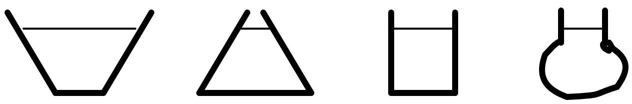
9-1A. A weight of 20 N is hung on the end of a Cu wire of length L = 0.60 m and diameter d = 1.0 mm. If Y(Cu) = 1.1×10^{11} Pa, by about how many mm does the Cu wire stretch?
(a) 1.5 (b) 0.15 (c) 0.015 (d) 0.0015 (e) 0.00015

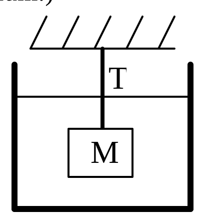
9-2A. A woman weighing 600 N stands so that 80% of her weight is on a single 'spike heel' of area 1 cm^2. About what pressure in Atm does this heel then exert on the floor? (1 Atm = 10^5 Pa).
(a) 4.8×10^{-3} (b) 0.48 (c) 48 (d) 4800 (e) 480,000

9-3A. The vessels below all contain water of the same depth. In which vessel is the pressure at the bottom of the water largest?

(a) (b) (c) (d) (e) All four pressures are the same.



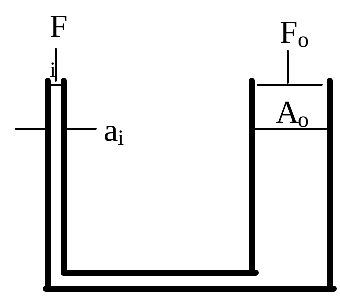
9-4A. Pure water has a density of 1×10^3 kg/m^3 At about what distance below the surface of a still pool of water would the total pressure (including the atmosphere) equal twice the atmospheric pressure at the top of the pool? Note #1: 1 Atm. = 10^5 Pa. (Note #2: The atmosphere could also support the same height of a column of water against a vacuum.)
(a) 10 m (b) 1 m (c) 100 m (d) 0.1 m (e) None of these is close.



9-5A. In the figure at the right, a block of mass 200 kg and volume 0.1 m^3 is at equilibrium while completely submerged under water and supported by a string. What is the tension T in the string? (Note: the density of water is 1 gm/cm^3).
(a) 2000 N (b) 3000 N (c) 1000 N (d) zero (e) None of these.

9-6A. A cubic block, 10 cm on a side, and having mass M = 1 kg, floats 50% submerged in a liquid. About what is the density of the liquid in 10^3 kg/m^3?
(a) 1 (b) 4 (c) 3 (d) 0.5 (e) 2

9-7A. The density of ice is 920 kg/m^3, and that of seawater is 1030 kg/m^3. About what fraction of the volume of an iceberg is above water?
(a) 11% (b) 89% (c) 6% (d) 94% (e) None of these is close.



9-8A In the figure at the right, a force F_i = 10 N is exerted on the piston that pushes down on the fluid in the pipe of area a_i = 0.01 m^2. If the system is in equilibrium, what is the force F_o on the piston in the pipe of area A_o = 1 m^2?
(a) 10 N (b) 1 N (c) 100 N (d) 1000 N (e) 0.1 N

9-9A. Which one of the following statements is WRONG?
(a) Pressure is a scalar.
(b) The units of density are kg/m^2.
(c) A fluid is a substance that can flow.
(d) Archimides' principle works because the forces that an incompressible fluid exerts on a body inside (or floating on) itself are the same as it would exert on an identical volume and shape of the fluid itself.
(e) The units of pressure are kg/(m•s^2).

9-10A. Which one of the following statements is WRONG?
(a) Because of Bernouilli's principle, other things being equal, a discus can be thrown farther into the wind than with the wind.
(b) Gases are compressible fluids, that is, their volume changes as the pressure on them changes.
(c) A balloon at the earth's surface weighs less when it is empty than when it is filled with air at a pressure of one atmosphere.
(d) The equation of continuity is basically just an equation describing conservation of mass.
(e) Liquids are almost incompressible, that is, their shape adjusts to fit their containers, but their volumes stay closely constant.

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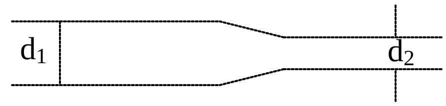
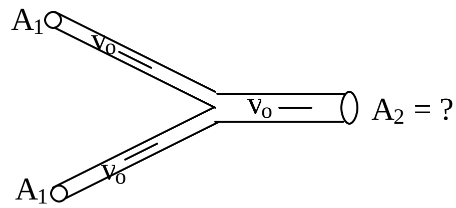
9-11A. A fluid flows with a speed 20 m/s through a circular tube of diam d_1 = 2 m and enters a second tube of diam. d_2 = 1 m as shown at the right. If the flow is smooth and frictionless in both tubes, what is the speed of the fluid in the second tube?



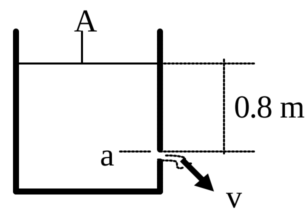
(a) 80 m/s (b) 10 m/s (c) 20 m/s (d) 40 m/s (e) 5 m/s

9-12A. Two identical horizontal pipes, having equal areas A_1 = 1 m^2, carry water flowing with speed v = 2 m/s. These two water flows enter, without loss and without turbulance, a third pipe in which the water speed is still v = 2 m/s. What is the area A_2 of the third pipe?



(a) 0.5 m^2 (b) 4 m^2 (c) 1 m^2 (d) 2 m^2 (e) 0.25 m^2

9-13A. Water is flowing from a hole of area a = 0.1 m^2 that is located 0.8 m below the water level in a large open vessel that has an area A = 10 m^2. About what is the velocity v of the water coming out of the hole?



(a) 4 m/s (b) 2 m/s (c) 10 m/s (d) 0.1 m/s (e) 0.9 m/s

9-14A. Which one of the following statements is WRONG?

(a) Pushing down a rubber suction cup, pushes most of the air out from under the cup, thereby producing a partial vacuum, after which the cup is held fixed by the pressure of the outside air.

(b) A cork floats in water to a certain depth on earth. If the system were inside a space station on the moon, where the air pressure was the same as on earth, the cork would float higher in the water, because of the lower force of gravity on the moon.

(c) Bernouilli's equation is basically just a statement that the work done by pressures is equal to the change in the sum of the kinetic energy of the fluid plus its potential energy due to gravity.

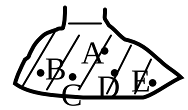
(d) Pascal's principle says that a pressure applied to an enclosed fluid is transmitted undiminished to every point within the fluid, and to the walls of the containing vessel.

(e) The derivation of Bernouilli's principle neglects viscous (frictional) forces in the fluid.

9-1B. About what weight in N would have to be hung on the end of a Cu wire of length L = 1.1 m and diameter d = 0.5 mm to stretch the wire by 0.1 mm? Take Y(Cu) = $1.1\text{x}10^{11}$ Pa.
(a) 2 x 10^4 (b) 2 (c) 2 x 10^2 (d) 2 x 10^8 (e) 2 x 10^6

9-2B. A man weighing 1000 N lies on a bed of 500 nails, each with a 'point' of area 1 mm^2. About what is the total pressure in Atm from the nails on the man's back? (1 atm = 10^5Pa).
(a) 20 (b) 2 (c) 200 (d) 2000 (e) 20,000

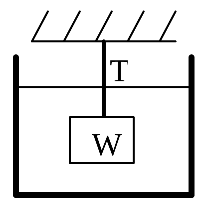
9-3B. In the picture at the right, at which one of the labelled points within the liquid should the pressure be largest?



(a) A (b) B (c) C (d) D (e) E

9-4B. Take the distance from the feet to the heart to be about 1.20 m, and the density of blood to be 1.06 x 10^3 kg/m^3. The difference in blood pressure between the heart and the feet should be about: (Note: For comparison, 1 Atm = 10^5 Pa).
(a) 1270 Pa (b) 1.06 x 10^3 Pa (c) 1.27 x 10^4 Pa (d) 1.06 x 10^5 Pa (e) None of these is close.

9-5B A large rock is submerged under pure water of mass density ρ(water) = 10^3 kg/m^3. The volume of water displaced by the rock is 10^{-3} m^3. The tension in the string holding the rock is T = 3 N. What is the weight of the rock in air?

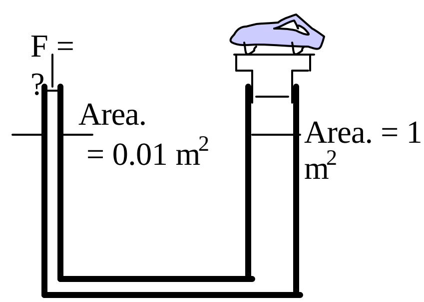


(a) 3 N (b) 4 N (c) 7 N (d) 13 N (e) 2 N

9-6B. A cubic block, 10 cm on a side, and having mass M = 1.0 kg, floats 25% submerged in a liquid. About what is the density of the liquid in 10^3 kg/m^3?
(a) 1 (b) 2 (c) 3 (d) 0.5 (e) 4

9-7B. Take the average density of a person who has filled her lungs with air to be about 900 kg/m^3. About what fraction of her volume should be above water if she is floating in a swimming pool filled with fresh water (density = 1000 kg/m^3?
(a) 20% (b) 10% (c) 5 % (d) 90% (e) None of these is close.

9-8B. A car weighing 1000 N is sitting on a hydraulic lift tube of area 1 m^2 as shown at the right. With how much force would you have to push down on the connected tube of area 0.01 m^2 to hold the car in equilibrium?



(a) 1000 N (b) 100 N (c) 10 N (d) 1 N (e) 0.1 N

9-9B. Which one of the following statements is WRONG?
(a) Pressure is a vector.
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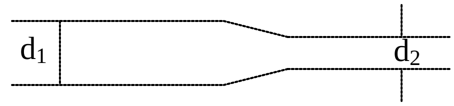
(c) Gases are compressible fluids, that is, their volume changes as the pressure on them changes.
(d) The equation of continuity is basically just an equation describing conservation of energy.
(e) Liquids are almost incompressible, that is, their shapes adjust to fit their containers, but their volumes stay essentially constant.

9-11B. A fluid flows with a speed 10 m/s through a circular tube of diam. d_1 = 3 m and enters a second tube of diam. d_2 = 2 m as shown at the right. If the flow is smooth and frictionless in both tubes, about what is the speed of the fluid in the second tube?

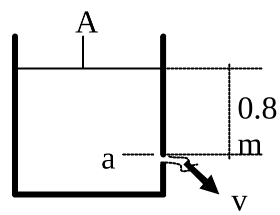


(a) 4.4 m/s (b) 15 m/s (c) 23 m/s (d) 6.7 m/s (e) 10 m/s

9-12B. Two rivers, each of width 10 m and depth 5 m, come together into a single river of width 15 m and depth 5 m. If the speed of flow is 10 m/s in one of the first two rivers, and 5 m/s in the other, what should be the speed of flow in the single river?

(a) 7.5 m/s (b) 5 m/s (c) 15 m/s (d) 8.5 m/s (e) 10 m/s

9-13B. Water is flowing from a hole of area a = 0.05 m that is located 0.8 m below the water level in a large open vessel that has an area A = 15 m . About what is the velocity v of the water coming out of the hole?



(a) 4 m/s (b) 2 m/s (c) 10 m/s (d) 0.1 m/s (e) 0.9 m/s

9-14B. Which one of the following statements is WRONG?

(a) Pushing down a rubber suction cup, pushes most of the air out from under the cup, thereby producing a partial vacuum, after which the cup is held fixed by the pressure of the outside air.

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(e) The derivation of Bernouilli's principle neglects viscous (frictional) forces in the fluid.

9-1A) b 2A) c 3A) e 4A) a 5A) c 6A) e 7A) a 8A) d 9A) b 10A) c 11A) a 12A) d 13A) a 14A) b

9-1B) b 2B) a 3B) e 4B) c 5B) d 6B) e 7B) b 8B) c 9B) a 10B) d 11B) c 12B) e 13B) a 14B) d