Mechanics 2, exercises week 7, NWI-MOL160

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Question 1: Thirsty Giraffe

A giraffe is 5.0 m tall, with its heart at approximately half that height.

1a. What pressure does the heart need to produce in order to keep blood owing to the brain?

1b. How does this pressure change when the giraffe lowers its head to drink from a pool?

1c. Does this explain why giraffes spread out their front legs when they drink?

Question 2: Floating aluminium

A spherical aluminium ball of mass 1.27 kg contains an empty spherical cavity concentric with the ball. The ball barely floats in water. The density of aluminium is 2700 kg/m^3.

2a. What is the outer radius of the ball?

2b. What is the radius of the inner cavity?

Question 3: Garden Hose

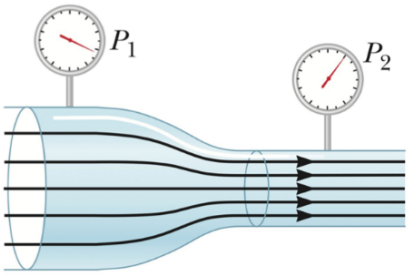
Water flowing through a garden hose of diameter 2.74 cm fills a 25-liter bucket in 1.50 min.

3a. What is the speed of the water leaving the end of the hose ?

3b. A nozzle is now attached to the end of the hose. If the nozzle diameter is one-third the diameter of the hose, what is the speed of the water leaving the nozzle?

Question 4: Venturi Tube

The so-called Venturi tube may be used as a fluid flowmeter. Suppose the device is used at a service station to measure the flow rate of gasoline ($\rho = 7.00 \cdot 10^2$ kg/m^3) through a hose having an outlet radius of 1.20 cm. The difference in pressure is measured to be $P_1 - P_2 = 1.20$ kPa and the radius of the inlet tube to the meter is 2.40 cm



4a. What is the speed of the gasoline as it leaves the hose?

4b. What is fluid flow rate in cubic meters per second?