1. $P_o$ is atmospheric pressure, so
   
   \[ P = P_o + \rho gh = 1 \times 10^5 \text{ Pa} + (1000 \text{ kg/m}^3)(10 \text{ m/s}^2)(50 \text{ m}) \]
   
   \[ = 1 \times 10^5 + 5 \times 10^5 = 6 \times 10^5 \text{ Pa} \]

2. The buoyant force is the weight of displaced water,
   \[ F_B = 10 \text{ N/liter} \times 2 \text{ liter} = 30 \text{ N} \]
   The scale reads the difference between the weight of the object and the buoyant force, $F_S + F_B = W$, so, $F_S = W - F_B$
   
   \[ \text{or } F_S = 50 \text{ N} - 30 \text{ N} = 20 \text{ N}. \]

3. The balance of forces requires that $F_B = T + W$. The buoyant force is the weight of displaced water:
   \[ F_B = 10 \text{ N/liter} \times \text{volume of displaced water} \]
   \[ = 10 \text{ N/liter} \times \frac{1}{4} (1000) \text{ liter} = 10 \text{N/liter} \times 250 \text{ liters} \]
   \[ = 2500 \text{ N} \]
   
   so, $T = F_B - W = 2500 \text{ N} - 1000 \text{ N} = 1500 \text{ N}$

4. The volume flow rate $Q = v A$. The continuity principle requires that $Q_1 = Q_2$, so that
   \[ v_1 A_1 = v_2 A_2 \rightarrow v_2 = v_1 \left( \frac{A_1}{A_2} \right). \]
   Now $A = \pi \left( \frac{d}{2} \right)^2$, so that $A_1/A_2 = \left( \frac{d_1}{d_2} \right)^2$.
   \[ \rightarrow v_2 = (0.5 \text{ cm/s}) \left( \frac{0.5 \text{ cm}}{0.01 \text{ cm}} \right)^2 = 0.5 \text{ cm/s} \left( 50 \right)^2 = 1250 \text{ cm/s}. \]

5. Again, the principle of continuity requires $Q_1 = Q_2$, so $Q_2 = 50 \text{ m}^3/\text{s}$. The mass flow rate is $\rho Q_2 = 2000 \text{ kg/m}^3 \times 50 \text{ m}^3/\text{s} = 1 \times 10^5 \text{ kg/s}$. 
