

PHYS 109: Suggested problems

CHAPTER 2

12.1. What is the net upward force on an airplane wing of area $A=20.0 \text{ m}^2$ if air streams at $3.03 \times 10^2 \text{ m/s}$ across its top and at $2.83 \times 10^2 \text{ m/s}$ past the bottom? Note that this airplane moves at subsonic speed, which is less than the speed of sound (called Mach 1, about $3.33 \times 10^2 \text{ m/s}$).

12.3. A large water-containing tank is open to air. It has a small hole 16 m below the water surface through which water leaks at a rate of 2.5 L/min. Determine (a) the speed of the water that is ejected from the hole, and (b) the diameter of the hole.

12.4. An ideal dynamic fluid flows through a tapering tube. Upstream, the tube has a cross-sectional area of 10.0 cm^2 ; the fluid pressure is 120 kPa, its density is $\rho = 1.65 \text{ g/cm}^3$, and the flow speed is 2.75 m/s. In the downstream section, the cross-sectional area is 2.5 cm^2 . Calculate in the downstream section (a) the fluid density, (b) the fluid flow speed, and (c) the fluid pressure.

12.12. Water is pumped into a storage tank from a well delivering 140 L/min through a pipe of 6.0 cm^2 cross-sectional area. What is the average velocity of the water in the pipe as it is pumped from the well?

12.15. The hypodermic syringe in Fig. 12.34 contains water. The barrel of the syringe has a cross-sectional area $A_1 = 30 \text{ mm}^2$. The pressure is 1.0 atm everywhere while no force is exerted on the plunger. When a force of F_S magnitude 2.0 N is exerted on the plunger, the water squirts from the needle. Determine the water's flow speed through the needle, v_2 . Assume that the pressure in the needle remains at a value of $p_2 = 1.0 \text{ atm}$, and that the syringe is held horizontal. The final speed of the water in the barrel is negligible.

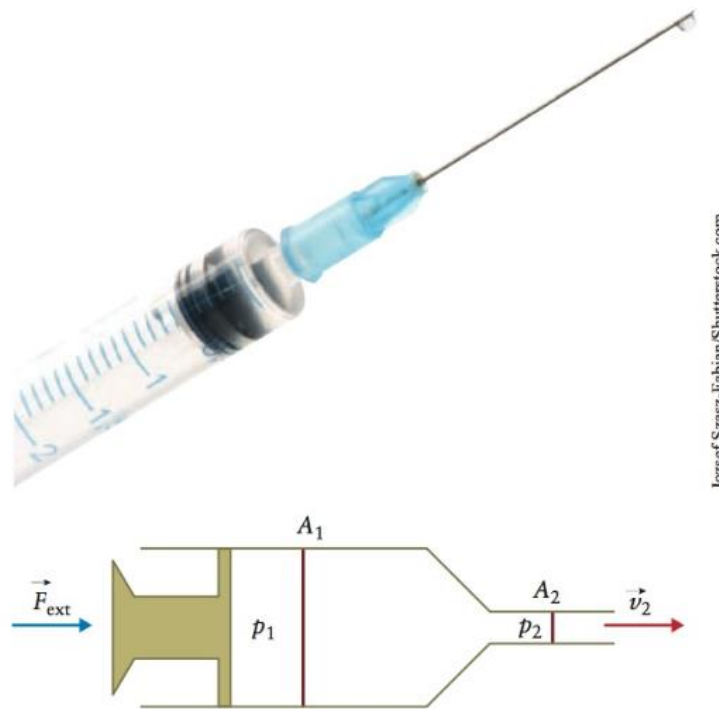


Figure 12.34