Charles's Law Lab

Beginning Question:
How does temperature affect the size (volume) of a balloon?

Procedure

1. Fill a large beaker with ice and wet the ice to make it slippery. (add water)
2. Set up ring stand set-up, including burner. Add water to the 250 or 400-mL beaker and heat it to boiling.
3. Measure the temperature of the room in degrees Celsius and record it on the data table on the next page.
4. Blow up the balloon, leaving room for expansion, and tie it closed.
5. Measure around the largest part (circumference) of the balloon. Mark the balloon with the permanent marker, indicating the place of measurement. Record the measurement.
6. Submerge the balloon in the ice bath. Try to cover the balloon completely with ice. Wait several minutes and measure the temperature of the submerged balloon. Remove the balloon and measure it at the marked location as quickly as possible. Record the measurement and the temperature.
7. With the tongs, hold the balloon in the steam over the boiling water, being careful not to touch the balloon to the tripod or other hot objects.

DATA:

	Ice	Room	Steam
Temperature (oC)			
Temperature (K)			
Circumference (cm)			
Volume (cm3)			

Calculations

Calculate the volume of your balloon. First calculate the radius of your balloon from its circumference, the substitute this value of the radius in the formula for the volume of a sphere ($V= 4/3\Pi r^3$). Record the volumes in the data table.

Graph

1. On a separate sheet of graph paper, make a graph of your circumference versus temperature data.
2. On a separate sheet of graph paper, draw a graph of volume versus Kelvin temperature

Discussion

1. What can you conclude about the relationship between the volume and temperature of a fixed amount of gas at constant temperature?
2. How did the circumference of the balloon change as the temperature was increased?

3. How is the circumference of a balloon related to its temperature?

(Extra Credit) 4. On Your own: Confirm the validity of Charles's Law by comparing the size of a helium balloon at room temperature with its size in the freezer compartment of your refrigerator.

Conclusion: