ball launcher and foam rocket may look simple, but they’re a sure-fire way to provoke a WOW reaction—and introduce students to Newton’s Laws. Hold the launcher by its straw and drop straight down onto a hard surface. The rocket shoots up dramatically higher than its original drop height. Explaining energy conversion was never this easy... or this much fun!



## Piezo Popper Kit (HS-2A)

These amazing piezoelectric devices generate a few thousand volt sparks at the touch of a button. No batteries required. The discharge is created when a small hammer inside the device strikes a quartz crystal. It can be used as a safety lesson to demonstrate the flammability of alcohol or perfume. Igniting two drops of alcohol in a film canister will cause the canister to fly more than 20 feet into the air! Kit includes piezo igniter, instructions, film canister, wire and butt connector.

## Dropper Popper (POP-100)

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.

