

This print-out should have 12 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

Lake Bottom Pressure

001 10.0 points

Determine the absolute pressure at the bottom of a lake that is 35.8 m deep. The acceleration of gravity is 9.8 m/s^2 and atmospheric pressure is $1.01 \times 10^5 \text{ Pa}$.

Blood Pressure

002 10.0 points

Blood of density 897 kg/m^3 that is to be administered to a patient is raised about 0.448 m higher than the level of the patient's arm.

How much greater is the pressure of the blood than it would be if the container were at the same level as the arm? The acceleration of gravity is 9.8 m/s^2 .

Ocean Pressure

003 (part 1 of 2) 10.0 points

Calculate the pressure at an ocean depth of 1510 m. The acceleration of gravity is 9.8 m/s^2 , atmospheric pressure is $1.01 \times 10^5 \text{ Pa}$, and the density of the sea water is 1024 kg/m^3 .

004 (part 2 of 2) 10.0 points

Calculate the total force exerted on the outside of a circular submarine window of diameter 32.1 cm at this depth.

Blowing Wind

005 (part 1 of 2) 10.0 points

If wind blows at 36.9 m/s over the roof of your house, what is the pressure difference at the roof between the inside and outside air? Use an air density of 1.29 kg/m^3 .

006 (part 2 of 2) 10.0 points

What net force does this pressure difference produce on a roof having an area of 96 m^2 ?

Car Lift

007 (part 1 of 2) 10.0 points

In a car lift used in a service station, compressed air exerts a force on a small piston of circular cross-section having a radius of 3.1 cm. This pressure is transmitted by a liquid to a second piston of radius 21.4 cm.

What force must the compressed air exert in order to lift a car weighing 11800 N?

Correct answer: 247.616 N.

008 (part 2 of 2) 10.0 points

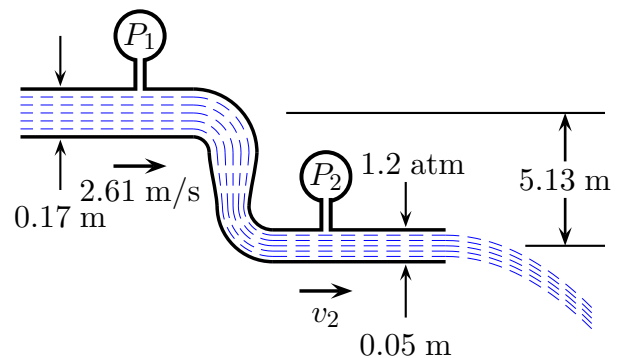
What air pressure will produce this force?

Correct answer: 82017.1 Pa.

Constricted Pipe 03

009 (part 1 of 2) 10.0 points

A liquid of density 1117 kg/m^3 flows with speed 2.61 m/s into a pipe of diameter 0.17 m. The diameter of the pipe decreases to 0.05 m at its exit end. The exit end of the pipe is 5.13 m lower than the entrance of the pipe, and the pressure at the exit of the pipe is 1.2 atm.



What is the velocity v_2 of the liquid flowing out of the exit end of the pipe? Assume the viscosity of the fluid is negligible and the fluid

is incompressible. The acceleration of gravity is 9.8 m/s^2 and $P_{atm} = 1.013 \times 10^5 \text{ Pa}$.

Correct answer: 30.1716 m/s .

010 (part 2 of 2) 10.0 points

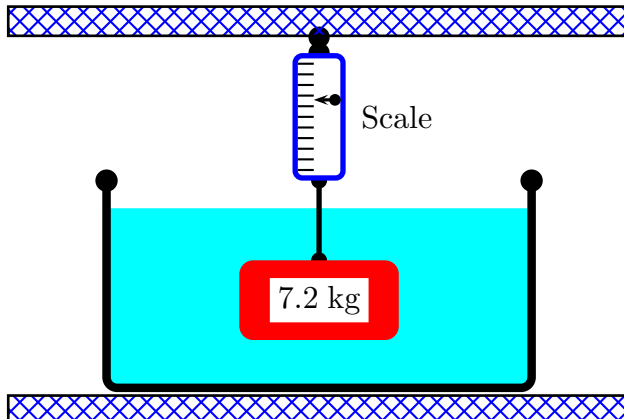
Applying Bernoulli's principle, what is the pressure P_1 at the entrance end of the pipe?

Correct answer: $5.70016 \times 10^5 \text{ Pa}$.

Total Immersion

011 10.0 points

A block of mass 7.2 kg is completely immersed in a liquid of density 1100 kg/m^3 . The block is suspended by a thin wire, which experiences a tension of 24.5 N .



What is the volume of the submerged block? The acceleration of gravity is 9.8 m/s^2 .

Correct answer: 0.00427273 m^3 .

Air in a Tornado

012 10.0 points

Air within the funnel of a large tornado may have a pressure of only 0.19 atm .

What is the approximate outward force F on a $8.5 \text{ m} \times 15 \text{ m}$ wall if a tornado suddenly envelopes the house? Atmospheric pressure is $1.013 \times 10^5 \text{ Pa}$.

<- F is the net outward force

Correct answer: $1.04618 \times 10^7 \text{ N}$.