STEM Sims™

Newton's Cradle

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Do you need an idea for a scientific study?
Try out one of our ideas or make one of your own.

Start learning right now about the wonders of Newton's Cradle. Take the following brief quiz to see how much you already know about Newton and his cradle. See the bottom of page 4 to check your answers.

1. Who is credited with inventing the first Newton's Cradle used to study motion?
   a. Isaac Newton
   b. Galileo
   c. Christiaan Huygens
   d. Archimedes

2. Which musical group or artist used a Newton's Cradle as a rhythm device in one of their recordings?
   a. The Beatles
   b. The Who
   c. Kanye West
   d. Jefferson Airplane

3. How large were the collision spheres on the largest operating Newton's Cradle that was o n public display?
   a. 24 centimeters
   b. 66 centimeters
   c. 127 centimeters
   d. 329 centimeters

4. In about how many movies has a Newton's Cradle appeared?
   a. 2
   b. 6
   c. 10
   d. 20+

5. The *MythBusters*™ television show created the largest Newton's Cradle ever. How massive was each colliding sphere on their cradle?
   a. 500 pounds
   b. 1,000 pounds
   c. 1,500 pounds
   d. 2,000 pounds

Making Your Cradle

Can you build your own Newton's Cradle? Grab a few common household materials and start impressing your friends and family with your new executive's toy that demonstrates energy and momentum. And is really fun to watch.

Materials

5 - super bouncy balls
1- spool of thread
1 - roll of masking tape
1 - pair of scissors
5 - thumbtacks
4 - 500 mL plastic water bottles
1 - ruler
4 - skewers or sticks each 25 cm long

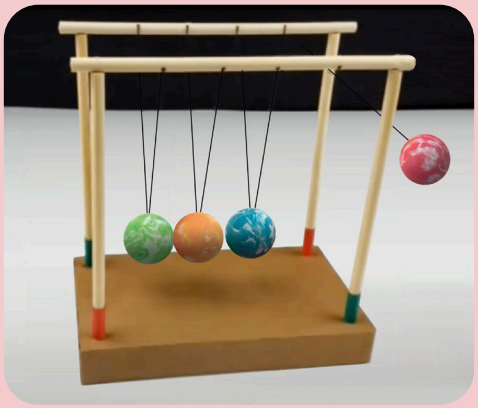
Directions

1. Make sure to get permission before starting this experiment.
2. Press one thumbtack into one super bouncy ball. Repeat this process until all bouncy balls have one thumbtack in place.
3. Fill each of the four empty water bottles with water and secure the lid.
4. Place the four bottles into a rectangular pattern. The pattern should be 25 cm long and 15 cm wide.
5. Place the skewers or sticks on the top of each bottle to make the rectangle. Secure the skewers in place with the masking tape.
6. Use the scissors to cut 5 pieces of thread each being 44-cm long.
7. Tie the *middle* of one piece of thread to the thumbtack on one of the bouncy balls. Repeat this process with the other four bouncy balls and their pieces of thread.
8. Tie each end of the bouncy ball's thread to the long side of the rectangle. Make sure that all the bouncy balls hang at the same height and are about one-cm away from touching each other. They should hang as low as possible without touching the surface.
9. If needed, adjust the length of each bouncy ball's thread to make them all hang at the same height. After making this adjustment, use the masking tape to secure the thread to each side of the skewer.
10. Have fun with your engineering marvel that is the Newton's Cradle!

Questions

1. Why were super bouncy balls used in this cradle?

2. What would happen if clay spheres were used instead of the super bouncy balls?



Newton's Cradle

Which Type of Vehicle Do You Want in a Collision?

Accidents involving vehicles happen every day. If you are a vehicle designer, should you make vehicles' frames elastic or inelastic? The answer is a resounding, it depends! Do the vehicle designers want to protect the vehicles or the occupants inside them? As much as people love their vehicles, making a vehicle that is not deformed in a collision causes major problems for the people inside the car. An elastic car frame would not be deformed and would bounce back quickly from any collision. The main problem with this design is that any occupant in the car would keep moving forward as the frame bounced back and the person would experience a large deceleration as a result of the quick stop.

The large deceleration of the person would result in another collision. This time with the internal organs of the person colliding with the person's skeletal system. Serious internal injuries take place with these collisions.

How do vehicle designers deal with this situation? They give up keeping the structure of the vehicle intact to protect the people inside. The designers make the vehicle frame more inelastic so it crumples during a collisions. This crumbling effect reduces the deceleration felt by occupants by increasing the time of the collision. So, the next time a person has a crumpled fender during a vehicle accident, thank an engineer for protecting the people inside by letting the vehicle be damaged.

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STEMsims.com

Answers: Page 2 Answers: 1) c, 2) d, 3) b, 4) d, 5) d (by the way, their cradle did not work properly because the concrete used to make the spheres converted too much energy to heat). **Page 3 Answers:** 1) The super bouncy balls were used because they are very elastic and are return quickly to their original shape when deformed with little loss of kinetic energy. 2) Clay balls would be inelastic and would not return to their original shape and would therefore have significant loss of kinetic energy. Instead, the clay balls would stick to each other and the results would not be one ball in and one ball out the other side. solidifies. 2) This lab models what happens in an underwater volcano. The molten rock moves up through gaps and holes in the mantle and crust, eventually reaching the surface.