TLaS
Think Like a Scientist

"Science at Home" Experiment

EXPLODING POPSICLE STICKS

The Science Behind the Experiment

Did you ever wonder how a battery can provide energy or why a pulled rubber band will bounce back? This is because there are different kinds of energy.

In this experiment, we will recreate the storage and release of energy using everyday objects. We will build and hold 'potential energy' by locking popsicle sticks into different shapes and patterns.

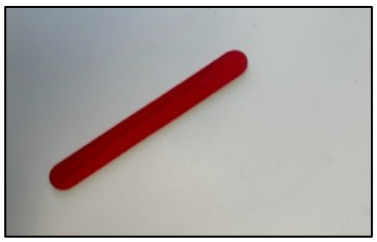
When you weave the popsicle sticks together into a ninja star stick you will notice tension building up in the sticks as they bend. When you throw the star, the potential energy will be released as kinetic energy, which propels the sticks to "explode"!

Materials Needed

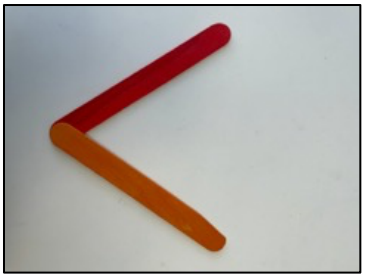
- Popsicle sticks or craft sticks
- A safe surface to throw the ninja star at, for example a wall without any objects or people nearby.
- Do NOT throw objects at people!

The Steps of the Experiment

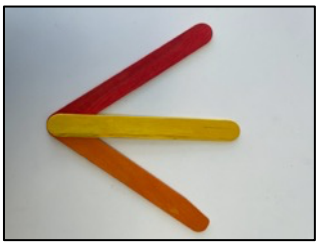
1 For this ninja star pattern, we will use 5 popsicle sticks. We will use them in the order of the rainbow colors.



2 Start off with the first (red) stick and lay it on a flat surface. Table and counter tops will work the best.



3 Place the end of the second (orange) stick on top of the red stick so their ends touch. The two sticks should be at a 60 degree angle.



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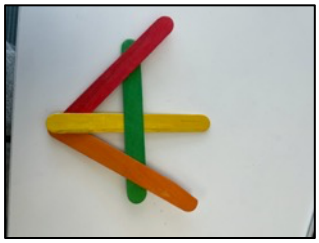
Now place the third (yellow) stick on top of the orange stick in the middle so one end of all three sticks meets each other. The red one should be on the bottom, followed by the orange, then the yellow on top.



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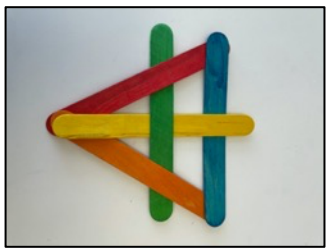
Carefully slide the fourth stick (green) in between. The green stick should be at a 90-degree angle with the yellow stick, and it should sit above the yellow stick but below the red and orange sticks. You should feel some tension in the green stick now since it is being pushed down by the red and orange sticks.



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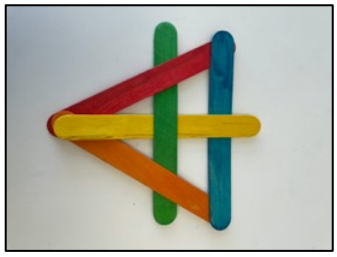
For the final step, insert the last (blue) stick. It should form a triangle with the red and orange sticks. Unlike the orange popsicle stick, the blue stick should go under the yellow stick but above the red and orange sticks. This creates a locking mechanism that holds the potential energy in place.



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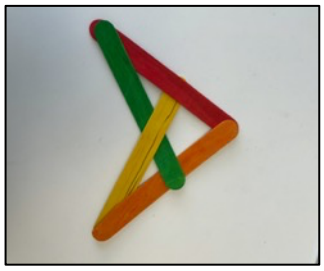
To release the energy stored in the ninja star, you can knock off one of the sticks by tossing it onto the floor or throwing it against an **empty** wall. Make sure to find a safe place to throw the star and do not throw it at people or pets!!



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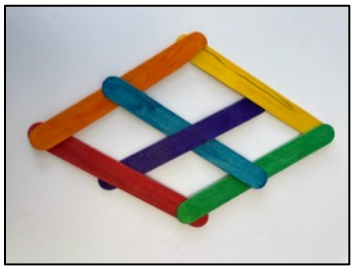
The ninja star above is not the only pattern that can store potential energy.

Can you figure out how to build the 4-stick star on the left without instructions?

Hint: follow the colors of the rainbow and note which stick is on top of which other sticks!



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This is another pattern you can try with 6 popsicle sticks.

Can you figure out how to build the 6-stick star on the left without instructions?

What Do You See?

You should observe the popsicle stick ninja star to 'explode' when you drop or throw the ninja star against a surface.

Why?

The potential energy stored in the popsicle sticks are released as kinetic energy (the explosion!)

Repeat the Experiment

To do a true repeat of the experiment you need to do it the exact same way again and compare the results of your first experiment with your second experiment.

Repeat the Experiment – But with a Twist!

To answer even more questions, how could you do the experiment differently?

- How many different ways can you think of to arrange the popsicle sticks and build different ninja stars? What is the biggest ninja star you can build that can release kinetic energy? What is the smallest ninja star you can build that can release kinetic energy?
- How do you measure the energy stored? (hint: how wide do the sticks disperse when you throw them?) Which popsicle stick pattern is the most efficient at storing energy?

Great Work