Colliding Spheres

Amount of time Demo takes: 1 minute

Try this at home!

Lesson's Big Ideas

- When the two spheres are smashed together, the kinetic motion energy is transformed into enough heat to burn a hole in a piece of paper.
- The spheres are very dense so they have a lot of potential energy.

Materials

- Arbor Scientific Colliding Steel Spheres Set
- Paper (any type will work)

SAFETY!

- Do not place fingers or important documents between the spheres!
- Only beat the spheres together hard enough to make the paper burn, do not try to hit them together at your hardest. Gradually increase force.

Background Information

- Energy cannot be created nor be destroyed, it can only transform from one form to another.
- In this case, kinetic energy is transformed into thermal energy.
- Paper burns at a temperature of 451 degrees Fahrenheit (233 degrees Celsius)

Set-up Instructions

1. Lay out some pieces of paper and the spheres.

Instructional Procedure

1. Hold the spheres on either side of a sheet of plain paper. Carefully (but firmly) crash the spheres together, with the paper in between.
2. Look at the paper, there should be a hole. To confirm that the hole was actually burned into the paper, sniff the paper and smell the smoke.

3. Have students start off lightly then build in force to get to a great enough collision to burn the hole in the paper.

Careers & Real-World Applications

- Transformation of energy is occurring all around you. We get electricity by converting the energy we get from windmills, solar panels, or burning coal into electrical energy.
- Careers:
    - Chemical Engineers
    - Chemist
    - Materials Scientists/Engineers
    - Mechanical Engineers

Assessment Questions

- Besides thermal energy and motion, what other forms of kinetic energy are there?
    - Sound, electromagnetic radiation, electric, mechanical, electrical
- What are other examples of energy changing form?
    - Potential to kinetic: When you drop a ball or another object, it has potential energy while it is still in your hand and is converted to kinetic energy once it starts falling.
    - Electrical to thermal: Some light bulbs get warm after they are turned on. The electrical energy used to turn on the bulb in converted into thermal energy.
    - Chemical to thermal: Fire is a chemical reaction that produces heat.
- What are the two broad categories of energy?
    - Potential and kinetic energy

Tips & Tricks

- Make sure you try this before kids get there so you can figure out the right amount of force to use to burn through the paper

Clean Up

- Place the spheres back in their box to keep them from rolling around.
- Recycle used paper

Related Next Generation Science Standards

- K-5
    - 2-PS1 Matter and Its Interactions
    - 4-PS3 Energy
- 6-8
    - MS-PS1 Matter and Its Interactions
    - MS-PS3 Energy
- 9-12
    - HS-PS3 Energy