

56. We use the result of part (a) in the previous problem.

(a) In this case, we have $\Delta p = p_1 = 2.0 \text{ atm}$. Consequently,

$$v = \sqrt{\frac{2\Delta p}{\rho((A/a)^2 - 1)}} = \sqrt{\frac{4(1.01 \times 10^5 \text{ Pa})}{(1000 \text{ kg/m}^3)((5a/a)^2 - 1)}} = 4.1 \text{ m/s} .$$

(b) And the equation of continuity yields $V = (A/a)v = (5a/a)v = 5v = 21 \text{ m/s}$.

(c) The flow rate is given by

$$Av = \frac{\pi}{4} (5.0 \times 10^{-4} \text{ m}^2) (4.1 \text{ m/s}) = 8.0 \times 10^{-3} \text{ m}^3/\text{s} .$$