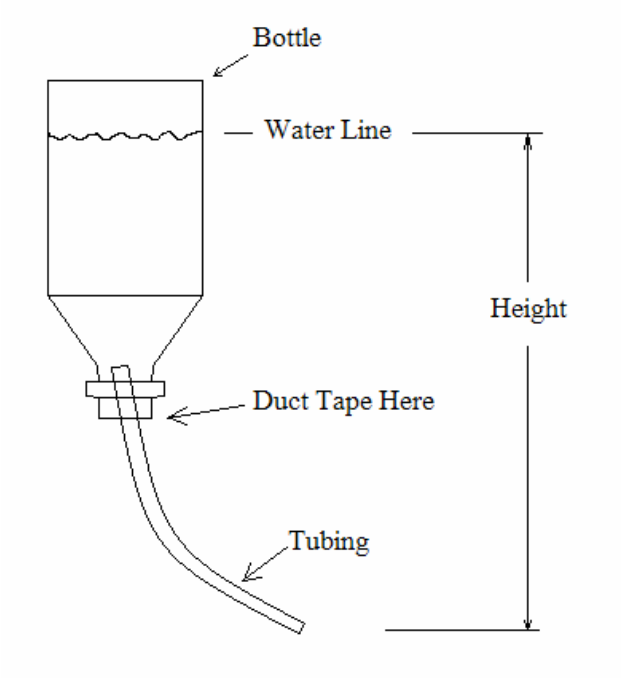
Name(s): _____ Date: _____

Too Much Pressure!

Today, we are going to be engineers that are trying to figure out the best design for a faucet.

Part 1 Setup

1. Assemble the Pressure testing device in the following manner.
    - Cut bottom end off of bottle.
    - Insert plastic tubing about one inch into the top of each bottle.
    - Wrap Duct tape around the tube and bottle top in order to form a watertight seal.



2. Hold your thumb over the end of the tube.
3. Pour some water in the bottle.
4. Hold the bottle two feet above the end of the tube (where you thumb is).

Part 2 Experiment

1. Slowly lift your thumb off of the tube, making sure to let the water flow into the catch basin provided. Without moving the tube, raise the bottle.

    Does the pressure of the water (**increase** or **decrease**) when you raise the bottle?

    Does the pressure (**increase** or **decrease**) when you lower the bottle?

2. Hold the end of the tube and the water line at the same height and remove your thumb from the tube. What happens to the water? Why does this happen?

The water should not move because there is no difference in height (hydrostatic pressure gradient) to move the water along.

Part 3 Measurement

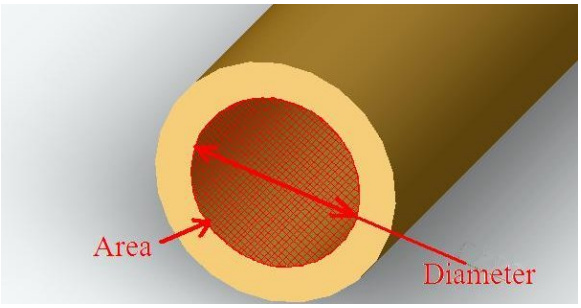


Image 2
ADA Description: Graphic of a tube showing the inside diameter and corresponding area.
Caption: none
Image File Path: H:\Spring 2004\GEEN4830\Public\New Lesson Plans\Chris\tub cross sectional area.JPG
Source/Rights: Chris Sheridan

3. What do you predict will happen if the diameter of the tube is bigger?

Answers will vary.

1. Measure the diameter of the inside of each tube and record in the table below. Don't forget to record the units. (inches, centimeters, or millimeters).

	Diameter (D)	Area (A)
Small Tube		
Medium Tube		
Big Tube		

2. The area of the tube is equal to the diameter squared, multiplied by 3.14 then divided by 4. Calculate the area and record in the table.

Area= D x D x 3.14 ÷4

3. Repeat the experiment with the different tubes.

   How is the force from your thumb related to the area of the tube? (Hint: Which tube requires more force from you thumb to hold back the water?)

The force of your thumb is directly proportional to the area of the tube opening, until your thumb completely closes off the end and the area equals zero. And then per the equation, when the area equals zero, the flow stops. The student may write that the smaller the area of the tube opening, the more force they need to apply with their thumb to keep the water from flowing.

Part 4 Engineering Design

1. Looking at your table in Part 3, which bottle and tube will you use to design a faucet? Why?

Answers will vary.

2. If the bottle is your water tank and the tube if the pipe into your sink, how would you want the tank and pipe positioned to let water flow into your faucet?

Answers will vary.

3. Using the provided materials, create a design to let the water flow in and out of your water tank (bottle) and pipe (tube).

   Draw a picture of your design here: