

Name \_\_\_\_\_

Fluid Mechanics Laboratory

<http://phet.colorado.edu/en/simulation/fluid-pressure-and-flow>

1. Determine the absolute pressure two meters underneath a  $1200 \text{ kg/m}^3$  density fluid under normal earth gravity and atmosphere. Use atmospheric pressure of 101 kPa. Show your work below, then use the simulation (under the "Pressure" tab) to get an experimental value. Calculate experimental error.

- a. Calculated Pressure (Theoretical) \_\_\_\_\_
- b. Simulated Pressure (Experimental) \_\_\_\_\_
- c. Experimental Error \_\_\_\_\_

2. A fluid of density  $1200 \text{ kg/m}^3$  flows out through a 2 meter diameter pipe without friction at a rate of 3000 L/s. Find the velocity of the fluid as it flows out of the pipe, and the velocity of the fluid if the pipe constricts to a diameter of 1 meter. Then calculate the change in pressure (in the middle of the pipe) between the 2 meter and 1 meter diameter. Using the simulation (under the "Flow" tab) determine experimental values for each of these velocities/change in pressures and calculate experimental error. Show your work.

- a. Calculated initial velocity \_\_\_\_\_
- b. Experimental initial velocity \_\_\_\_\_
- c. Experimental Error \_\_\_\_\_
- d. Calculated final velocity \_\_\_\_\_
- e. Experimental final velocity \_\_\_\_\_
- f. Experimental Error \_\_\_\_\_
- g. Calculated change in pressure \_\_\_\_\_
- h. Experimental change in pressure \_\_\_\_\_
- i. Experimental Error \_\_\_\_\_

3. A 10 meter tall tank open to the air is filled with a fluid with a density of  $1200 \text{ kg/m}^3$ . It is located with its bottom 10 meters off the ground. When a hole is open at the bottom, fluid sprays out with an initial horizontal velocity. Determine how far (initially) the fluid sprays horizontally before it touches the ground. Find an experimental value for this experiment using the "Water Tower" tab and determine an experimental error. Show your work below.

- a. Calculated horizontal range \_\_\_\_\_
  - b. Experimental horizontal range \_\_\_\_\_
  - c. Experimental error for the range \_\_\_\_\_
4. Using the three experiments above as models, write out your own question to solve for below. You do not need to solve it, but it should be solvable.