Curiosity Guide #210
Mechanical Energy

Accompanies Curious Crew, Season 2, Episode 10 (#210)

Cup Racer

Investigation #1

Description

Learn about several types of energy while building and testing a really cool racer.

Materials

- 2 foam coffee cups with lids
- Scissors
- Duct tape
- Clear tape
- Ruler or compass
- Rubber bands
- Paper clip
- Straw
- Plastic bead
- Scratch awl or nail set
- Hammer
- Washer
- Pencil

Procedure 1: Prepare the cups

1) On the bottom of each coffee cup, trace a circle about an inch in diameter.
2) Cut the one-inch diameter circles out with scissors.
3) Put the cup bottoms together. Line the holes up.

4) Run a strip of duct tape around where the cups touch, to keep them secure.

Procedure 2: Prepare the lids and rubber-band chain

1) Lay the lids on a flat surface. Tap a small hole in the center of each lid with the nail set or scratch awl.
2) Link several rubber bands together in a chain. The chain should measure about the length of the two stacked cups.
3) Feed the rubber-band chain through the center of the cups.
4) You will connect a lid to each cup by pulling the ends of the rubber-band chain through the holes you made in the lids, one on each side.

Procedure 3: Connect lid 1

1) Pull one end of the rubber-band chain through the first lid.
2) On the outside of the first lid, thread a paper clip through the end of the rubber-band chain. This will keep the chain from falling back into the cup.
3) Tape the clip flat on the outside of the lid, using clear tape.
4) Put the lid firmly on the cup.

Procedure 4: Connect lid 2

1) Thread the other end of the rubber band chain through the second lid on the opposite side.
2) About an inch of rubber-band chain should be coming through to the outside of the second lid.
3) Thread a plastic bead onto this end of the rubber-band chain.
4) Slide a straw into the top loop of the rubber band, on the outside of the plastic bead.
5) Slide the straw so that the rubber band is an inch from one end.
6) Gently pull the rubber band from the cup side to get the band snug on the straw.
7) Put the second lid on the cup.

Procedure 5: Test the racer

1) Wind up the straw.
2) Lay the cup racer down on the floor and watch.

My Results

Explanation

When you wind the straw, the rubber band begins to twist inside the cup. The twisting increases its **elastic potential energy**. When the cups are placed on the table or floor, the longer side of the straw prevents the rubber band from unwinding on that side, so the rubber band begins to twist on the end with the paper clip. The elastic potential energy is transferred into **kinetic energy** as the cup begins to move. Because the cup is displaced from the force of the rubber band, there is **mechanical energy** as well. The cups will eventually come to a stop because of the friction of the cup and the straw with the ground.

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