

4. Measure 10 mL of distilled water. Pour it into the paper cup with the latex.
5. Measure 10 mL of the 5% acetic acid solution, and pour it into the paper cup with the latex and water.
6. Immediately stir the mixture with the wooden stick.
7. As you continue stirring, a polymer lump will form around the wooden stick. Pull the stick with the polymer lump from the paper cup, and immerse the lump in the 2 L beaker, bucket, or tub.
8. While wearing gloves, gently pull the lump from the wooden stick. Be sure to keep the lump immersed under the water.
9. Keep the latex rubber underwater, and use your gloved hands to mold the lump into a ball. Then, squeeze the lump several times to remove any unused chemicals. You may remove the latex rubber from the water as you roll it in your hands to smooth the ball.
10. Set aside the latex rubber ball to dry. While it is drying, proceed to step 11.
11. In a clean 25 mL graduated cylinder, measure 12 mL of sodium silicate solution, and pour it into the other paper cup.
12. In a clean 10 mL graduated cylinder, measure 3 mL of 50% ethanol. Pour the ethanol into the paper cup with the sodium silicate, and mix with the wooden stick until a solid substance is formed.
13. While wearing gloves, remove the polymer that forms and place it in the palm of one hand. Gently press it with the palms of both hands until a ball that does not crumble is formed. This step takes a little time and patience. The liquid that comes out of the ball is a combination of ethanol and water. Occasionally, moisten the ball by letting a small amount of water from a faucet run over it. When the ball no longer crumbles, you are ready to go to the next step.
14. Observe as many physical properties of the balls as possible, and record your observations in your lab notebook.
15. Drop each ball several times, and record your observations.
16. Drop one ball from a height of 1 m, and measure its bounce. Perform three trials for each ball.
17. Measure the diameter and mass of each ball.

CLEANUP AND DISPOSAL

18. Dispose of any extra solutions in the containers indicated by your teacher. Clean up your lab area. Remember to wash your hands thoroughly when your lab work is finished.



ANALYSIS AND INTERPRETATION

1. **Analyzing Information:** List at least three of your observations of the properties of the two balls.
2. **Organizing Data:** Calculate the average height of the bounce for each type of ball.
3. **Organizing Data:** Calculate the volume for each ball. Even though the balls may not be perfectly spherical, assume that they are. (Hint: The volume of a sphere is equal to $\frac{4}{3} \times \pi \times r^3$, where r is the radius of the sphere, which is one-half of the diameter.) Then, calculate the density of each ball, using your mass measurements.

CONCLUSIONS

1. **Inferring Conclusions:** Which polymer would you recommend to a toy company for making new toy balls? Explain your reasoning.
2. **Evaluating Viewpoints:** What are some other possible practical applications for each of the polymers you made?

EXTENSIONS

1. **Predicting Outcomes:** Explain why you would not be able to measure the volumes of the balls by submerging them in water.