Newton's Laws, Friction, and Hovercraft

A Carolina Essentials™ Activity

Student Worksheet

Overview

Hovercraft are vehicles that glide over surfaces on a cushion of air. They are designed to reduce frictional force between the craft and the surface. Hovercraft illustrate Newton's laws of motion and frictional force. Newton's laws explain how the craft "hovers" above the surface and how the craft reacts to an applied force.

Essential Question

How can Newton's laws of motion and friction explain the motion of a hovercraft?

Activity Objective

1. Build a working model hovercraft using inexpensive household items.
2. Observe the effect of friction on a mechanical system.

Safety Procedures and Precautions

Glue guns are a source of heat. Hot glue can stick to fingers and burn the skin. Follow all directions carefully.

Activity Procedures

1. Position the soap bottle cap over the center hole of the CD. Draw a circle around the cap.
2. Using the drawn circle as a guide, attach the soap bottle cap to the CD with hot glue.
3. Make sure the hot glue provides an airtight seal around the edge of the cap.
4. Allow the glue to dry.
5. Make sure the soap bottle cap is closed and pushed downward.
6. Inflate the balloon.
7. Twist the neck of the balloon to stop the air from escaping.
8. Stretch the neck of the balloon over the plastic tip of the cap. Make sure the balloon is securely attached to the cap so that no air can escape.
9. Place the balloon on a flat surface, such as a lab table or a tile floor.
10. Pull up on the cap so that air escapes from the balloon through the cap and the hole in the CD.
11. Gently push the hovercraft and observe how it moves across the floor.

SAFETY REQUIREMENTS

MATERIALS

Compact disc
Balloon
Dish soap bottle cap
Hot glue gun and glue sticks

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12. When the balloon is completely deflated, push the hovercraft again.

Analysis and Discussion

1. Explain in detail which of Newton's laws were illustrated in this activity.

2. Explain differences in the force of friction between the hovercraft on a smooth surface and on a rough surface.

3. Use a diagram illustrating the microscopic view of the surfaces to generate a model for friction in this activity.