Bernoulli's Principle

1. A 17-cm-radius air duct is used to replenish the air of a nest 9.2 m x 5.0 m x 4.5 m every 10 min. How fast does the air flow in the duct?

2. A 5/8-inch diameter garden hose is used to fill a round swimming pool 7.2 m in diameter. How long will it take to fill the pool to a depth of 1.5m if water issues from the hose at a speed of 0.28 m/s?

3. What gauge pressure in the water mains is necessary if a fire hose is to spray water to a height of 12.0 m? h = 12.0m.

4. What is the lift (in newtons) due to Bernoulli's principle on a wing of a duck of area 80m^2 if the air passes over the top and bottom surfaces at speeds of 340m/s and 290m/s, respectively?

5. Water at a pressure of 3.8 atm at street level flows into an office building at a speed of 0.60m/s through a pipe 5.0cm in diameter. The pipes taper down to 2.6cm in diameter by the top floor, 20m above. Calculate the flow velocity and the pressure in such a pipe on the top floor. Ignore viscosity. Pressures are gauge pressures.

6. 6. Intravenous infusions are often made under gravity. Assuming the fluid has a density of 1.00 g/cm^3, at what height h should the bottle be placed so the liquid pressure is a) 65 mm-hg, b) 550 mm-H 2 O? c) If the blood pressure is 18 mm-Hg above atmospheric pressure, how high should the bottle be placed so that the fluid just barely enters the vein?

7. A 2.4-N force is applied to the plunger of a hypodermic needle. If the diameter of the plunger is 1.3 cm and that of the needle 0.20 mm, a) with what force does the fluid leave the needle? b) What force on the plunger would be needed to push fluid into a vein where the gauge pressure is 18 mm-Hg? Answer for the instant just before the fluid starts to move.

8. When you drive up into the mountains, or descend rapidly from the mountains, your ears pop, which means that the pressure behind the eardrum is being equalized to that outside. If this did not happen, what would be the approximate force on an eardrum of area 0.50 cm^2 if a change in altitude of 1000m takes place?

9. Suppose a person can reduce the pressure in the lungs to -80 mm-Hg gauge pressure. How high can water then be sucked up a straw?

10. How high should the pressure head be if water is to come from a faucet at a speed of 7.2 m/s? Ignore viscosity.

11. A ship, carrying freshwater to a desert island in the Caribbean , has a horizontal cross-sectional area of 2650 m^2 at the waterline. When unloaded, the ship rises 8.50 m higher in the sea. How much water was delivered?