***Name*_____**

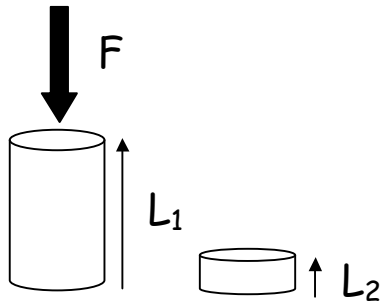
How Much Stress Can an Aluminum Can Take?

Young's Modulus for any solid stretched or compressed from its orignal is defined as:

$$Y = \frac{stress}{strain} \quad \text{or} \quad \frac{F/A}{\Delta L/L}$$

Since different materials handle stress differently, the Young's Modulus varies widely from material to material. The purpose of this experiment is to determine the stress that will cause an aluminum can to crumble under foot.

Take three aluminum cans and measure their length and diameter (radius). Then crush them and measure their new length. Using the accepted value for the Young's modulus of aluminum find the stress on the can. Finally, solve for the cross-sectional area of the can and using the value for stress come up with the force exerted.



L_1 (m)	L_2 (m)	ΔL (m)	r (m)	Area (m^2)	Stress (N/m^2)	Force (N)

Table 1: Data for calculation of force on an aluminum can

Young's Modulus for Aluminum _____

Sample Calculations:

A New Way to Understand ΔP with Depth

Interpretation of the Terms in the ΔP Equation

The equations below describe the difference in pressure between two points in a fluid. Before answering the questions that follow, make sure you understand what each variable represents. Attach a separate sheet with the answers.

$$\Delta P_{1\ to\ 2} + \rho_{liq} g \Delta y_{1\ to\ 2} = 0 \qquad or \qquad P_2 - P_1 + \rho_{liq} g (y_2 - y_1) = 0$$

1) What do the terms $\Delta P_{1\ to\ 2}$ and $\rho_{liq} g \Delta y_{1\ to\ 2}$ represent?
2) How is the "Δ" interpreted in this fluid energy equation. How does this interpretation differ from that used before?
3) How does the different interpretation of "Δ" change the meaning of energy conservation in fluids?

Using Bernoulli's Equation to Explain Pressure in a Straw

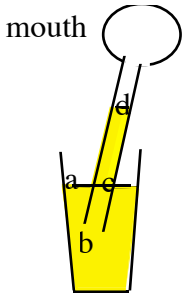
Observe

Observe one of your group members drinking a liquid through a straw. Think about and discuss the following questions.

As water comes up the straw, has the person increased or decreased the pressure in his/her mouth?

Is the pressure just below the surface of the water outside the straw greater than, less than, or equal to atmospheric pressure?

If the person holds the liquid at a certain height in the straw, is the pressure in the air above this liquid greater than, less than, or equal to atmospheric pressure?



Analyze

Use bernoulli's equation to explain whether the pressures at the points (b), (c), and (d) are greater than or less than atmospheric pressure. Note that point (a) is at atmospheric pressure, P_{atm}. Put your answers on a separate sheet.