

Balancing Balloon

Summary

Suspend a balloon in the stream of air from a hairdryer

Current Physical Science Curriculum links

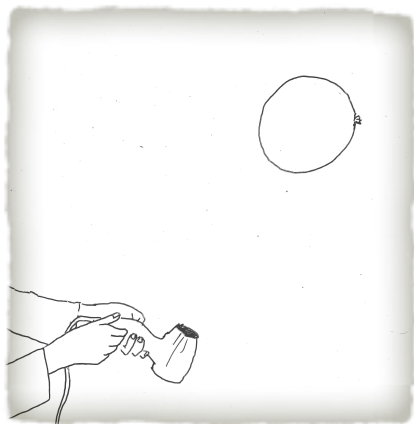
Force + Motion (gr 1), Forces (gr 5)

Draft Physics Curriculum links

Motion of Objects (K), Forces + Motion (gr 2), Energy (gr 4), Newton's Laws of Motion; Gravity (gr 6)

Processes of Science/Curricular Competencies

Observation, manipulation, questioning, comparing observations and predictions, inferring, controlling variables and fair testing, hypothesizing, concluding, consideration of alternatives



Materials

- balloon blown up until it is as near to a sphere as possible
- hairdryer, with the heat turned/taped off

Materials Cost

Couple of dollars for balloons. Borrow hair dryers.

Procedure

Show students how to put the balloon into the hairdryer airstream. Leave them to experiment, with some prompting questions:

How far can you tip the dryer over without losing the balloon?

Can you throw the balloon and catch it in the airstream?

If you gently push the balloon out of the airstream, can you feel the force of the balloon being pulled back in?

How does this work?

Gather as a group and hear what students found, allow them to compare results. Ask for their ideas on why the balloon stays within the airstream. Encourage students to discuss in terms of the forces involved.

If the students are involved in their own ideas and discussions of what is going on, an explanation may not be needed, and may even stop their questioning and hypothesizing.

Only if students need an explanation, can this one be given:

The balloon stays at a certain height above the hairdryer when the force of gravity (which pulls the balloon down) is equal to the force of the air underneath the balloon (which is pushing the balloon up).

While the balloon is in the airstream, air curves around the base of the balloon then moves outwards and upwards, then over the top. As it moves outwards, all around the balloon, it pushes back on the balloon, holding it in the airstream. (Newton's Third Law of action and reaction.) You can feel this same force when you stick your hand out of a car window. When you tip your hand so that the air is directed down or up, you feel your hand being pushed up or down by the redirected air.

In addition, some explanations include the Bernoulli effect: the air that moves around the balloon is faster moving than the surrounding still air, so has lower pressure. The balloon is pushed by the still, higher pressure air into the lower pressure air within the airstream.

More details, references and further experiments

- This activity at www.ingridscience.ca/node/107
- Use as a station alongside other activities investigating forces and balance: www.ingridscience.ca/node/110 and www.ingridscience.ca/node/200