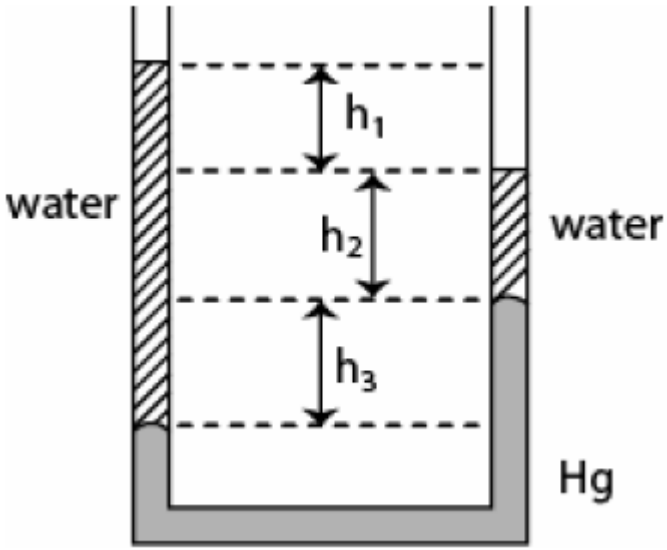
Questions

Chapter 14
Fluids

14-3 Fluid at Rest
F-062

A U-tube of constant cross sectional area, open to the atmosphere, is partially filled with Hg (ρ_{Hg}=13.6 g/cm^3). Water (ρ_w=1.00 g/cm^3) is then poured into both arms. If the equilibrium configuration of the tube is as shown in the Fig. 5 with h_3= 1.00 cm, determine the value of h_1. (Note that h_1, h_2 and h_3 are not drawn to scale).

A) 3.0 cm
B) 0 cm
C) 13.6 cm
D) 12.6 cm
E) 2.6 cm

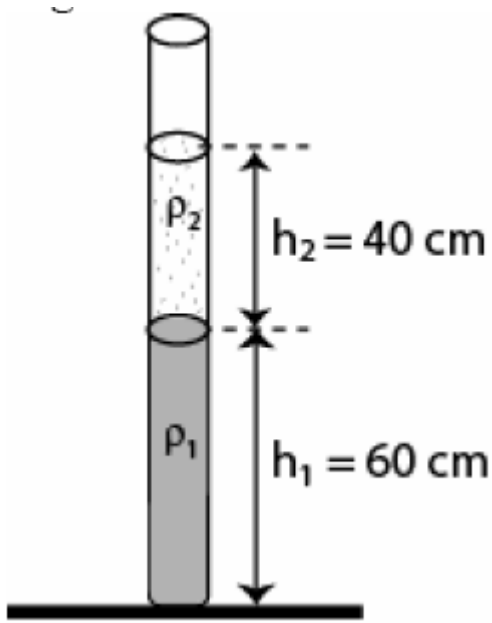


Answer D

14-3 Fluid at Rest
F-061

The open vertical tube in Fig. 13 contains two liquids of densities ρ_1 = 1000 kg/m^3 and ρ_2 = 800 kg/m^3, which do not mix. Find the gauge pressure (pressure due to the liquids only) at the bottom of the tube.

A) 7000 Pa
B) 8000 Pa
C) 9000 Pa
D) 6000 Pa
E) 18000 Pa

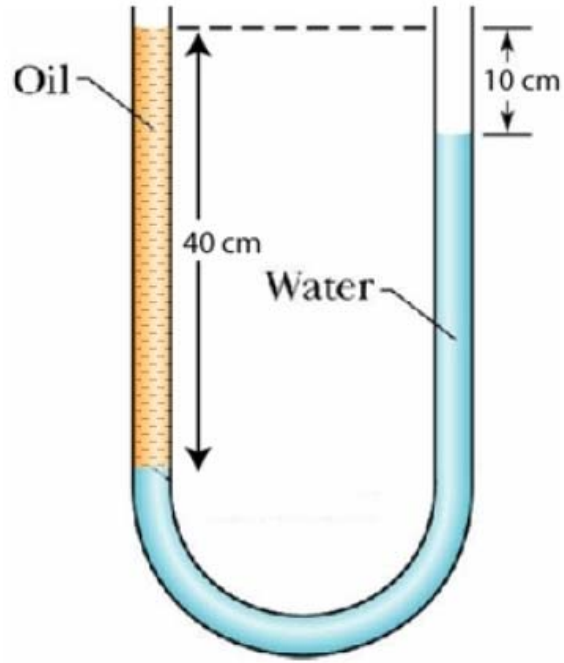


Answer C

14-3 Fluid at Rest
F-041

A U-tube of uniform cross-section, open at both ends, is filled with water (density 1000 kg/m^3) and oil as shown in Fig 2. Water and oil do not mix. Find the density of oil.

A) 980 kg/m^3
B) 654 kg/m^3
C) 250 kg/m^3
D) 750 kg/m^3
E) 500 kg/m^3

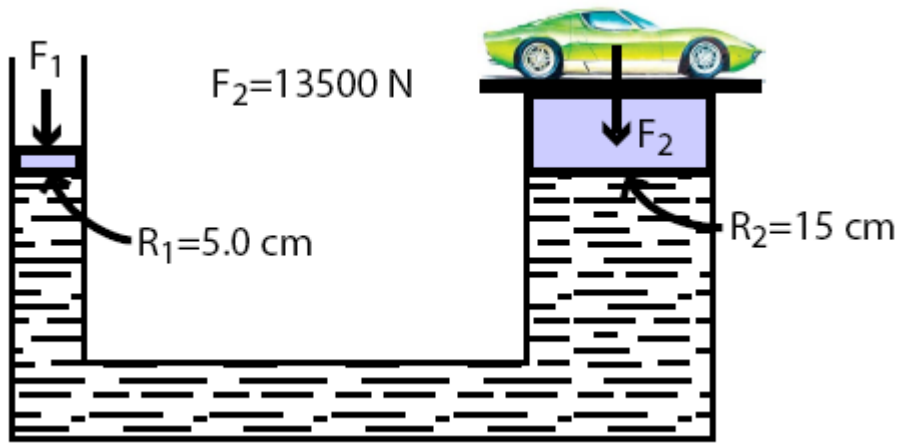


Answer D

14-5 Pascal's Principle
F-042

A piston of radius R_1= 5.0 cm is used in a hydraulic press to exert a force F_1 on the enclosed liquid to raise a car of weight F_2=13,500 N (see Fig 4). If the radius of the larger piston is R_2 = 15 cm, Find F_1.

A) 1.5×10^3 N
B) 2.5×10^3 N
C) 3.5×10^3 N
D) 4.0×10^3 N
E) 2.0×10^3 N



Answer A

14-6 Archimedes' Principle
F-062

A wooden box has been found to floats in three different fluids of densities: ρ_1 (fluid 1) = 0.9 g/cm^3, ρ_2 (fluid 2) = 1.0 g/cm^3, ρ_3 (fluid 3) = 1.1 g/cm^3. Which one of the following statements is true?

A) the buoyant force of fluid 3 is greater than the buoyant forces of the other two fluids
B) the buoyant force of fluid 1 is greater than the buoyant forces of the other two fluids
C) the three fluids exert the same buoyant force
D) the object displace the same volume of all three fluids
E) none of these are true

Answer C

14-6 Archimedes' Principle
F-061

An Aluminum block of density 2.70 g/cm^3 has a weight W in air and has a weight W_{app} in water when completely submerged. If (W- W_{app}) is equal to 196 N, the volume of the block is:

A) 0.010 m^3
B) 0.020 m^3
C) 0.030 m^3
D) 0.040 m^3
E) 0.050 m^3

Answer B

14-6 Archimedes' Principle
F-042

A block of metal has mass of 0.50 kg and density of 8.0×10^3 kg/m^3. It is suspended from a string and completely submerged in water. Find the tension in the string. (Density of water = 1.0×10^3 kg/m^3)

A) 0.60 N
B) 5.0 N
C) 4.3 N
D) 4.9 N
E) 5.5 N

Answer C

14-6 Archimedes' Principle
F-041

A solid sphere of mass 5.0 kg is floating in water with half of its volume submerged. The density of water is 1000 kg/m^3. The buoyant force on the sphere is

A) 10 N
B) 98 N
C) 75 N
D) 49 N
E) 25 N

Answer D

14-8 The Equation of Continuity
F-062

The open end of a cylindrical pipe has a radius of 1.5 cm. Water (density = 1.0×10^3 kg/m^3) flows steadily out of this end at a speed of 7.0 m/s. The rate at which mass is leaving the pipe is:

A) 4.9 kg/s
B) 2.5 kg/s
C) 7.0 kg/s
D) 48 kg/s
E) 7.0×10^3 kg/s

Answer A

14-8 The Equation of Continuity
F-042

A water hose of 1.00 cm radius is used to fill a container of volume 20.0×10^3 cm^3. It takes 60 s to fill the container. What is the speed at which the water leaves the hose?

A) 154 cm/s
B) 201 cm/s
C) 106 cm/s
D) 189 cm/s
E) 255 cm/s

Answer C

14-9 Bernoulli's Equation
F-062

Fig. 4 shows an ideal fluid flow in a horizontal tube. The pressure, velocity, and cross sectional area of fluid at point 1 and 2 are (P_1, v_1, A_1) and (P_2, v_2, A_2) respectively with $A_1 > A_2$. Which one of the following statements is correct?

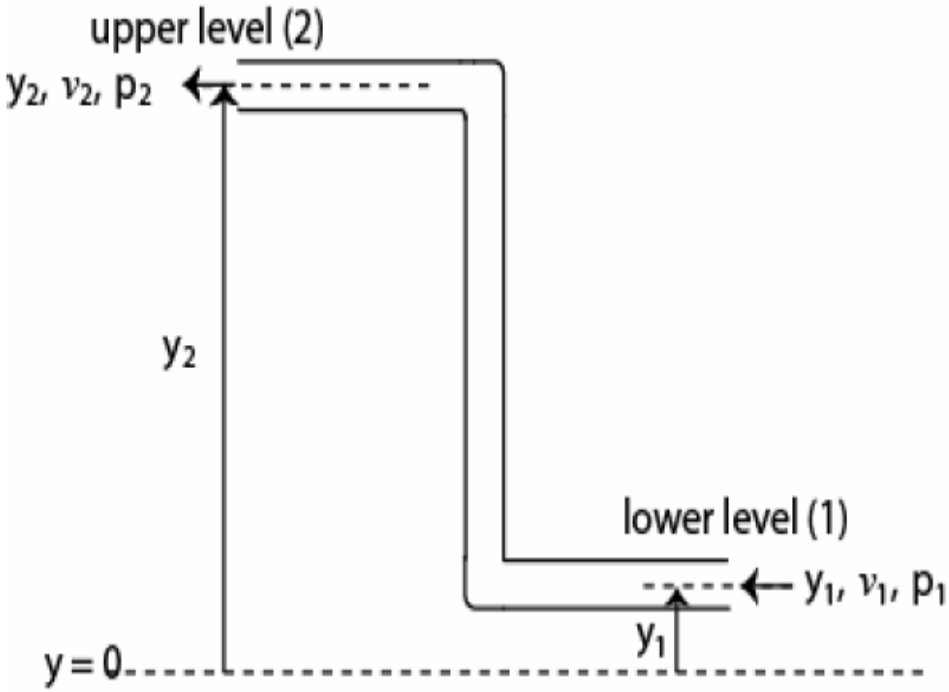
A) $v_1 < v_2$ & $P_1 > P_2$
B) $v_1 = v_2$ & $P_1 = P_2$
C) $v_1 < v_2$ & $P_1 < P_2$
D) $v_1 > v_2$ & $P_1 > P_2$
E) $v_1 < v_2$ & $P_1 = P_2$

Answer A

14-9 Bernoulli's Equation
F-061

Water is pumped through a hose of uniform cross-section as shown in Fig. 14, from the lower level (1) to the upper level (2). Which of the following expresses the correct relationship between velocity and pressure at the two levels?

A) $v_1 = v_2$ and $p_2 = p_1$
B) $v_1 = v_2$ and $p_2 < p_1$
C) $v_1 < v_2$ and $p_2 < p_1$
D) $v_1 = v_2$ and $p_2 > p_1$
E) $v_1 > v_2$ and $p_2 > p_1$



Answer B

14-9 Bernoulli's Equation
F-042

Water enters a house through a pipe with a velocity of 4.0 m/s at a pressure of $4x10^5$ Pa. The water in a narrower pipe at the second floor bathroom 5.0 m above has a velocity of 16 m/s. What is the pressure of water in the bathroom? (Density of water = $1.0x10^3$ kg/m^3)

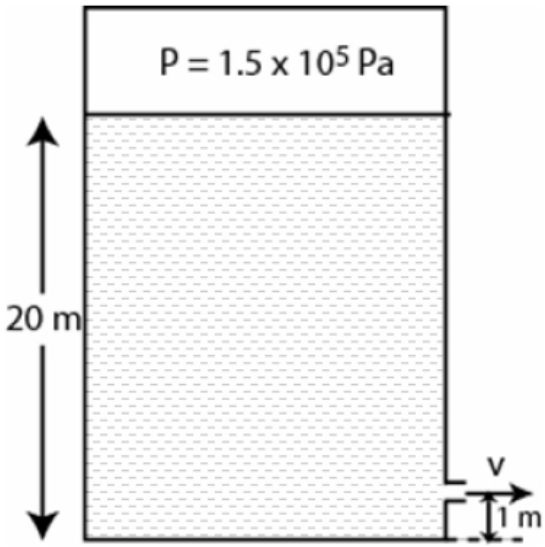
A) $2.3x10^5$ Pa
B) $1.5x10^5$ Pa
C) $5.5x10^5$ Pa
D) $4.5x10^5$ Pa
E) $3.0x10^5$ Pa

Answer A

14-9 Bernoulli's Equation
F-041

Fig 5 shows a very large, closed, oil tank with a hole at a height of 1.0 m from the bottom of the tank. The oil vapor pressure in the tank is maintained at 1.5×10^5 Pa. Find the speed at which oil leaves the hole, when the oil level is 20 m from the bottom of the tank. The density of oil is 850 kg/m^3.

A) 10 m/s
B) 70 m/s
C) 90 m/s
D) 14 m/s
E) 22 m/s

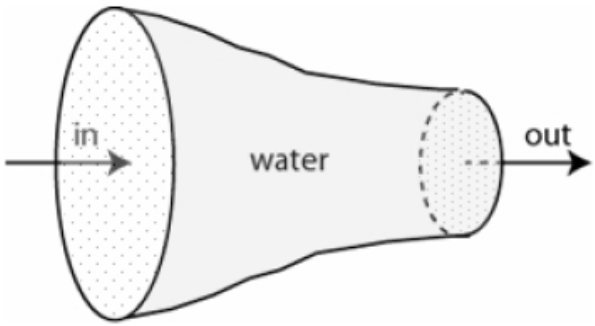


Answer E

14-9 Bernoulli's Equation
F-041

Water flows through a horizontal pipe. The diameter of the pipe is reduced gradually as shown in Fig 3. Assume water is an ideal fluid. Which of the following statements is true?

A) The water flow rate is constant everywhere.
B) The speed of water is decreased as it comes out of the smaller section of the pipe.
C) The speed of water is constant everywhere.
D) Bernoulli's equation is not applicable.
E) Equation of continuity is not applicable.



Answer A