## Science 122 Formative/Summative – Hydrodynamics (2014)

Name - \_\_\_\_\_ Date - \_\_\_\_\_

Problems (Value - 30)

Do these problems on your own paper. Show your work.

- Ann uses a hose to water her garden. The water enters the hose through a faucet with a 6.0-cm diameter. The speed of the water at the faucet is 5 m/s. If the faucet and the nozzle are at the same height, and the water leaves the nozzle with a speed of 20 m/s, what is the diameter of the nozzle? (7)
- 2. Jill went to her outside faucet to fill a 0.035-m<sup>3</sup> bucket with water to wash her potbellied pig, Petunia. Water exits the faucet with a speed of 0.74 m/s. The radius of the faucet is 0.0075 m.
  - a) How long, in minutes, does it take to fill the bucket completely? (5)
  - b) What is the mass flow rate of the water? (2)
- 3. A large tank open to the atmosphere at the top is filled with water to a depth of 15 m. A spout located 10 m above the bottom of the tank is opened. With what speed will water emerge from the spout? (6)



- 4. The drawing shows a fluid flowing at speed  $v_2$  through a horizontal section of pipe whose radius is
  - $r_2 = 0.246$  m. The fluid has a density of  $\rho = 3.25$  kg/m<sup>3</sup>. A Venturi meter that has a radius of  $r_1 = 0.0820$  m has been substituted for a section of the larger pipe. The pressure difference
  - $_1 = 0.0820$  m has been substituted for a section of the larger pipe. The pressure difference between the two sections is  $P_2 - P_1 = 160$  Pa.
    - a) Find the speed  $v_2$  of the fluid in the larger original pipe. (8)
    - b) Find the volume flow rate Q of the fluid. (2)

