THE WAY THE BALL BOUNCES

Everything around you has energy. You, your neighbor, the pencil you're writing with and even the desk where you're sitting has energy. That said, how does the amount of energy in an object affect how it behaves? In this lab you will explore energy transfers and how energy transfers affect bounce height of a racquetball.

QUESTION:
Does heating and cooling a racquetball affect how high the ball will bounce?

HYPOTHESIS:
In your notebook, write a hypothesis to the question above. Be sure to write your hypothesis with the appropriate "If _____, then _____, because _____" format.

MATERIALS:
Racquetball
Meter stick
Hot plate
Beaker & water
Thermometer
Tongs
Paper towels
Plastic tub for ice bath

PROCEDURE:

1. Mass the racquetball and record the mass in your notebook.

2. Fill the beaker half-way with water.

3. Using your hot plate, heat the water to 70°C. Use the thermometer to check the water temperature, but never touch the bulb of the thermometer to the glass beaker. Once the water is to temperature, remove the beaker from the heat.

4. Submerge the racquetball in the hot water for 5 full minutes. Use the tongs to keep the ball submerged.

5. Once 5-minutes has passed, use the tongs to remove the ball from the hot water and dry it quickly with a paper towel.

6. Hold a meter stick on the ground as shown in the picture.

7. Hold the ball exactly 1 meter above the ground. This is the ball's starting height.

8. Drop the ball and measure the height to which the ball bounces. Record this data in a data table.

Trial #	Hot ball's bounce height (cm)	Cold ball's bounce height (cm)
1		
2		
3		

9. Quickly repeat steps 5-7 two more times. If the ball begins to cool off so it no longer feels hot, use tongs to immerse it for a few minutes in the 70°C water.

10. After all the hot measurements are made, cool the ball and repeat the experiment: submerge the ball in an ice bath for 5 full minutes turning it often with tongs so that it cools evenly.

11. Remove the ball from the ice, dry it quickly. Measure the bounce height as before 3 times. Record your data. If the ball starts to feel warm between drops, let it cool in the ice bath a few minutes before continuing.

ANALYSIS:
Record all calculations and conversions in your notebook.

1. Calculate the average bounce height for the hot racquetball and the cold racquetball.

2. Calculate the potential energy of the warm racquetball relative to the bounce surface (use average bounce height). Show all of your work.

3. Calculate the potential energy of the cold racquetball relative to the bounce surface (use average bounce height). Show all of your work.

4. Draw a graph comparing the potential energy of a hot racquetball to a cold racquetball. Remember, the manipulated variable is on the x-axis and the responding variable is on the y-axis. Include a title and label the axes.

5. Compare the differences in potential energy for both temperatures of racquetballs. Include data/calculations in your discussion as well as energy transfer.

6. Discuss any sources of error in the investigation.

7. Discuss the reliability of the investigation (i.e. how do you know your data was accurate).

8. If you were to let the ball reach room temperature, how would the bounce height be affected? Use your data and observations to make a scientific estimate with explanation.

CONCLUSION:
Answer the following questions in complete sentences in your notebook.

1. In your notebook, answer the original question: *Does heating and cooling a racquetball affect how high the ball will bounce?* Explain <u>why</u> using supporting data. Include your interpretation of potential energy and energy transfer.

2. Did the data support or refute your hypothesis? Use supporting data in your answer.