STEM in the lab

Inspiring Idaho's future STEM workforce

BALLOON POWERED CAR

GRADE LEVELS

This activity is appropriate for grades 2-5.

MISSION

Make a ballon powered car out of recycled materials.

VOCABULARY

RECYCLING: the action or process of converting waste into reusable material.

AIR PRESSURE: force exerted onto a surface by the weight of the air.

POTENTIAL ENERGY: the energy possessed by a body due to its position relative to others, stresses within itself, electric charge, and other factors.

KINETIC ENERGY: energy that a body possesses due to being in motion.

MATERIALS

- Balloon (engine)
- 4 x 6 index card (car body)
- Plastic bottle caps (wheels)
- Paper straws (axles)
- Tape
- Scissors

ABOUT THIS ACTIVITY

At Idaho National Laboratory, recycling is an important aspect of our work. The goal of INL's recycling program is to lower the amount of raw materials consumed and reduce the amount of materials going to landfills. In this activity, you will use a few pieces of recycled materials, like cardboard and bottle tops, to make a car powered by a balloon. Chances are you have all the materials you need for this recycled craft right at home.

INSTRUCTIONS

1. Cut two straws to the width (short side) of an index card.
2. Tape each of the cut straws to the short sides of the index card. Make sure that each straw is secure, as they will be the axles for the car.
3. Cut two skewers that are slightly longer than your straws. Insert your skewers into each of the cut straws.
4. Put a bottle cap on each end of the skewer. Insert the skewer tightly in the hole in the bottle cap. If the bottle caps are loose, use glue to prevent the wheels (bottle caps) from moving side to side on the skewer.
5. Take a straw and place a balloon over the end of the straw. Tape the balloon to the straw, secure it with tape, leaving no gaps, so you can use the straw to blow up the balloon. Blow up the balloon using the straw. Now, release the straw and balloon and observe what happens.
6. In the middle of the index card, tape the straw with the balloon attached. The straw needs to be pointed toward the back of the car.
7. Blow into the balloon, set it on the ground, and watch it go. Why does the balloon car go in the opposite direction that the air is flowing?
8. Try some of the extension activities to learn more about how your car works.

THE SCIENCE BEHIND IT

A balloon powered car is an example of Newton's third law of motion: For every action there is an equal and opposite reaction. Air is forced out of the end of the balloon, which means there must be an equal and opposite reaction pushing the car forward. The inflated balloon stores potential energy in the form of the stretched rubber of the balloon and the compressed air inside the balloon. The more the balloon is inflated, the more potential energy it stores. The balloon's stored potential energy is converted to kinetic energy, the energy of motion. An object's kinetic energy depends on its mass and the square of its velocity. For example, if two objects are moving at the same speed, the heavier one has more kinetic energy. This balloon's kinetic energy is gradually converted to thermal energy as friction slows it down. The balloon may also collide with an object like a wall or desk, which exerts a force to stop the balloon (and converts the remaining energy into thermal energy).

When you add oil to water, the oil floats on the surface of the water. And if you shake the two together, then leave them to stand, tiny droplets of oil float upward. These droplets join until eventually the oil is floating on the water again. To stop the two liquids from separating, you need a substance called an emulsifier. This is how soap cleans your hands – it causes drops of grease and dirt to be pulled off your hands and is suspended in water. These drops are washed away when you rinse your hands.

EXTENSIONS

- Make more balloon cars with slight variations and race each other. Which one was faster?
- What happens to your car if more weight is added?
- Try different sizes of balloons and straws. How does the size influence the speed?

RESOURCES

- Balloon Car Lesson Plan
  https://www.sciencebuddies.org/teacher-resources/lesson-plans/balloon-car
- Easy Balloon Powered Car
  https://www.science-sparks.com/easy-balloon-car/

LEARN MORE

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For information on grants, training and student opportunities, curriculum ideas, and other resources, please visit ***stem.inl.gov.***