NOEO SCIENCE PHYSICS 1

EXPERIMENT GUIDE

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EXPERIMENT GUIDE

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noeo science
MOSCOW, IDAHO

Noeo Science Packages

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unit 1: FORCE AND MOTION

WEEK 1: FORCES THAT MOVE US

Experiment: Gravity Pulls the Same Objects

Our Question

Does gravity have the same pull on objects with different weights?

Materials

From Home

- 2 plastic water bottles with lids
- water

Instructions

1. Fill one bottle with water, and the other only halfway.
2. If you have stairs in your house, go to the top of the stairs. If you don't have stairs in your house, have an adult help you climb on top of a chair.
3. Drop the water bottles at the same time.
   Note: You could ask an adult to video record your experiment in slow motion!
4. Keep one bottle filled with water. Empty the other bottle.
5. Repeat steps 2-3.

What We Learned

Even though one bottle is heavier, and one is lighter, they fall to the ground at the same time. Gravity pulls the same objects at the same speed even though their weights are different. Galileo was a famous scientist who observed that two objects that were the same size but had different mass would drop to the ground at the same time, when they are dropped from the same height.

WEEK 1: FORCES THAT MOVE US

Experiment: Gravity Pulls Different Objects

Our Question

Does gravity affect different objects in different ways if one is heavier and one is lighter?

Materials

From Home

- plastic water bottle with lid
- piece of paper or a feather

Instructions

1. Fill the plastic water bottle with water.
2. If you have stairs in your house, go to the top of the stairs. If you don't have stairs in your house, have an adult watch as you climb on top of a chair.
3. Drop the bottle and piece of paper at the same time.

What We Learned

The bottle and piece of paper did not fall to the ground at the same time. This is not because one object was heavier than the other. This is because of the force of air resistance that is pushing against the piece of paper and slowing it down. If you dropped the bottle and paper (or other objects that are different sizes, shapes, and weights) in a vacuum where there is no air, they would fall at the same rate of speed.

Fun fact: David Scott, an astronaut on the Apollo 15, dropped a hammer and a feather on the moon. They dropped at the same speed since the moon's atmosphere is like a vacuum and has no air resistance.

WEEK 1: FORCES THAT MOVE US

Experiment: Gravity Trick

Our Question

Can someone guess which hand is holding a penny?

Materials

From Home

- penny

Instructions

1. Ask someone to guess which hand you are holding a penny in.
2. First have them close their eyes then make both your hands into fists (one hand will be holding the penny).
3. Hold the hand with the penny straight up in the air.
4. Keep your other hand down by your side.
5. Count slowly to 30.
6. Put your hands in front of the person guessing and have them open their eyes and guess which hand is holding the penny.

What We Learned

Gravity affects the blood flow of your hand holding the penny in the air. As the blood flows down, it looks paler than the hand that was down by your side.

WEEK 2: MORE ABOUT FORCE

Experiment: Momentum

Our Question

What is momentum?

Materials

Included in Kit

- 2 chopsticks
- string (6 feet)
- 4 push pins
- 4 rubber balls

From Home

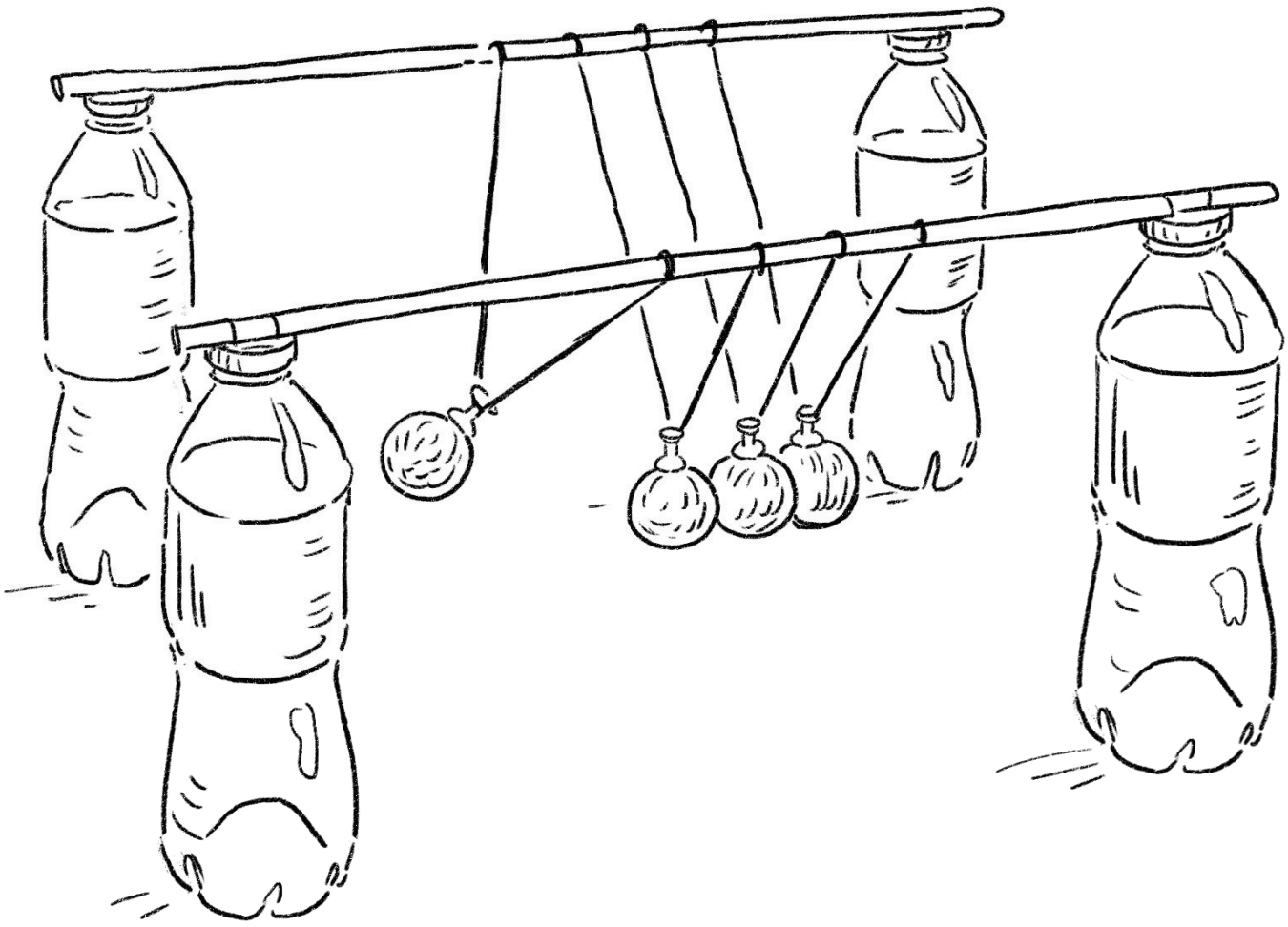
- 4 objects 8 inches in height (water bottles, glasses, books, or 4 shorter objects stacked on top of books to equal 8 inches in height)
- tape
- scissors
- ruler

Instructions

1. Find 4 things that are 8 inches tall, and place them to form the shape (corners) of a rectangle. The short sides of the rectangle should be 6 inches apart, and the long sides should be 10 inches apart.

Instructions

1. Find 4 things that are 8 inches tall, and place them to form the shape (corners) of a rectangle. The short sides of the rectangle should be 6 inches apart, and the long sides should be 10 inches apart.
2. Tape 2 chopsticks on the top of your 8 inch tall objects to make the long sides of the rectangle.
3. Cut the string into 4 equal parts.
4. Push a push pin into each rubber ball.
5. Tie the middle of one of the strings around the push pin.
6. Repeat with the other balls.



7. Tape one end of the string to one dowel, and the other end to the other dowel, so that the rubber ball is hanging in the middle.
8. Hang the rest of the strings and balls one inch apart.
9. Pull one ball back, and let it go! Write down what happens.

What We Learned

Momentum is the force of something that is moving, and it can move from one object to another object. When the rubber ball bounces against the other balls, it gives or transfers its momentum to the other balls so that they move! This device is called a Newton's Cradle and is named after Sir Isaac Newton.

WEEK 2: MORE ABOUT FORCE

Experiment: Moving Pennies

Our Question

What causes something that is still to move?

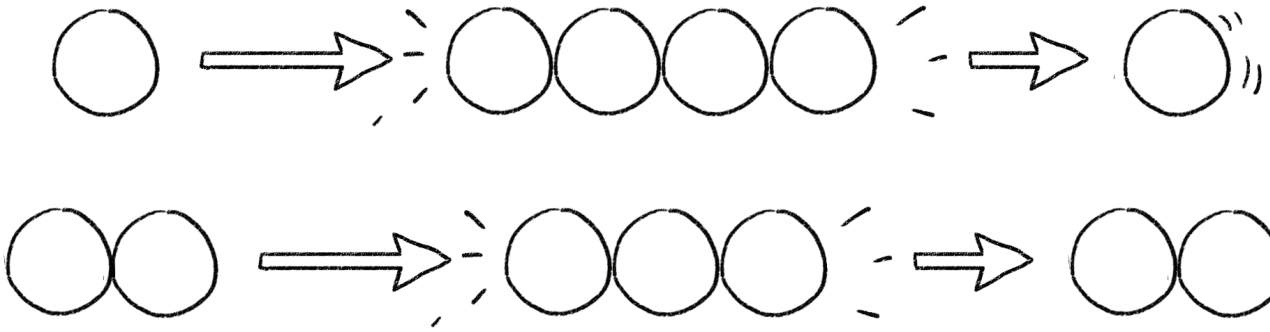
Materials

From Home

- 5 pennies (or other coins that are all the same)

Instructions

1. Line 4 pennies up in a straight line on a hard surface.
2. Take the last penny and slide it into the other pennies.
3. Line up 3 pennies. Take the other 2 pennies and slide them together into the line of pennies.



What We Learned

Newton's First Law of Motion says that an object will stay still until another object moves it, and it will keep moving until a force stops it. Since energy cannot be created or destroyed, it is just transferred from the moving penny to the other pennies. This causes them to move until a force (friction) stops them. The pennies are still until one penny slides into them, which makes one penny move at the opposite end. When two pennies slide into the coins, there is twice as much energy that is transferred, so two pennies move at the opposite end.

More penny fun: Put your hand next to your ear, and place a penny on your elbow. Quickly bring your hand down, and try to catch the penny as it falls from your elbow toward the floor. Are you faster than gravity?

WEEK 2: MORE ABOUT FORCE

Experiment: Build a Ramp

Our Question

What is friction?

Materials

Included in Kit

- 2 toy cars (save with your kit supplies to use in future experiments)
- piece of sandpaper

From Home

- cardboard or wood planks to make 2 ramps (shipping boxes work well, but you could also use cereal boxes.)
- stacks of books or a chair, to prop up one end of the ramp
- dishcloth
- duct tape

Instructions

1. Make two ramps from cardboard, wood, or other material around your house. Put one end of the ramp on a chair and the other end on the floor.
2. Send both cars down the ramps, and write down what happens.

1. Use duct tape to attach a piece of sandpaper to the second ramp. Send one car down the normal ramp, and one car down the sandpaper ramp, at the same time. Write down what happens.
2. Remove the sandpaper, and tape a dishcloth on the ramp. Send one car down each ramp at the same time. Write down what happens.

What We Learned

The force of gravity causes the cars to roll down the ramp. Friction is the force of two objects rubbing against one another. When the car went down the ramp with nothing taped to it, it did not have much to rub against, so it rolled very quickly. Each thing we taped to the ramp rubbed against the car's wheels more, causing more friction and making the car roll slower each time.