



## Curiosity Guide #601

### Collisions

Accompanies Curious Crew, Season 6, Episode 1 (#601)

### Mystery Ball Collisions

Investigation #2

#### Description

We're on a roll! Let's set up some collisions!

#### Materials

- 1 ball of polynorbornene rubber
- 1 ball of polyneoprene rubber
- One 2 by 4 piece of wood, 25 cm in length
- Wooden ramp
- Wood blocks
- Meter stick

#### Procedure

- 1) Stack two piles of wood blocks so that one pile is twice the height of the other.
- 2) Slide the piles apart. Place the wood ramp on top of the block piles.
- 3) Stand the 2 by 4 on end about 15 cm from the end of the ramp.
- 4) Roll the less elastic polynorbornene ball down the ramp and observe how it hits the board.
- 5) Repeat with the polyneoprene ball.
- 6) What effect did the second ball's collision have on the board?

#### My Results

## Explanation

Sometimes objects bump into each other, and those are called collisions. If the objects bounce away, like in the case of two bouncy balls, we say that the collision is elastic. Other times the objects might stick together, like with two balls of clay. Those kinds of collisions are inelastic. When things bump into each other, the collisions are usually part elastic and part inelastic. Kersplat!

In both cases, the balls collide with the standing 2 by 4. However, only the second ball makes the board tip over. The ball that knocked over the board is made of polyneoprene rubber. If we could look at this ball microscopically, we would see long chains of crosslinked polymers that cannot move very easily. Because there is so little movement in the chains, very little of the kinetic energy gets transferred into heat on impact, so the momentum and kinetic energy of the ball are conserved.

The less bouncy polynorbornene ball has a different pattern, with 5 carbon atoms linked into a series of connected rings. When the ball collides, the molecular rings will momentarily flex, and the kinetic energy gets transferred into heat. This causes the polynorbornene ball not to bounce very much in an inelastic collision. The elastic, polyneoprene ball can transfer more of that kinetic energy into the board and tip the board over.

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