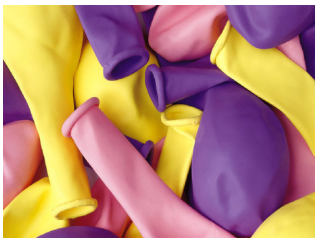
ROCKET BALLOONS



BENCHMARKS and TASKS

SC.B.1.2.1 The student knows how to trace the flow of energy in a system (e.g., as in an ecosystem.)

SC.B.1.2.2 The student recognizes various forms of energy (e.g., heat, light and electricity).

SC.B.1.2.4 The student knows the many ways in which energy can be transformed from one type to another.

- The student defines energy as the ability to do work or exert a force and recognizes that work is done every time a force is used to move something.
- The student describes energy as stored energy (potential) or energy of motion (kinetic).
- The student recognizes that energy comes in many different forms: (e.g., **mechanical**, energy of position and motion; **electrical**, energy of moving electrons; **chemical**, energy stored in chemical bonds; **thermal,** heat energy - the energy of moving and vibrating molecules; **nuclear**, energy contained in the nuclei of atoms; and **radiant,** energy that travels in waves like sunlight).
- The student discovers through experiences ways that energy can be transformed from one form to another (e.g., electricity to light, light to heat, potential to kinetic).

KEY QUESTION

What happens to an inflated rocket balloon when the air is released?

BACKGROUND INFORMATION

There are two kinds of mechanical **energy – kinetic and potential.** Potential energy is energy an object has because of its position or shape. Kinetic energy is the energy an object has because it is moving. The greater the speed and the mass of an object, the greater its kinetic energy. When the rocket balloon has been inflated and the neck is being pinched closed, the balloon has potential energy (stored energy). When the rocket balloon is released and moves along the track, the potential energy is transformed to kinetic energy (energy of motion).

Newton's three laws of motion can be used to explain the movement of all objects in the universe. Newton's Third Law states, "For every action, there is an equal but opposite reaction." Newton's Third Law says that when one object exerts a force on a second object, the second object exerts a force back that is equal in size but opposite in direction. All forces act in pairs. In this activity, when the air inside the balloon escapes, it pushes the balloon forward - an equal and opposite reaction.

MATERIALS

Per group

4 balloons of various sizes/shapes (Note: Every group must have the same set of 4 balloons.)
straws
cellophane or masking tape
1 metric measuring tape
10 m of fishing line or string coiled around an index card
Rocket Balloons data sheet

TEACHING TIPS

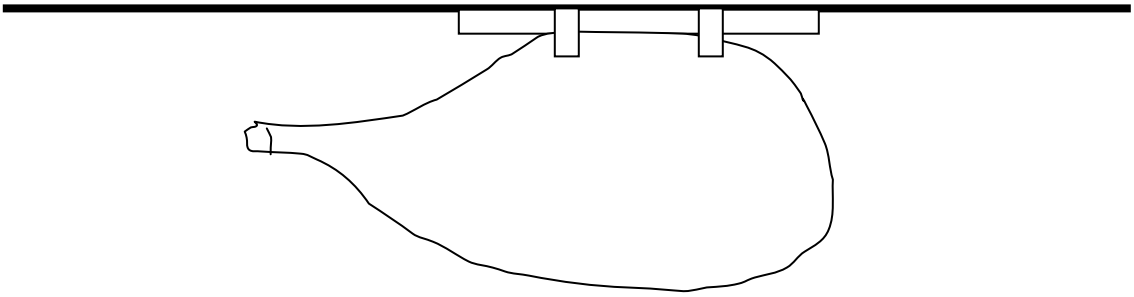
1. Assign launch teams before the lesson starts.
2. This activity should be done in a large, open area.
3. For each group, cut 10 m of fishing line and wrap it around an index card. Tape the line to the card.
4. This activity provides a perfect opportunity for supporting mathematics benchmarks/tasks in the measurement strand. As students are measuring the distance the balloons travel, insist they use metric measurement. If they record measurements in centimeters, reinforce how easily they can convert to meters since 100 cm = 1 m, they just need to move the decimal point (e.g., 367 cm or 3.67 m).

ENGAGE

1. Ask students how they would move a balloon from one end of the room to the other. Give balloons to several students and allow them to demonstrate their ideas.
2. Inflate a balloon and ask students to predict what will happen when you release it. Release it and observe.

EXPLORE

1. Ask a team of four student volunteers to help you demonstrate how to set up a rocket balloon track. Give one student the card of fishing line and have her slip a straw onto one end of the line. Extend the fishing line out and have a second student hold the opposite end of the line some distance away.
2. Have a third student select a balloon, blow it up, and pinch the end closed while the fourth student tapes the balloon to the straw. Be sure the balloon is taped to the straw and not to the line itself. (See the illustration below.)



3. Have students predict how far they think the balloon will travel when released.
4. As the two students are holding the line taut and about shoulder height, the student who is pinching the balloon closed should release it.
5. Then one student should measure the distance the balloon traveled and record it on the data sheet.
6. Distribute materials to the teams. Challenge students to experiment with the four balloons of various shapes and sizes to see how far they can cause a balloon to travel along the track. (Some teams may need to lengthen their tracks!)

EXPLAIN

1. Allow teams to demonstrate their most successful launches for the class and to explain the conditions of the launch.
2. Discuss:
   What caused the rocket balloon to move along the tracks? (When the air inside the balloon escapes, it pushes the balloon forward - an equal and opposite reaction.)
   When did an energy transformation occur during the activity? (Potential energy changed to kinetic energy. At the instant the balloon was released, the potential energy, energy stored while the balloon was pinched closed, changed to kinetic energy, energy of motion, which caused the balloon to move along the track.)
   How did balloon size affect the flight? (The more air that was released, the greater the distance the balloon traveled.)
   Which of the four balloons traveled the greatest distance? Why do you think so?
   Which of the four balloons traveled the shortest distance? Why do you think so?
   What other variables may have affected the distance the balloons traveled? (the way the balloon was attached to the straw, the tautness of the line)
3. Remind students that energy is the ability to do work or exert a force and work is done every time a force is used to move something. Ask: *Was any work done?* (The force of the air escaping from the balloon pushed the balloon along the track. The balloon moved, so work was done.)

EXTEND/APPLY

Have students think about how launching a rocket balloon is similar to popping a kernel of popcorn. (The small amount of water in the starch inside the hull turns to steam, which builds up pressure, and POP! If there is no lid, the popcorn will shoot into the air just as the balloon shoots along the track.)

EXTENSIONS

1. Have students predict what will happen if they place the balloon on the track vertically rather than horizontally. Try it and see what happens!
2. Encourage students to investigate with tracks at different angles. Encourage the use of a protractor to measure the angles of the tracks.

ASSESSMENT

Have students describe in their journals other examples of action and reaction forces.

Investigators:_____

ROCKET BALLOONS

Experiment with a variety of balloon rockets. Measure the distance the balloon traveled. If applicable, write the distance traveled in at least two ways (e.g., 241 cm and 2.41 m).

Balloon Number	Distance Traveled
1	
2	
3	
4	

Write your conclusions about the activity. _____

_____

_____

_____

_____

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