The Effects of Temperature on Bounce

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Grade: 4th - 7th; Type: Physical Science

Objective:

To determine if the temperature of rubber effects how high it bounces.

The purpose of this experiment is to see whether rubber balls will bounce differently when heated or cooled versus at room temperature.

Research Questions:

- What is the optimal temperature range for rubber?
- What is rubber made of?
- How do scientists and engineers test new objects?
- What kinds of objects is rubber used in?
- Why is it important for objects to hold up under extreme heat and cold?

Scientists need to be aware of the possible ways temperature can effect a material when designing everything from spaceships and deep sea submersibles to rubber tires and microwavable bowls. We expose many objects to extreme heat and cold every day and expect that these objects hold up under these stressors. By testing objects at various temperatures, scientists and engineers are able to learn how objects are effected by temperature and at what point these objects do not perform as well as we would like them to. Using the results of experiments such as this one, scientists and engineers are able to make things safer and more resistant to environmental stress.

Materials:

- A meter stick
- 5 rubber balls, all the same size
- A thermometer
- Tongs
• A refrigerator
• A freezer
• A pot to heat water in

Experimental Procedure:

1. Collect 5 rubber balls, all the same size. You will need to use five different balls because they may be permanently effected by the changes in temperature. It will help to get balls that are all different colors so you can tell them apart.
2. To test each of the balls for initial bounce height, begin by placing the thermometer on one of the balls.
3. Record the temperature.
4. Hold the meter stick vertically with one end on the ground.
5. Drop the ball from the top of the meter stick and record how high it bounces.
6. Perform steps 2-5 three times for each of the balls.
7. Average the results for each ball.
8. Place one of the balls in the refrigerator for 30 minutes.
9. Take the ball out.
10. Place the thermometer on the ball.
11. Record the temperature.
12. Hold the meter stick vertically with one end on the ground.
13. Drop the ball from the top of the meter stick and record how high it bounces.
14. Perform steps 10-13 three times.
15. Average the results.
16. Place one of the balls in the freezer for 30 minutes (you can do this while executing steps 9-14).
17. Take the ball out (make sure you use tongs!).
18. Place the thermometer on the ball.
19. Record the temperature.
20. Hold the meter stick vertically with one end on the ground.
21. Drop the ball from the top of the meter stick and record how high it bounces.
22. Perform steps 18-21 three times.
23. Average the results.
24. Fill a pot with hot water from the tap.
25. Place one of the balls in the water for 15 minutes.
26. Take the ball out (make sure to use tongs!).
27. Place the thermometer on the ball.
28. Record the temperature.
29. Hold the meter stick vertically with one end on the ground.
30. Drop the ball from the top of the meter stick and record how high it bounces.
31. Perform steps 27-30 three times.
32. Average the results.
33. Take the pot of water and bring it to a boil.
34. Place one of the balls in the water for 15 minutes.
35. Take the ball out (make sure you use tongs!).
36. Place the thermometer on the ball.
37. Record the temperature.
38. Hold the meter stick vertically with one end on the ground.
39. Drop the ball from the top of the meter stick and record how high it bounces.
40. Perform steps 36-39 three times.
41. Average the results.
42. Use the final ball as a control.
43. Place the thermometer on the ball.
44. Record the temperature.
45. Hold the meter stick vertically with one end on the ground.
46. Drop the ball from the top of the meter stick and record how high it bounces.
47. Perform steps 43-46 three times.
48. Average the results.
49. Compare the results to determine how temperature effected the height of the bounces.

**SAMPLE BOUNCE CHART**

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**Terms/Concepts:** Rubber; Stress Testing; Freezing Point; Melting Point

**References:**

http://www.selah.k12.wa.us/SOAR/sciproj2001/AndyE.html