# STEP BY STEP
BALLOON POWERED CAR

Turn a pile of trash into a toy car—and watch it go! In this activity you will learn some physics concepts and use recycled materials to build a toy car that is propelled by a balloon. You can even find a friend, build two cars and race them against each other. Whose car will go the fastest?

You can watch the Dyson Foundation Video on this Challenge!

PREPARATION

- Cut one of the straws in half.

- Tape both pieces of the straw to one side of the water bottle.

- Cut the wooden skewer in half and push each piece through one of the straws. These will form your axles. (Have an adult help.)

- Have an adult help use the scissors to poke a "+"-shaped hole directly in the centre of each plastic bottle cap.

- Press each bottle cap onto the ends of the wooden skewers. These will form your wheels.

- Put your car down on a flat surface and give it a good push. Make sure the car rolls easily and coasts for a bit before stopping. If your car gets stuck or does not roll smoothly make sure: your axles are parallel to each other; the hole in each bottle cap is centred; and the straws are securely taped to the water bottle and do not wobble. You can add some glue if tape is not sufficient.

- Tape the neck of the balloon around one end of the other straw. Wrap the tape very tightly so the connection is airtight.

- Cut a small hole in the top of the water bottle, just big enough to push the straw through.

- Push the free end of the straw through the hole and out the mouth of the bottle.

- Use tape to secure the straw to the bottle.
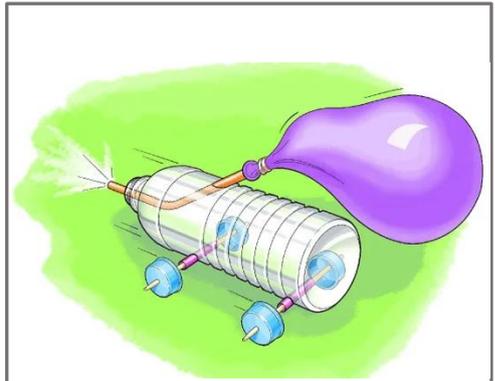
TOOLS & MATERIALS

- Plastic bottle
- Four plastic bottle caps
- Wooden skewer
- Two straws
- Balloon
- Tape
- Scissors
- Craft materials to decorate!

Alternative materials for the wheels

- Plastic drink lids (from a takeaway cup), Old CD's/DVD's, spools of thread

- Blow through the straw to inflate the balloon, then put your finger over the tip of the straw to trap the air. *What do you think will happen when you put the car down and release your finger?*

- Put the car down on a flat surface and release your finger. *What happens?*

- See what adjustments you can make to make the car go farther.

- *What happens if you inflate the balloon more?*

- *What happens if you adjust the direction the straw is aimed? Does it work best if the straw is aimed straight back?*

Extra: There are many different ways to build a balloon car. Turn this into an engineering design project and try building your car with different materials. For example: *What happens if you use a cardboard box instead of a plastic bottle for the body? What happens if you use different diameter straws? What about different materials for the wheels and axles?* Get some friends and try building different cars and racing them against one another. *What materials work the best?*

Observations and results

When you inflate a balloon and let it go, it zips randomly around the room. When you tape the balloon to a straw and attach it to the body of your car, however, you can control the direction of the escaping air. When the end of the straw is aimed backward, the air pushes your car forward, as described by Newton's third law of motion. Your design will be most efficient if the straw is pointed straight back and not downward or to the side. The more you inflate the balloon the more potential energy it stores, which in turn is converted to more kinetic energy, according to the law of conservation of energy—so the car will go faster.

You may find your car does not work perfectly on the first try, particularly if its axles are not parallel or the wheels wobble. Too much friction can cause the wheels to get stuck, and the balloon will not be powerful enough to push the car forward. Test your car to make sure the wheels spin freely and, when you give it a push, the car rolls easily. If not, you might need to make some adjustments to your design. You should also make sure no air escapes the balloon where it is taped to the straw, and re-tape it more tightly if necessary.

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