Experiment 8 Measuring Pressure

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We lightly inflated some freezer bags and measured its approximate area using a ruler. We then placed a device with the phyphox app inside to measure the pressure change as we added stacks of 8 nickels onto the bag. The approximate values for both the gallon and pint freezer bags fell within the average range we calculated from the measured pressure changes.

Results

Compare the average value of the gallon size freezer bag area with the approximate area value from part 1 part A. Compare the average value of the quart size freezer bag with the approximate area value from part 2 part A.

Gallon: the approximate value was 0.0371 while the average value was 0.0331. This was a difference of 0.004, which falls well within the calculated uncertainty.

Pint: the approximate value was 0.0207 while the average value was 0.0188. This was a difference of 0.0019, which falls well within the calculated uncertainty.

Questions for Discussion

1. It is difficult to get a precise measurement of the length and width of the area of the freezer bag to which the forces are being applied. Determine a reasonable amount of uncertainty in measuring the length, and a reasonable amount of uncertainty in measuring the width, describing why you chose these amounts. Then, determine both the area and the uncertainty in the area. Show all work.

0.01m uncertainty. This is because it is very difficult to measure the lengths and widths, so it would be reasonable to have a much larger uncertainty than normal.

Gallon  
 Area:0.195\*0.190=0.0371  
 Uncertainty:0.0371\*sqrt((0.01/0.195)2+(0.01/0.19)2)=0.0027  
Pint  
 Area:0.132\*0.152=0.0207  
 Uncertainty: 0.0207\*sqrt((0.01/0.132)2+(0.01/0.157)2)=0.00205

1. The U.S. Mint declares that the mass of a newly minted nickel is equal to a value of 5.000 grams. All of the digits in this number are significant. Using the information from the Uncertainty Analysis Instructions file, determine the total uncertainty in the weight (in Newtons) of 40 nickels. Is this uncertainty large enough to be used as an error bar for the graph? Looking at the scaling of the graph may be helpful in answering this question.

Sqrt(40\*0.0012)=0.006, this is negligible relative to the scales used in the graph

1. In this experiment the same weights are used to generate the pressures in both the gallon size freezer bag, and in the quart size freezer bag. Are there any differences between these two bags and the pressures generated? If so, why did this occur?

The pressures on for the quart sized bag were greater. This is because the force is being applied to a smaller area.

1. If you place the cell phone into the gallon size bag, and placed cardboard on top of the bag, then placed the quart size bag on top of the cardboard, with another cardboard on top of the quart size bag, would you get a different slope value for the gallon size bag when adding the same weights on top of this combination? If so, by how much would the slope change? If not, explain why not.

The slope should not change as all the pressure values would shift up accordingly keeping the change in force over the change in pressure the same.