

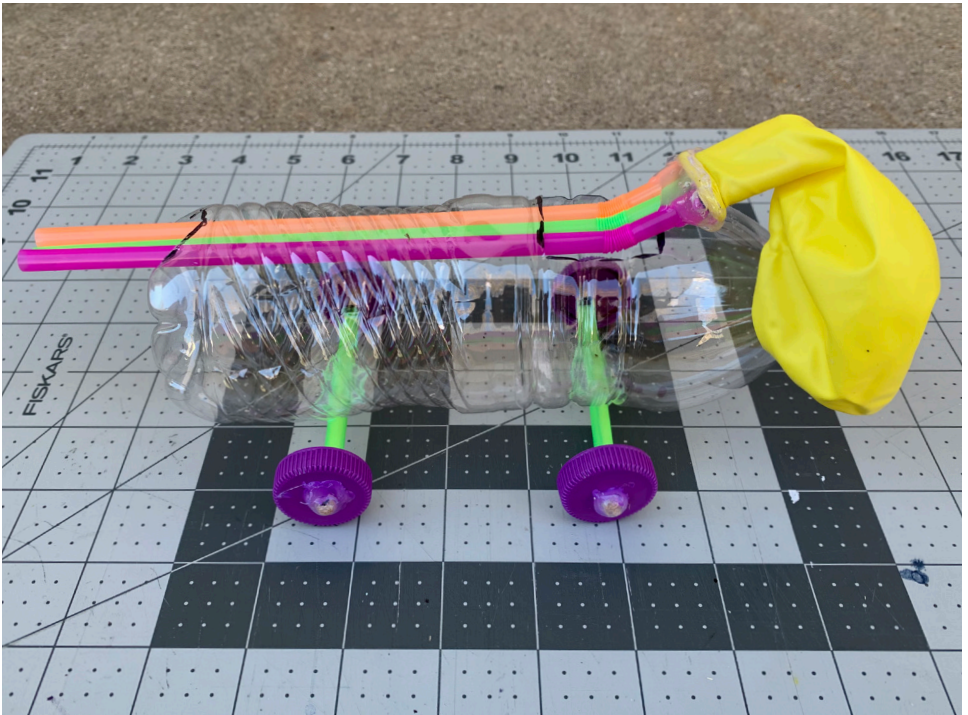
# TAKE & MAKE KIT

## Balloon Engine Car

TIME: 45 min - 1 hour

ADULT SUPERVISION REQUIRED | CONTAINS SMALL PIECES

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## What's in this kit?

Recycle everyday objects and build your own race car. Make a few with your friends and race against each other!

### You will learn:

- Engineering
- Physics
- Forces and energy
- Work and motion

## Let's Get Started!

This project requires adult assistance. Please read and follow instructions carefully. Exercise caution and safety when handling tools and materials.

### Materials

1 plastic bottle  
4 bottle caps  
1 balloon  
1 bamboo skewer  
4 straws  
10 tiny elastics  
2 rubber bands  
Tape

### Tools

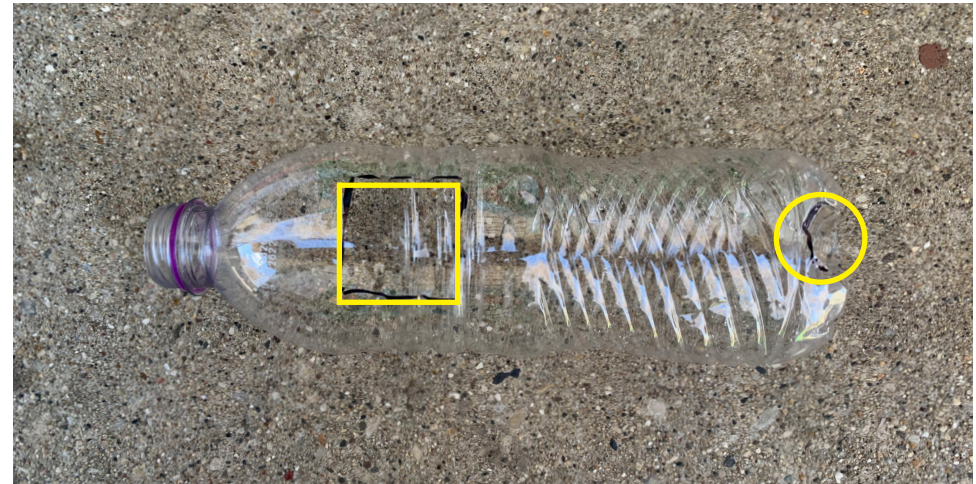
Scissors or X-Acto knife  
Permanent pen  
Push pin  
Hot glue gun (optional)

## Predictions!

The balloon stores potential energy and converts it into kinetic energy to make the car move. How far do you think your car will travel?

### Step 1 - Prepare the bottle

Cut a square in the top half of the bottle (approximately 1.5 x 1.5 inches) and a hole at the bottom of the bottle (approximately .75 inch diameter).



### Step 2 - Make the wheels

Push the pin into the center of the cap to create a pilot hole. Repeat with 4 bottle caps. Set aside for later.



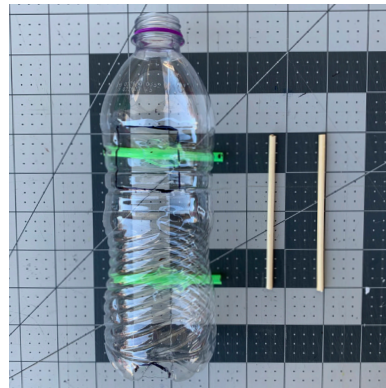
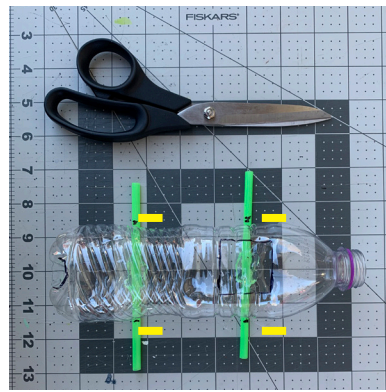
### Step 3 - Make the axles

Cut off the short end of the flexible bendy straw and discard. Cut the remainder of the straw in half.

Tape or hot glue the straws on to the bottom of the bottle. The square you cut out on Step 1 should be facing up and the straws on the bottom should be at least 3 inches apart.

Once attached, use the scissors to trim the ends of the straw to the width of your bottle.

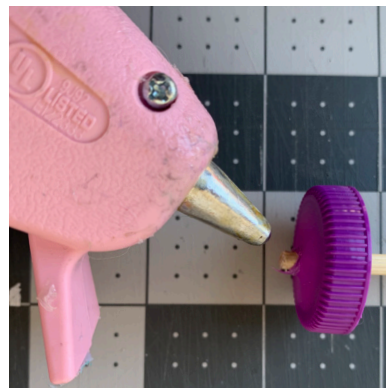
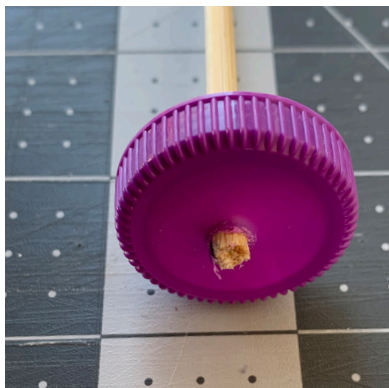
Cut the bamboo skewer into thirds. Use scissors to score the bamboo by applying enough pressure to make a dent but not enough to cut through. After scoring you can snap at the dents.



### Step 4 - Attach the wheels

The bamboo skewers need to fit through the hole in the bottle caps. You can use the pointed end of the bamboo skewer to widen the pilot hole created in Step 2.

Once the bottle cap is on the bamboo skewer, secure it with a dab of hot glue on the outside of the cap.



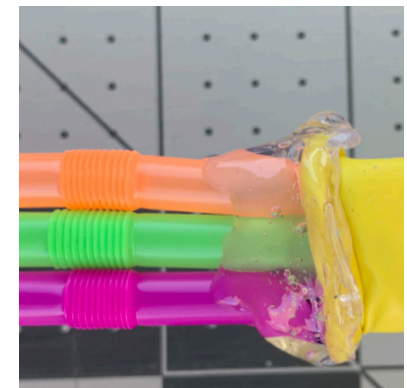
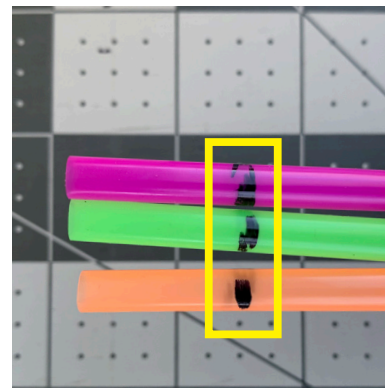
If you don't have a hot glue gun, tie a tiny elastic about an inch from the end of the bamboo skewer, add the bottle cap, and then secure it by tying another elastic on the outside. Make sure you tie the elastic as close to the bottle cap as possible.

Attach one wheel to the skewer, insert the bamboo skewer into the straw axle and then repeat the steps for the second wheel. Repeat for both sets of wheels.

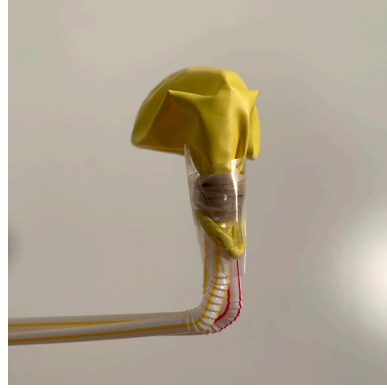
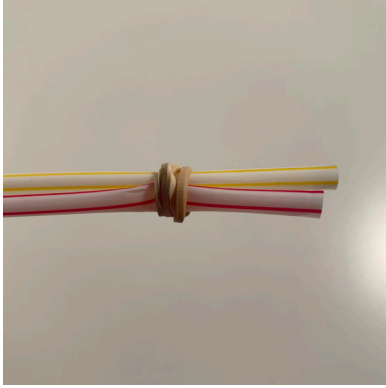


### Step 5 - Make the exhaust pipes

Hold three straws together. On the shorter end of the bendy straws, add a thick line of hot glue about an inch away from the opening of the straws. (Skip to next page if you do not have a hot glue gun.) Do this on both sides to secure them together. With glue still warm, carefully slide the open end of the balloon onto the straws and bring gently over the line of glue. Add more glue to fill any gaps.



You can do this step without a hot glue gun. Hold the three straws together and tie the shorter end of the bendy straws with a rubber band. Slide on the balloon and secure it by tying a rubber band around it. Additional tape may be added to make sure you have no gaps for air to escape.



### Step 6 - Assemble your balloon engine car!

Take the exhaust pipe and slide it into the bottle through the square and out through the hole you cut. The balloon should be resting outside of the square. You can bend the straws to allow room for the balloon to inflate.

### You did it!

There you go! You built your own car! Now you might be asking, how does this actually work?

To power your car we will be using physics. Place your car on a flat surface and blow into the straws to inflate the balloon. When the balloon is inflated, it becomes filled with potential energy. When you release the balloon, the potential energy is converted into kinetic energy.

In physics, the transferring of energy is called work. Work is possible because of forces that are applied to an object. In this case, the forces at work are friction (the wheels against the flat surface) and air resistance.

Let go of the straws and watch your car zoom away! If the balloon does not inflate, add more glue or tape to fill in any gaps. Adults may need to assist younger children with blowing up the balloon.

## Go Beyond

How far did your car move? Measure the distance from where it started to where it stopped. Record the distance in feet and inches.

Take a stopwatch and time how long your car moves. How long did it take until your car stopped moving?

## Challenge!

Can you challenge a friend to build a car? Make a few cars and have a race. What can you add or take away from the design of your car to make it move faster or slower?

HANG OUT,  
MESS  
AROUND,  
GEEK OUT.



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