

# NEWTON'S NOTIONS

SAMPLE



STUDENT WORKBOOK



# SURPRISING SPIN

What will happen when you spin steel balls and corks in a water-filled tube? You might be surprised!

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## SPIN IT AROUND

### WHAT YOU NEED:

#### FROM THE KIT:

- 2 corks
- 2 rubber caps
- 2 small steel balls
- Plastic tube

#### OTHER ITEMS:

- Water



### **SAFETY!**

**WARNING! CHOKING HAZARD - Small parts.**  
Not for children under 3 years.

### WHAT TO DO:

1. Fit a cap over one end of the plastic tube.
2. Push the cap down until it makes a tight seal with the tube.
3. Gently place the two corks and the two steel balls into the tube and let them hit the bottom (where the cap is).
4. Fill the tube almost to the top with water, leaving about ½ inch of space at the top.
5. Place the second cap over the open end of the tube.
6. Push the cap down until it makes a tight seal (you may want to do this over a sink in case some water gets pushed out).
7. Place the tube horizontally on a flat surface like a table.
8. Make a prediction about what will happen when you spin the tube.



## PREDICT: What will happen to the objects in the tube?



- 9.** Quickly and forcefully (but carefully) spin the tube on the surface by flicking your wrist. A half turn is enough. Be sure to not let the tube move upward – keep it level.
- 10.** Keep spinning/turning the tube continuously several times until you notice a pattern in how the objects inside it behave.
- 11.** Record your observations (especially related to the corks and steel balls) below.
- 12.** Drain the water out of the tube and dry off the steel balls so they don't rust. Save the materials for future activities.



## THINK ABOUT IT!

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- 1.** Write two observations about the objects in the spinning water tube.

- 2.** Evaluate how well your prediction matches what happened.

- ? 3. Write three questions you have about the behavior of the objects in the spinning water tube.

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## PUT YOUR OWN SPIN ON IT

Using one of the questions you wrote, choose something to change about the spinning tube during the experiment.

### MAKE A PLAN:

- ? 1. What will you change in the experiment?

- ? 2. What do you expect to be different as a result?

Repeat the spinning experiment using your new conditions.



## REFLECT

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1. What was the effect of the change you made?
2. How well did your prediction match what happened this time?
3. What other things would you change in future trials?

### REMINDER:



Most of the kit items are used in multiple activities, so please wait until you are completely finished with the learning experience before disposing of any of them.

## IS YOUR HEAD SPINNING?

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Throughout the following activities, you will explore several aspects of the event you just observed. First, organize your thoughts about Newton's Laws of Motion (the topic of this kit!) using the KWLQA graphic organizer below.

You will begin this KWLQA chart and come back to it at key points throughout the Student Workbook. For now, you will complete only the K and W parts of the chart. We will let you know when it's time to come back to do the rest.

In the K section, write what you already *know* about Newton's Laws of Motion. This can include the history, the laws themselves, or any applications of the laws. In the W section write at least two things you *want* to know about Newton's Laws of Motion.

## TOPIC: ISAAC NEWTON AND HIS LAWS OF MOTION

<b>K</b>	What you already <b>Know</b>	
<b>W</b>	What you <b>Want</b> to find out	
<b>L</b>	What you have <b>Learned</b> so far about the topic	
<b>Q</b>	<b>Questions</b> you have about the topic	
<b>A</b>	<b>Actions</b> you can take to answer your questions	

# GLOSSARY

**Acceleration** – change in velocity over time.

**Buoyancy** – upward force on an object floating in a fluid.

**Density** – amount of mass in a certain volume.

**Energy** – the ability to cause a change.

**Force** – an interaction between two objects.

**Force of kinetic friction** – resistance to the motion of two objects sliding over each other.

**Force of static friction** – the friction force that opposes the initial movement of an object.

**Friction force** – the resistance to the motion of two objects sliding over each other.

**Free fall** – a state of motion in which the only force acting on an object is gravity.

**Gravity** – the force of attraction between two objects.

**Inertia** – resistance to change in motion for an object.

**Mass** – amount of matter in an object.

**Momentum** – quantity of motion of an object based on its velocity and mass.

**Newton's First Law** – an object at rest will stay at rest, and an object in motion will continue that motion, unless acted on by a new force.

**Newton's Second Law** – the force acting on an object is equal to the product of the mass and acceleration of the object.

**Newton's Third Law** – for every force, there is an opposite but equal reaction force.

**Physics** – the study of matter, energy, and the interactions between them.

**Thrust** – an applied force that causes an object to move in the opposite direction of the force.

**Velocity** – change in position of an object over time.

**Volume** – amount of space an object takes up.

**Weight** – the force of gravity acting on an object.

# REFERENCES

1. Westfall, Richard S. *Never at Rest: A Biography of Isaac Newton*. Cambridge University Press, 1983.

2. "Yes, Rockets CAN Fly in a Vacuum." *Discover Magazine*, Kalmbach Media Co., 25 Feb. 2018, <https://www.discovermagazine.com/the-sciences/yes-rockets-can-fly-in-a-vacuum>, Accessed 28 Oct. 2020.

SAMPLE

LAUNCH



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Kit	SU-NEWTON
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