DO ~~DON'T~~ TRY THIS AT HOME!

Elastic Science

Stretching Your Knowledge

Have you ever played with an elastic band? Did you notice how it can be stretched, squished and bent but always returns to its initial shape?
When an object is elastic it can be changed into different forms but always goes back to its initial shape.

Do these fun experiments while exploring your creative side as you heat them, cool them and use them to make fun gadgets from things found right in your home.

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BE A SCIENTIST

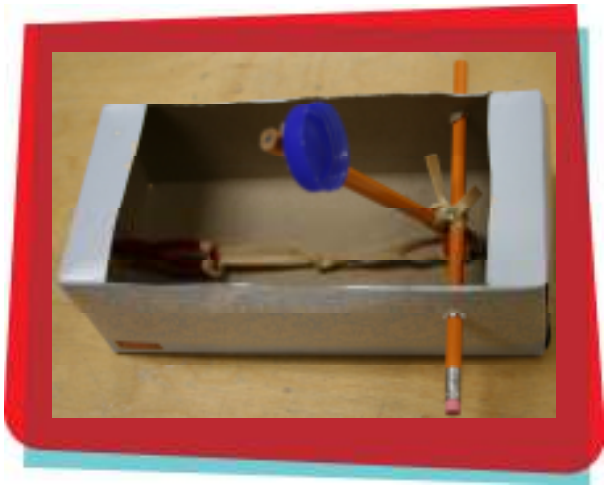
AMAZING EXPERIMENTS!

Marshmallow Catapult

Get ready to test your building skills! In this fun activity you will construct your own catapult that uses elastics to make a marshmallow to fly.

Materials

- an empty tissue box
- 3 medium sized elastics
- 2 unsharpened pencils
- 1 pipe cleaner
- a pair of scissors
- a roll of tape
- 1 hot glue gun
- 1 bottle cap
- 1 ball point pen
- marshmallows (the small ones work best)



Let's get started

1. Cut out the top of the tissue box until there is only 3 cm of cardboard left on the short sides of the box.
2. Make two holes with a ball-point pen on either side of the box – 3 cm from the end and 3 cm from the bottom (use step 2 photo as a guide).
3. Cut one of the elastics so that it forms a single strand.
4. Tie the two unsharpened pencils together with the cut elastic about 5 cm from the bottom of one of the pencils (it will create a cross-like shape see step 4).
5. Insert the horizontal pencil through the holes in your tissue box so that the vertical pencil touches the other end of the tissue box (see step 2).

Step 2

Step 4

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Step 6

Step 9

TAKE NOTE!

Hot glue can burn your skin. Ask an adult to help you glue the bottle cap on.

6. On the end of the tissue box opposite to the horizontal pencil, poke another hole in the bottom centre of the short side. The hole should be 1 cm from the bottom (see photo for step 6).
7. Cut a 10 cm piece of the pipe cleaner and thread it through the hole in the bottom of the tissue box that was made in step 6.
8. Tie two elastics together so that they form one long strand and attach one end through the pipe cleaner loop.
9. Tie the second elastic to the end of the vertical pencil that is closest to where it crosses with the horizontal pencil (see photo for 9).
10. Using the hot glue gun, attach the bottle cap to the vertical pencil and let it dry for a few minutes.
11. Place a marshmallow in the bottle cap, pull the pencil back towards the inside of the box, and let it fly!

What happened?

When we pull back on the pencil, we are applying force to the elastic band, stretching it out of shape. When the elastic band is stretched it gains potential energy (stored energy). When the elastic is released, the potential energy is converted into movement and away goes the marshmallow!

Going the Distance

With this fascinating experiment, you will discover how elastics behave in different temperatures. Do they change when we heat them up? Or when we cool them down? Learn, observe, and take notes as you go!

Materials

- a shoebox
- 1 medium sized elastic
- 1 metal washer (or small weighted object)
- 1 pair of scissors
- 1 measuring tape
- 1 roll of tape
- 1 pen
- a freezer
- a hair dryer
- a note book
- a timer or stop watch

Let's get started

With a notebook, record your findings as you complete the following steps.

1. Cut the elastic so it forms one long piece.
2. Attach a metal washer (or small weight) to the end of the elastic.
3. Remove the shoebox cover and make a hole in the top of the shoe box with the tip of a pen.
4. Thread the elastic through the hole and secure the elastic with a piece of tape.
5. Stand the shoebox vertically and measure the elastic.
6. Put the shoebox (with the elastic) in the freezer and wait for 10 minutes.
7. Take the shoebox out and measure the elastic.
8. Now, with your hair dryer, heat up the elastic for 60 seconds (ensure that the heat is directed on the elastic as much as possible).
9. Measure the elastic again.

Think about it…

- Why did the cooled elastic react the way it did?
- Why did the heated elastic react the way it did?

What happened?

We usually think of things getting bigger when they get hotter because the molecules move more and take up more space. A thermometer is a good way to understand this, where the liquid expands and takes up more room as it gets warmer.

An elastic actually behaves in the opposite way. It will get smaller (or shorter) when heated, because its long string-like molecules get tangled together and pull together to make the elastic shorter. When they get cold, the molecules untangle themselves and the elastic relaxes and gets longer.

BE A SCIENTIST

AMAZING EXPERIMENTS!

Reaching New Heights!

Try dropping one elastic on the floor, does it bounce? What happens when you drop many elastic together? With this short experiment you create a fun bouncy ball toy to play with.

Materials

- a small plastic container with lid
- a bag of at least 50 small elastics (multi-coloured for added fun)
- 380ml (1 ½ cups) vinegar
- set of measuring cups
- tin foil (optional)
- fridge
- paper towel

Let's get started

1. Measure and pour the vinegar into the small plastic container with the elastics.
2. Place the container in the fridge and leave for at least 6 hours.
3. Take the elastics out of the fridge, drain the vinegar and rinse the elastics with water.
4. Dry the elastics with paper towel, they are now ready to use.
5. Begin by making a small ball of tin foil (about 1-3 cm in diameter, depending how large you want the bouncy ball to be).
6. Stretch the elastics around the tin foil ball one by one.
7. Repeat this step until you see your bouncy ball appear (use at least 50 elastics).
8. Bounce away!

What happened?

Your ball is composed of many elastics that now stick well together thanks to the vinegar treatment. It will behave like any other rubber ball and bounce. When the ball hits the ground it's compressed by the downward force squishing the rubber together. As the ball tries to return to its original shape (just like a stretched out rubber band), it will push on the floor and spring back up. The harder you throw it, the more it will compress and the higher it will bounce back.

KITCHEN LABORATORY

EDIBLE SCIENCE RECIPES

Taffy Pull

Elastics are very stretchy and so is taffy candy. This means that it is fun to make, stretch, and eat!

Ingredients

- 240mL (1 cup) light corn syrup
- 720mL (3 cups) sugar
- 1 mixing bowl
- 1 mixing spoon
- a few drops of glycerine (food grade)
- a pinch of salt
- 15 ml (1 tbsp) butter
- 5mL (1 tsp) vanilla
- 380mL (1 ½ cups) water
- 1 candy thermometer
- a tray or cookie sheet
- a set of measuring cups
- food colouring
- 1 medium sized saucepan

Stretching out the fun!

1. Put the corn syrup and sugar in a bowl and mix together well.
2. Add a few drops of glycerine.
3. Add 380mL (1 ½ cups) water.
4. For added fun, add of few drops of your favorite colour.
5. Mix all ingredients together well and place in saucepan.
6. Heat until temperature reaches 125°C (use a candy thermometer to make sure the temperature reading is accurate).
7. Take the taffy off the stove and add the butter, vanilla and salt.
8. Pour into a greased cooking sheet and let it cool.
9. When the taffy is cool (but not cold) you can begin pulling, stretching and breaking it into different shapes.
10. Break the taffy into bite size pieces and enjoy!

TAKE NOTE!

Always use oven mitts when handling hot objects and be sure to have an adult assist you.

What happened?

The sugar and butter in the taffy prevented sugar crystals from forming and explains why the taffy is so smooth. Pulling the taffy allows tiny air bubbles to enter the mixture and makes the taffy light and chewy.

Experiments

- ☐ 3 medium sized elastics
- ☐ 2 unsharpened pencils
- ☐ 1 pipe cleaner
- ☐ 1 metal washer
- ☐ 1 measuring tape
- ☐ 1 roll of tape
- ☐ a small plastic container with lid
- ☐ tin foil
- ☐ marshmallows
- ☐ a pair of scissors
- ☐ 1 bag of medium sized elastics

Recipes

- ☐ light corn syrup
- ☐ sugar
- ☐ glycerine
- ☐ salt
- ☐ water
- ☐ vanilla
- ☐ butter
- ☐ food coloring

Movie

Fantastic Four

A film about a group of astronauts who gain superpowers, one of whom (Reed Richards) is able to stretch his body any way he wishes.
(20th Century Fox)

Book

Plastic Man- Kyle Baker (2004)

Plastic Man can stretch his body into any imaginable form. His adventures were known for their quirky, offbeat structure and surreal slapstick humor.
(DC Comics, 2004)

Web link

http://www.ugdsb.on.ca/uploadedFiles/odss/science/Physics/SPH4U/unit2/chapter4/HookesLawElasticPotential.pdf

Student resource, Guelph Ontario

Become an expert and understand what is really behind elastic science.