PHYSICS

BOOKS - MBD

MECHANICAL PROPERTIES OF FLUID

Example

1. The bags and suitcases are provided with broad handles. Explain why.

Watch Video Solution

2. What is one torr of pressure?

Watch Video Solution

3. On what factors, the atmospheric pressure at a place depends?

Watch Video Solution

4. Straws are used to take soft drinks. Why?

Watch Video Solution

5. What do you mean by gauge pressure?

Watch Video Solution

6. Explain why Hydrostatic pressure is a scalar quantity even though pressure is force divided by area.

Watch Video Solution

7. What do you mean by buoyancy ?

Watch Video Solution

8. What do you mean by buoyancy ?

Watch Video Solution

9. Does Archimedes's principle hold in a vessel in free fall?

Watch Video Solution

10. What does the sudden fall, gradual fall and gradual increase in barrometer level indicate?

Watch Video Solution

11. Why two holes are made to empty an oil tin?

Watch Video Solution

12. If few drops of water are introduced in the barometer tube, what would be the effect on the barometric height?

Watch Video Solution

13. Why water does not come out of a dropper unless its rubber head is pressed hard?

Watch Video Solution

14. Why mercury is used in barometer?

Watch Video Solution

15. For flow of a fluid to be turbulent

Watch Video Solution

16. What is the value of Reynolds number for streamline flow?

Watch Video Solution

17. What is continuity equation?

Watch Video Solution

18. Write the dimensions of Reynolds number.

Watch Video Solution

19. In streamline flow, what is the velocity of the liquid in contact with the containing vessel?

Watch Video Solution

20. What should be the properties of a liquid to satisfy Bernoulli's theorem?

Watch Video Solution

21. Why is that a liquid set in motion comes to rest after some time?

Watch Video Solution

22. Write two factors affecting viscosity. Which one is more viscous , pure water or saline water?

Watch Video Solution

23. What is the effect of density on viscosity of liquids and gases.

Watch Video Solution

24. Why machines are sometimes jammed in winter?

Watch Video Solution

25. Why small air bubbles rises slowly through the liquid whereas the bigger one rises rapidly?

Watch Video Solution

26. Why does velocity increase when water flowing in a broader pipe enters narrower pipe?

Watch Video Solution

27. Why is it dangerous to stand on the edge of the platform near the railway line when the train is passing by?

Watch Video Solution

28. Are the dimensions of coefficient of viscosity and coefficient of friction same?

Watch Video Solution

29. Hotter liquids flow faster than cold liquids. Why?

Watch Video Solution

30. Explain why A drop of liquid under no external forces is always spherical in shape.

Watch Video Solution

Watch Video Solution

31. Mercury does not cling to glass. Why?

Watch Video Solution

32. Mercury does not cling to glass. Why?

Watch Video Solution

33. Why antiseptics have low surface tension?

Watch Video Solution

34. What happens to surface tension when impurity is mixed in a liquid?

Watch Video Solution

35. By which phenomenon water rises from the root to the leaves of plants?

Watch Video Solution

36. Why hot soup tastes better than cold soup?

Watch Video Solution

37. Two drops of mercury when brought together coalesce into one. Why?

Watch Video Solution

38. Why the nib of a pen is split?

Watch Video Solution

39. What type of clothes should we wear in summer ?

Watch Video Solution

40. What is the effect of highly soluble impurities on the surface tension of a liquid .

Watch Video Solution

41. What is the effect of less soluble impurities on the surface tension of a liquid.

Watch Video Solution

42. What is the effect on the angle of contact when the temperature of a liquid is increased?

Watch Video Solution

43. What is the shape of meniscus of mercury in contact with glass?

Watch Video Solution

44. The shape of liquid meniscus is concave. Will it rise or fall in a capillary tube?

Watch Video Solution

45. Why clothes become water-proof when wax is rubbed on them?

Watch Video Solution

46. What do you understand by molecular range?

Watch Video Solution

47. How do tree draw water from ground?

Watch Video Solution

48. The radius of a capillary tube is doubled. What changes will take place in height of the capillary rise?

Watch Video Solution

49. Explain why The blood pressure in humans is greater at the feet than at the brain?

Watch Video Solution

50. Explain why Atmospheric pressure at a height of about 6 km decreases to nearly half of its value at the sea level, though the height of the atmosphere is more than 100 km

Watch Video Solution

51. Explain why Hydrostatic pressure is a scalar quantity even though pressure is force divided by area.

Watch Video Solution

52. Explain why The angle of contact of mercury with glass is obtuse, while that of water with glass is acute.

Watch Video Solution

53. Explain why Water on a clean glass surface tends to spread out while mercury on the same surface tends to form drops. (Put differently, water wets glass while mercury does not.)

Watch Video Solution

54. Explain why Surface tension of a liquid is independent of the area of the surface

Watch Video Solution

55. Explain why Water with detergent disolved in it should have small angles of contact.

Watch Video Solution

56. Explain why A drop of liquid under no external forces is always spherical in shape.

Watch Video Solution

57. Fill in the blanks using the word(s) from the list appended with each statement: Surface tension of liquids generally . . . with temperatures ($\in creases / decreases$)

Watch Video Solution

58. Fill in the blanks using the word(s) from the list appended with each statement: Viscosity of gases . . . With temperature, whereas viscosity of liquids . . . With temperature ($\in creases / decreases$)

Watch Video Solution

59. Fill in the blanks using the word(s) from the list appended with each statement: For solids with elastic modulus of rigidity, the shearing force is proportional to ... , while for fluids it is proportional to . . . ($shearstra \in / rateofshearstra \in$)

Watch Video Solution

60. Fill in the blanks using the word(s) from the list appended with each statement: For a fluid in a steady flow, the increase in flow speed at a constriction foliows ($conservationofmass / Bernoli'spr \in cip \leq$)

Watch Video Solution

61. Fill in the blanks using the word(s) from the list appended with each statement:For the model of a plane in a wind tunnel, turbulence occurs at a ... speed for turbulence for an actual plane $(greater / smal \leq r)$

Watch Video Solution

62. Explain why To keep a piece of paper horizontal, you should blow over, not under, it

Watch Video Solution

63. Explain why When we try to close a water tap with our fingers, fast jets of water gush through the openings between our fingers

Watch Video Solution

64. Explain why The size of the needle of a syringe controls flow rate better than the thumb pressure exerted by a doctor while administering an injection

Watch Video Solution

65. Explain why A fluid flowing out of a small hole in a vessel results in a backward thrust on the vessel

Watch Video Solution

66. Explain why A spinning cricket ball in air does not follow a parabolic trajectory

Watch Video Solution

67. A 50 kg girl wearing high heel shoes balances on a single heel. The heel is circular with a diameter 1.0 cm. What is the pressure exerted by

the heel on the horizontal floor ?

Watch Video Solution

68. Toricelli's barometer used mercury. Pascal duplicated it using French wine of density $984 kgm^{-3}$. Determine the height of the wine column for normal atmospheric pressure.

Watch Video Solution

69. A vertical off-shore structure is built to withstand a maximum stress of 10^9 Pa. Is the structure suitable for putting up on top of an oil well in the ocean ? Take the depth of the ocean to be roughly 3 km, and ignore ocean currents.

Watch Video Solution

70. A hydraulic automobile lift is designed to lift cars with a maximum mass of 3000 kg. The area of cross-section of the piston carrying the load is $425cm^2$. What maximum pressure would the smaller piston have to bear ?

Watch Video Solution

71. A U-tube contains water and methylated spirit separated by mercury. The mercury columns in the two arms are in level with 10.0 cm of water in one arm and 12.5 cm of spirit in the other. What is the specific gravity of spirit ?

Watch Video Solution

72. In the previous problem, if 15.0 cm of water and spirit each are further poured into the respective arms of the tube, what is the difference in the levels of mercury in the two arms ? (Specific gravity of mercury = 13.6)

Watch Video Solution

Watch Video Solution

73. Can Bernoulli's equation be used to describe the flow of water through a rapid in a river? Explain.

Watch Video Solution

74. Doesit matter if one uses gauge instead of absolute pressuresin applying Bernoulli's equation ? Explain

Watch Video Solution

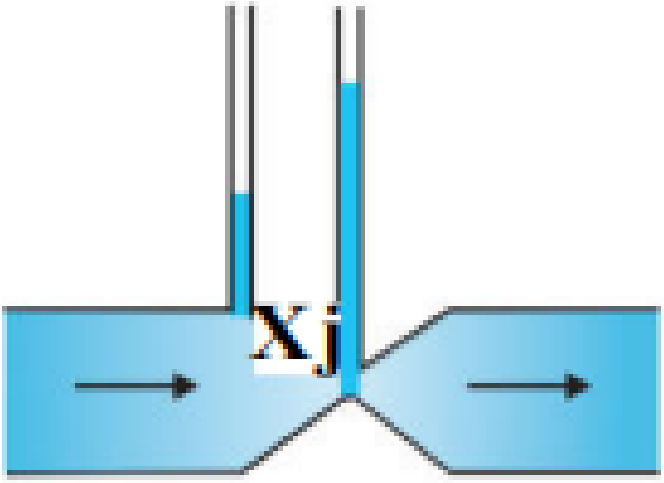
75. Glycerine flows steadily through a horizontal tube of length 1.5 m and radius 1.0 cm. If the amount of glycerine collected per second at one end is $4.0 \times 10^{-3} kgs^{-1}$, what is the pressure difference between the two ends of the tube ? (Density of glycerine = $1.3 \times 10^{3} kgm^{-3}$ and viscosity of glycerine = 0.83 Pa s). [You may also like to check if the assumption of laminar flow in the tube is correct].

Watch Video Solution

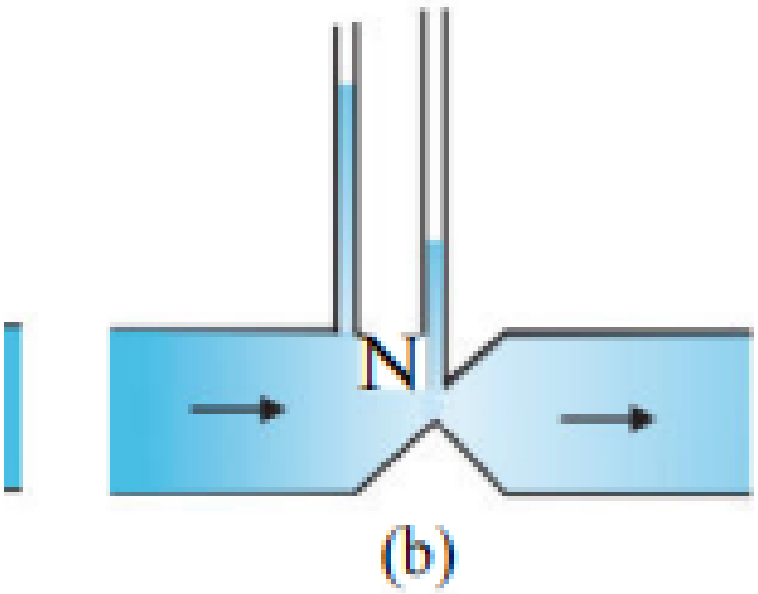
76. In a test experiment on a model aeroplane in a wind tunnel, the flow speeds on the upper and lower surfaces of the wing are $70ms^{-1}$and $63ms^{-1}$ respectively. What is the lift on the wing if its area is $2.5m^2$? Take the density of air to be $1.3kgm^{-3}$

Watch Video Solution

77. Figures 10.23(a) and (b) refer to the steady flow of a (non-viscous) liquid. Which of the two figures is incorrect ? Why ?:



(a)



Watch Video Solution

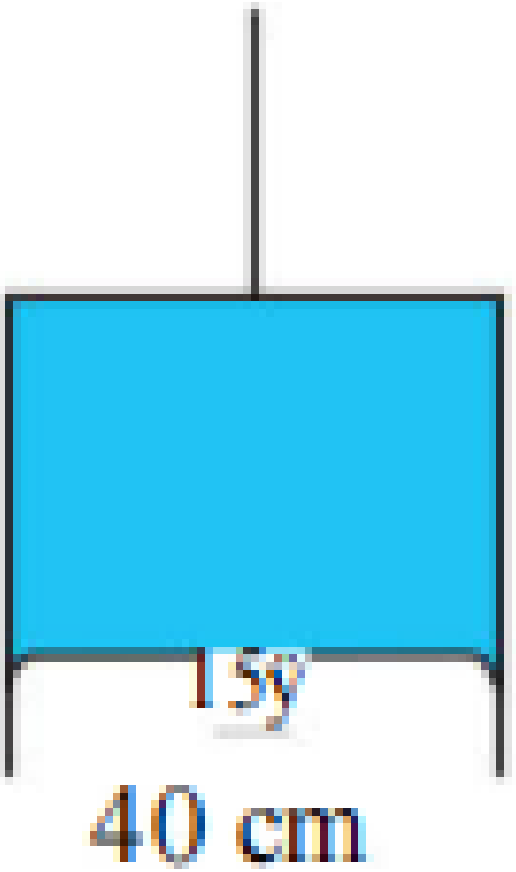
78. The cylindrical tube of a spray pump has a cross-section of $8.0cm^2$ one end of which has 40 fine holes each of diameter 1.0 mm. If the liquid flow inside the tube is $1.5m\ \min^{-1}$, what is the speed of ejection of the liquid through the holes ?

Watch Video Solution

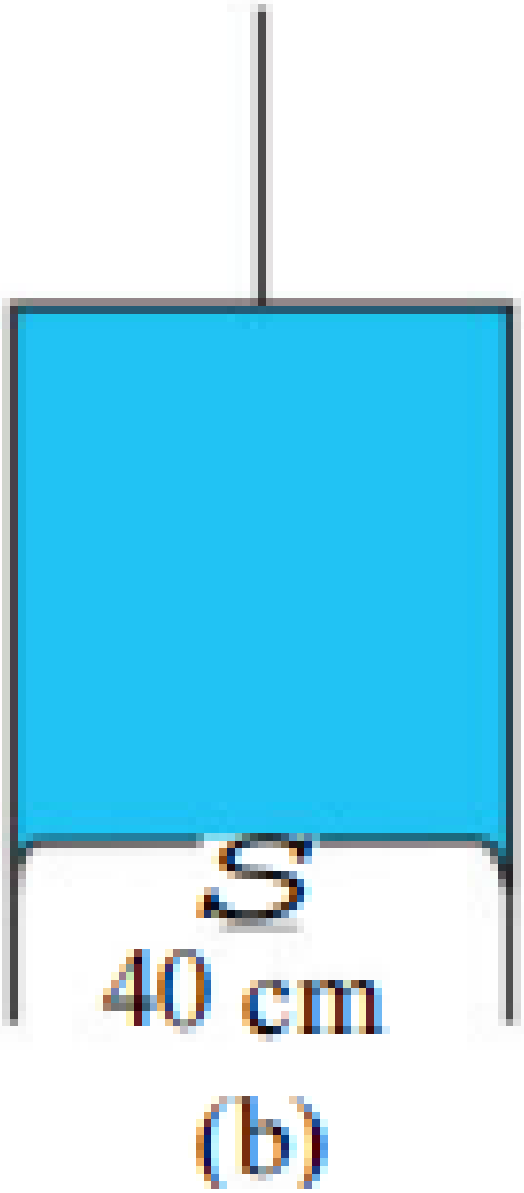
79. A U-shaped wire is dipped in a soap solution, and removed. The thin soap film formed between the wire and the light slider supports a weight of $1.5 \times 10^{-2} N$ (which includes the small weight of the slider). The length of the slider is 30 cm. What is the surface tension of the film ?

Watch Video Solution

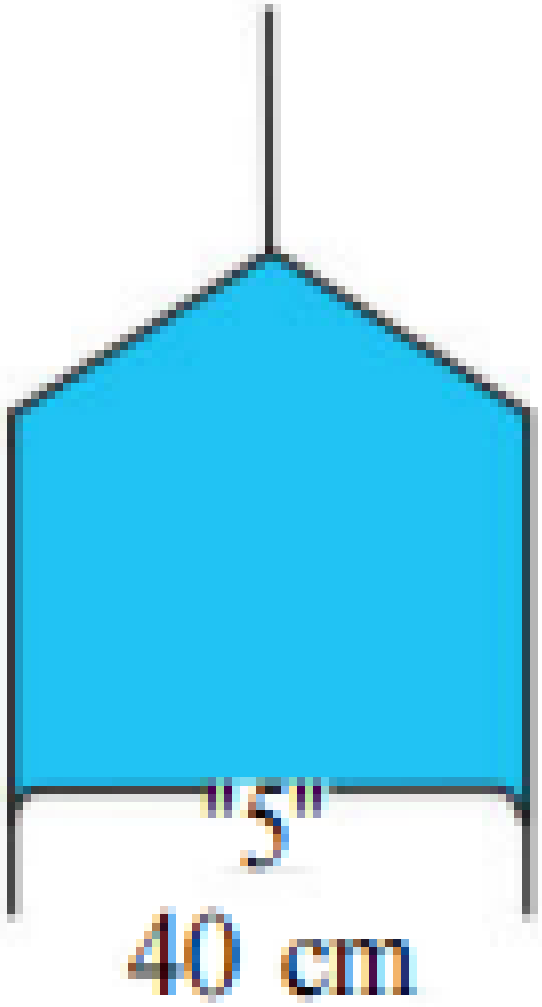
80. Figure 10.24 (a) shows a thin liquid film supporting a small weight = 4.5×10^{-2} N. What is the weight supported by a film of the same liquid at the same temperature in Fig. (b) and (c) ? Explain your answer physically:



(a)



(b)



Watch Video Solution

81. What is the pressure inside the drop of mercury of radius 3.00 mm at room temperature ? Surface tension of mercury at that temperature ($20^{\circ}C$) is $4.65 \times 10^{-1} Nm^{-1}$The atmospheric pressure is $1.01 \times 10^{5} Pa$. Also give the excess pressure inside the drop.

Watch Video Solution

82. What is the excess pressure inside a bubble of soap solution of radius 5.00 mm,given that the surface tension of soap solution at the temperature (20^@C) is 2.50xx 10 2 N in 1 ? If an air bubble of the same dimension were formed at depth of 40.0 cm inside a container containing the soap solution (of relative density 1.20), what would be the pressure inside the bubble ? (1 atmospheric pressure is 1.01xx 105 Pa).

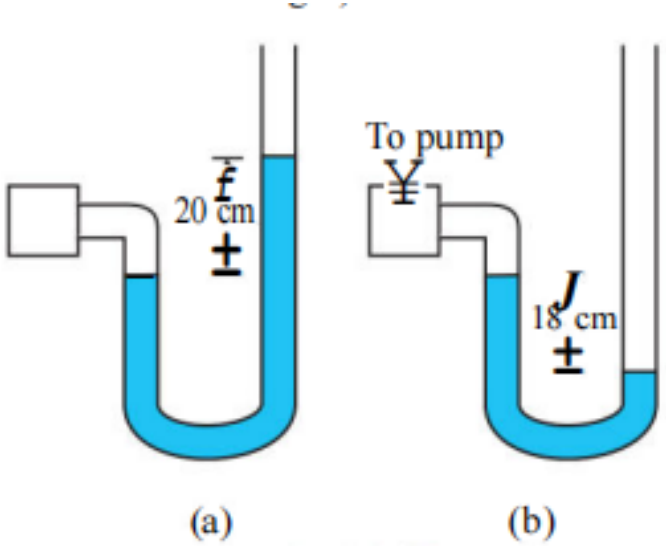
Watch Video Solution

83. A tank with a square base of area 1.0 m^2 is divided by a vertical partition in the middle. The bottom of the partition has a small-hinged

door of area $20cm^2$. The tank is filled with water in one compartment, and an acid (of relative density 1.7) in the other, both to a height of 4.0 m. compute the force necessary to keep the door close.

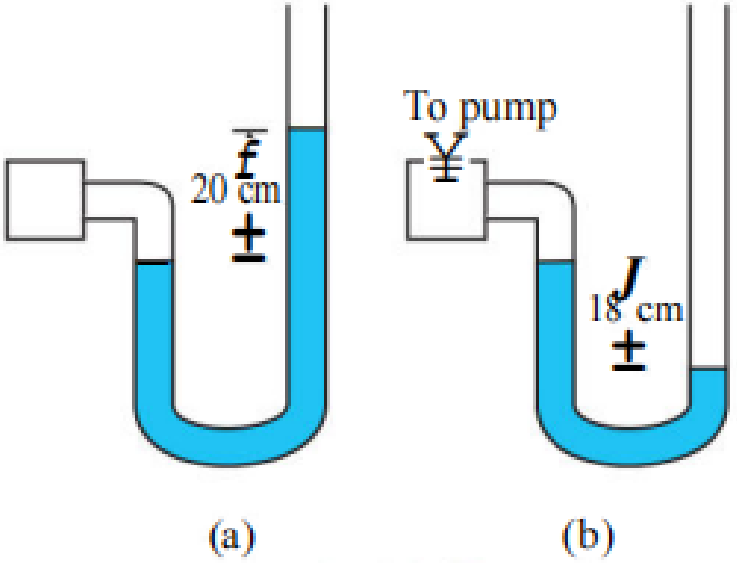
Watch Video Solution

84. A manometer reads the pressure of a gasin an enclosure asshown in Fig. 10.25 (a) When a pump removes some of the gas, the manometer reads as in Fig. 10.25 (b) The liquid used in the manometersis mercury and the atmospheric pressure is 76 cm of mercury.Give the absolute and gauge pressure of the gas in the enclosure for cases (a) and (b), in units of cm of mercury.:



Watch Video Solution

85. A manometer reads the pressure of a gasin an enclosure asshown in Fig. 10.25 (a) When a pump removes some of the gas, the manometer reads as in Fig. 10.25 (b) The liquid used in the manometersis mercury and the atmospheric pressure is 76 cm of mercury.How would the levels change in case (b) if 13.6 cm of water (immiscible with mercury) are poured into the right limb of the manometer ? (Ignore the small change in the volume of the gas).:



Watch Video Solution

86. Two vessels have the same base area but different shapes. the first vessel takes twice the volume of water than the second, vessel requires to fill upto a particular common height. Is the force exerted by water on the base of the vessel the same in the two cases? If so, why do the vessel filled with water to that same height give differnt readings on a weighing scale?

Watch Video Solution

87. During blood transfusion the needle isinserted in a vein where the gauge pressure is 2000 Pa. At what height must the blood container be placed so that blood may just enter the vein ? [Use the density of whole blood from Table 10.1],

Watch Video Solution

88. In deriving Bernoulli's equation, we equated the work done on the fluid in the tube to its change in the potential and kinetic energy. Do the

dissipative forces become more important asthe fluid velocity increases ? Discuss qualitatively.

Watch Video Solution

89. In deriving Bernoulli's equation, we equated the work done on the fluid in the tube to its change in the potential and kinetic energy. Do the dissipative forces become more important asthe fluid velocity increases ? Discuss qualitatively.

Watch Video Solution

90. In deriving Bernoulli's equation, we equated the work done on the fluid in the tube to its change in the potential and kinetic energy . What is the largest average velocity of blood How in an artery of diameter 2×10^{-3} m if the flow must remain laminar ? Discuss qualitatively.

Watch Video Solution

91. (a) What is the largest average velocity of blood flow in an artery of radius 2×10^{-3} m if the flow must remain laminar? (b) What is the corresponding flow rate? (Taking viscosity of blood to be $2.084 \times 10^{-3} Pas$)

Watch Video Solution

92. A plane is in level flight at constant speed and each of its two wings has an area of $25m^2$. If the speed of the air is $180km/h$ over the lower wing and $234km/h$ over the upper wing surface, determine the plane's mass. (Take air density to be $1kgm^{-3}$)

Watch Video Solution

93. In Millikan's oil drop experiment, what is the terminal speed of an uncharged drop of radius 2.0×10^5 m and density $1.2 \times 10^3 kgm^{-3}$. Take the viscosity of air at the temperature of the experiment to be

1.8×10^{-5} Pa s. How much is the viscous force on the drop at that speed ? Neglect buoyancy of the drop due to air

Watch Video Solution

94. Mercury has an angle of contact equal to 140° with soda lime glass. A narrow tube of radius 1.00 mm made of this glass is dipped in a trough containing mercury. By what amount does the mercury dip down in the tube relative to the liquid surface outside ? Surface tension of mercury at the temperature of the experiment is 0.465 Nm^{-1}. Density of mercury = $13.6 \times 10^{3} kgm^{-3}$.

Watch Video Solution

95. Two narrow bores of diameters 3.0 mm and 6.0 mm are joined together to form a U-tube open at both ends. If the U-tube contains water, what is the difference in its levels in the two limbs of the tube ? Surface tension of water at the temperature of the experiment is

$7.3 \times 10^{-2} Nm^{-1}$'. $Takethe \angle ofcontact \rightarrow bezero$ and $densityofwater$ –

1.0xx 10^3 kg m^- 3(g = 9.8 m s^-2`) .

Watch Video Solution

96. It is known that density ρ of air decreases with height y (in metres) as :

$\rho = \rho_0 e^{-y/y_0}$ where $\rho_0 = 1.25 kgm^{-3}$ is the density at sea level and y_0 is a constant. This density variation is called the law of atmospheres. Obtain this law assuming the temperature of atomoshpere remains constant (isothermal conditions). Also assume that the value of g remains constant.

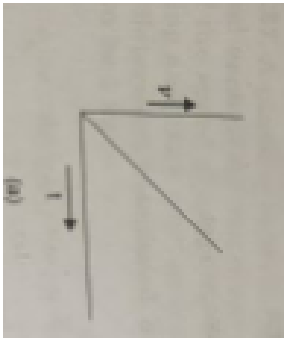
Watch Video Solution

97. A large ballon of volume $1425 m^3$ is used to lift a payload of 400 kg. Assuming that the ballon maintains constant radius as it rises. How high does it rise? $(TakeY_0 = 8000m$ and $\rho_{He} = 0.18 kgm^{-3})$

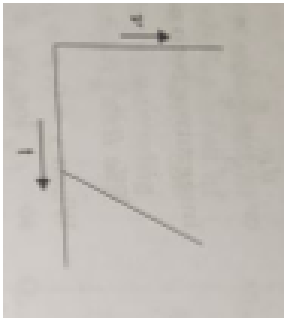
Watch Video Solution

98. A tall cylinder is filled with viscous oil. A round pebble is dropped from the top with zero initial velocity.From the plot shown in the figure. indicate the one that represents the velocity (v) of the pebble as a function of time (t).

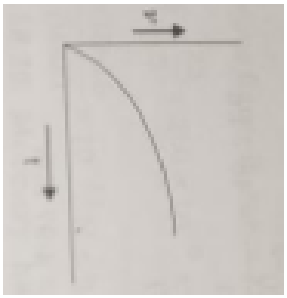
A.



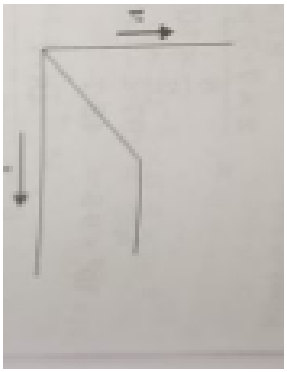
B.



C.



D.

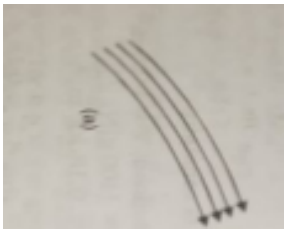


Answer:

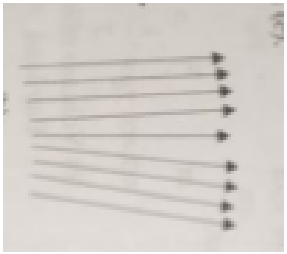
Watch Video Solution

99. Which of the following diagrams (shown in the figure) doesnot represent a streamline flow?

A.

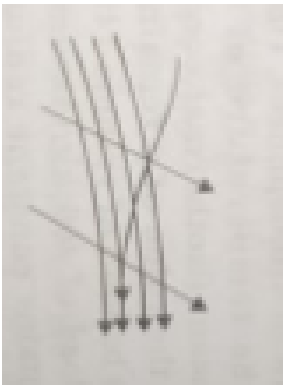


B.



C.

D.



Answer:

Watch Video Solution

100. State and prove Bernoulli's theorem for liquid having streamline flow.

A. the velocity of a fluid particle remains constant

B. the velocity of all fluid particles crossing a given position is constant.

C. the velocity of all fluid particles at a given instant is constant

D. the speed of a fluid particle remains constant.

Answer:

Watch Video Solution

101. An ideal fluid flows through a pipe of circular cross-section made of two sections with diameters 2.5 cm and 3.75 cm. The ratio of the velocities in the two pipes is

A. $9:4$

B. $3:2$

C. $\sqrt{3}:\sqrt{2}$

D. $\sqrt{2}:\sqrt{3}$

Answer:

Watch Video Solution

102. The angle of contact at the interface of water-glass is 0°. Ethyl alcohol-glass is 0°, Mercury-glass is 140° and Methyl iodide-glass is 30°. A glass capilalry is put in a trough containing one of these four liquids. It is observed that the meniscus is convex. The liquid in the trough is

A. water

B. ethyl alcohol

C. mercury

D. methyl iodide.

Answer:

Watch Video Solution

103. For a surface molecule

A. the net force on it is zero

B. there is a net downward force

C. the potential energy is less than that of a molecule inside

D. the potential energy is more than that of a molecule inside.

Answer:

Watch Video Solution

104. Explain why Hydrostatic pressure is a scalar quantity even though pressure is force divided by area.

A. it is the ratio of force to area and both force and area are vectors

B. it is the ratio of the magnitude of the force to area

C. it is the ratio of the component of the forcenormal to the area

D. it doesnot depend on the size of the area chosen.

Answer:

Watch Video Solution

105. Fill in the blanks using the word(s) from the list appended with each statement: Viscosity of gases . . . With temperature, whereas viscosity of liquids . . . With temperature ($\in creases / decreases$)

A. gases decreases

B. liquids increases

C. gases increases

D. liquids decreases.

Answer:

Watch Video Solution

106. State and prove Bernoulli's theorem for liquid having streamline flow.

A. high density

B. high viscosity

C. low density

D. low viscosity.

Answer:

Watch Video Solution

107. Is viscosity a vector quantity?

Watch Video Solution

108. Is surface tension a vector quantity?

Watch Video Solution

109. Iceberg floats in water with part of it submerged. What is the fraction of the volume of iceberg submerged if the density of ice is $\rho_1 = 0.971 gcm^{-3}$?

Watch Video Solution

110. A vessel filled with water is kept on weighing pan and the scale is adjusted to zero. A block of mass M and density ρ is suspended by a massless spring of spring constant K. This block is ubmerged inside into the water in the vessel. What is the reading of the scale?

Watch Video Solution

111. A cubical block of iceberg of density ρ is floating on the surface of water. Out of its height L, fraction x is submerged in water. The vesel is in an elevator accelerating upward with acceleration a . What is the fraction immersed?

Watch Video Solution

112. The sap in trees, which consists aminly of water in summer, rises in a system of capilaries of radius $r = 2.5 \times 10^{-5}$m. The surface tension of sap is $T = 7.28 \times 10^{-2} Nm^{-1}$ and the angle of contact is 0°. Does

surface tension alone account for the supply of water to the top of all trees?

Watch Video Solution

113. The free surface of oil in a tanker, at rest, is horizontal. If the tanker starts accelerating the free surface will be tilted by and angle θ. If the acceleration is αms^{-2}, what will be the slope of the free surface?

Watch Video Solution

114. Two mercury droplets of radii 0.1 cm and 0.2 cm collapse into one single drop. What amount of energy is released ? The surface tension of mercury, $T = 435.5 \times 10^{-3} Nm^{-1}$

Watch Video Solution

115. If a drop of liquid breaks into smaller droplets, it results in lowering of temperature of the dorplets. Let a drop f radius R,break into N small droplets each of radius r. Estimate the dorp in temperature.

Watch Video Solution

116. The surface tension and vapour pressure of water at $20^\circ C$ is $7.28 \times 10^{-2} Nm^{-1}$ and 2.33×10^3 Pa, respectively. What is the radius of the smallest spherical water droplet which can form without evaporating at $20^\circ C$?

Watch Video Solution

117. Pressure decreases as one ascends the atmosphere. If the density of air is ρ, what is the change in pressure dp over a differntial height dh?

Watch Video Solution

118. Considering the pressure p to be proportional to the density, find the pressure p at a height h if the pressure on the surface of the earth is p_0.

Watch Video Solution

119. If $p_0 = 1.03 \times 10^5 Nm^{-2}$, $\rho_0 = 1.29 kgm^{-3}$ and $g = 9.8 ms^{-2}$, at what height will the pressure drop to (1/10) the value at the surface of the earth?

Watch Video Solution

120. Surface tension is exhibited by liquids due to force of attraction between molecules of the liquid. The surface tension decreases with increase in temperature and vanishes at boiling point. Given that the latent heat of vaporation for water $\rho_w = 540 kca \frac{l}{k} g$,mechanical equivalent heat =4.2j/cal Avogadro's No. $N_A = 6.0 \times 10^{26}$, and the molecular weight of water M_A = 18 kg for 1 k mole.

Estimate the energy required for oe molecule of water to evaporate.

Watch Video Solution

121. Surface tension is exhibited by liquids due to force of attraction between molecules of the liquid. The surface tension decreases with increase in temperature and vanishes at boiling point. Given that the latent heat of vaporation for water $\rho_w = 540kca\frac{l}{k}g$,mechanical equivalent heat =4.2j/cal Avogadro's No. $N_A = 6.0 \times 10^{26}$, and the molecular weight of water M_A = 18 kg for 1 k mole.

Estimate the energy required for oe molecule of water to evaporate.

Watch Video Solution

122. Surface tension is exhibited by liquids due to force of attraction between molecules of the liquid. The surface tension decreases with increase in temperature and vanishes at boiling point. Given that the latent heat of vaporation for water $\rho_w = 540kca\frac{l}{k}g$,mechanical equivalent heat =4.2j/cal Avogadro's No. $N_A = 6.0 \times 10^{26}$, and the

molecular weight of water M_A = 18 kg for 1 k mole.

Estimate the energy required for oe molecule of water to evaporate.

Watch Video Solution

123. Surface tension is exhibited by liquids due to force of attraction between molecules of the liquid. The surface tension decreases with increase in temperature and vanishes at boiling point. Given that the latent heat of vaporation for water $\rho_w = 540kca\frac{l}{k}g$,mechanical equivalent heat =4.2j/cal Avogadro's No. $N_A = 6.0 \times 10^{26}$, and the molecular weight of water M_A = 18 kg for 1 k mole.

Estimate the energy required for oe molecule of water to evaporate.

Watch Video Solution

124. Surface tension is exhibited by liquids due to force of attraction between molecules of the liquid. The surface tension decreases with increase in temperature and vanishes at boiling point. Given that the

latent heat of vaporation for water $\rho_w = 540kca\frac{l}{k}g$,mechanical equivalent heat =4.2j/cal Avogadro's No. $N_A = 6.0 \times 10^{26}$, and the molecular weight of water M_A = 18 kg for 1 k mole.

Estimate the energy required for oe molecule of water to evaporate.

Watch Video Solution

125. What is the final temperature of 0.10 mole monoatomic ideal gas that performs 75 cal of work adiabatically if the initial temperature is $227^\circ C$ (use R = 2 cal/K-mol)

Watch Video Solution

126. Give important characteristics of the liquid state.

A. Elasticity

B. Fluidity

C. Formlessness

D. Volume conservation

Answer:

Watch Video Solution

127. 1 kg of cotton and iron are weighed in vaccum, then

A. Cotton and iron will weigh same

B. Iron will weigh more than cotton

C. Cotton will weigh more than iron

D. Both have zero weight

Answer:

Watch Video Solution

128. Small liquid drops assume spherical shape because

A. Atmoshperic pressure exerts a force on a liquid drop

B. Volume of a spherical drop is minimum

C. Gravitational force acts upon the drop

D. Liquids tends to have the minimum surface area due to surface tension.

Answer:

Watch Video Solution

129. Bernoulli's equation for steady, non-viscous, ncompressible flow expression the

A. Conservation of angular momentum

B. Conservation of density

C. Conversation of momentum

D. Conversation of energy.

Answer:

Watch Video Solution

130. If we dip capillary tubes of differnt radii r in water and water rises to different height h in them, then

A. $\frac{h}{r^2}$ = a constant

B. $\frac{h}{r} = cons\tan t$

C. hr = a constant

D.

Answer:

Watch Video Solution

131. In a streamline flow, if the gravitational head is h, the kinetic and pressure heads are

A. $\frac{v^2}{g}$ and $\frac{P}{\rho}$

B. $\frac{v^2}{2}g$ and $\frac{P}{\rho g}$

C. $\frac{v^2}{2}$ and $\frac{P}{\rho}$

D. $\frac{v^2}{2}$ and $\frac{P}{\rho}g$

Answer:

Watch Video Solution

132. A big drop of radius R is formed by 1000 small droplets of water, then radius of small drop is

A. $\frac{R}{2}$

B. $\frac{R}{5}$

C. $\frac{R}{6}$

D. $\frac{R}{10}$

Answer:

Watch Video Solution

133. Surface tension of water is $0.072Nm^{-1}$. The excess pressure inside a water drop of diameter 1.2 mm is

A. $240Nm^{-2}$

B. $120Nm^{-2}$

C. $0.06Nm^{-2}$

D. $72Nm^{-2}$

Answer:

Watch Video Solution

134. What will be angle of contact of a liquid relative to solid, if forces of adhesion and cohension are equal?

A. 0°

B. 30°

C. 90°

D. None of these.

Answer:

Watch Video Solution

135. In a container having water filled upto a height h, a hole is made in the bottom. The velocity of the water flowing out of the hole is

A. Independent of h

B. Proportional to $h^{1/2}$

C. Proportional to h

D. Proportional to h^2

Answer:

Watch Video Solution

136. The flow of liquid is laminar or steamline, is determined by

A. Rate of flow of liquid

B. Density of fluid

C. Radius of the tube

D. Coefficient of viscosity of liquid

Answer:

Watch Video Solution

137. For flow of a fluid to be turbulent

A. fluid should have high density

B. critical velocity should be large

C. Reynold number should be less than 2000

D. All the above.

Answer:

Watch Video Solution

138. If two soap bubbles of different radii are connected by a tube

A. air flows from the bigger bubble to the smaller bubble till the sizes become equal

B. air flows from the bigger bubble to the smaller bubble till the sizes are interchanged

C. air flows from smaller to the bigger

D. there is no flow of air.

Answer:

Watch Video Solution

139. The spherical shape of liquid drops is due to

A. density of water

B. surface tension

C. acceleration due to gravity

D. viscosity

Answer:

Watch Video Solution

140. In cold countries, water pipes some-times burst, becuase

A. pipe contracts

B. water expands on freezing

C. when water freezes, pressure increased

D. when water freezes, it takes heat from pipes.

Answer:

Watch Video Solution

141. Fill in the blanks:

_____ that stress is directly proportional to strain within the elastic limit.

Watch Video Solution

142. Fill in the blanks:

Two ____ cannot cross each other.

Watch Video Solution

143. Fill in the blanks:

Falling water drops are ____ in shape.

Watch Video Solution

144. Fill in the blanks:

Mercury does not _____ to glass.

Watch Video Solution

145. Why antiseptics have low surface tension?

Watch Video Solution

146. What is the effect of less soluble impurities on the surface tension of a liquid.

Watch Video Solution

147. What is meant by saying that atmospheric pressure is 75 cm of mercury?

Watch Video Solution

148. What is surface tension? What is the effect of temperature on surface tension ?

Watch Video Solution

149. What is one bar?

Watch Video Solution

150. Write the dimensions of Reynolds number.

Watch Video Solution

151. What is upthrust?

Watch Video Solution

152. Will 2 litre of kerosene oil weigh more in winter or summer?

Watch Video Solution

153. How many 'pascal' are there in one atmosphere pressure?

Watch Video Solution

154. Give reason : a gas exerts pressure on the walls of the container.

Watch Video Solution

155. On what factors, the atmospheric pressure at a place depends?

Watch Video Solution

156. What is Poisson's ratio? Give its expression. What are its units?

Watch Video Solution

157. Write down Poiseuille's equation in terms of velocity of flow of liquid.

Watch Video Solution

158. If honey and water are dropped out of a tube seperately the honeycomes out later than water.Why?

Watch Video Solution

159. What is streamline?

Watch Video Solution

160. Why liquids exert pressure on the walls of the containing vessel?

Watch Video Solution

161. Define one decapoise.

Watch Video Solution

162. Why high viscosity liquids are used buffers in trains?

Watch Video Solution

163. How does the ploughing of fields help in preservation of moisture in the soil?

Watch Video Solution

164. Why small drop of mercury is spherical but bigger drops are oval in shape?

Watch Video Solution

165. Why flags flutter on a windy day?

Watch Video Solution

166. If surface tension of water is 70 dyn cm^{-1}, what is its value in S.I.?

Watch Video Solution

167. What is fluid friction?

Watch Video Solution

168. What is the physical significance of Reynolds number?

Watch Video Solution

169. For a floating body, the weight of the body is balanced by the _____.

Watch Video Solution

170. Sea water is _____ dense than pure water.

Watch Video Solution

171. What is the effect of temperature on viscosity of liquid?

Watch Video Solution

172. The laminar flow is generally used for _____.

Watch Video Solution

173. The term fluid covers _____ and _____.

Watch Video Solution

174. The equation of ___ is derived from the principle of _____ of mass.

Watch Video Solution

175. Bernoulli's equation is derived form the principle of conservation of _____.

Watch Video Solution

176. Surface tension of liquids is a _____ phenomenon.

Watch Video Solution

177. The pressure on the _____ side of a curved surface is always more than that on its _____ side.

Watch Video Solution

178. What do you mean by the terms hydrostatic and hydrodynamics?

Watch Video Solution

179. Sate Pascal's law . Is it an independent law?

Watch Video Solution

180. Derive an expression for the pressure exerted by a liquid column.

Watch Video Solution

181. How does an actual liquid differ from an ideal liquid?

Watch Video Solution

182. Write down Poiseuille's equation in terms of velocity of flow of liquid.

Watch Video Solution

183. What is Poiseuilles formula? Deduce it by means of dimensions.

Watch Video Solution

184. What is Stokes' law? Derive the relation by method of dimensions.

Watch Video Solution

185. For flow of a fluid to be turbulent

Watch Video Solution

186. What do you mean by critical velocity?

Watch Video Solution

187. Derive an expression for critical velocity using dimensional considerations.

Watch Video Solution

188. What is Reynolds number? What is its importance?

Watch Video Solution

189. Define Angle of contact.

Watch Video Solution

190. What do you understand by capillarity?

Watch Video Solution

191. Explain what happens when length of a tube is less than the height upto which a liquid may rise in it?

Watch Video Solution

192. How does surface tension change with temperature?

Watch Video Solution

193. How do detergents change surface tension of water?

Watch Video Solution

194. Define surface tension.

Watch Video Solution

195. How will you measure surface tension?

Watch Video Solution

196. How do detergents change surface tension of water?

Watch Video Solution

197. Water rises in capillary tube, whereas mercury falls in the same tube. Explain.

Watch Video Solution

198. What is equation of continuity ? Derive it.

Watch Video Solution

199. How is the velocity of liquid flowing through capillary tube depends?

Watch Video Solution

200. What is capillary action ?

Watch Video Solution

201. What is the cuase of special shape fo bullets?

Watch Video Solution

202. If a person stands nera a fast moving train, there is a possibility of his falling towards it. Why?

Watch Video Solution

203. Bernoulli derived the relation by assuming the liquid to be non-viscous . HOw does the relation will change if fluid is viscous?

Watch Video Solution

204. Define thrust and pressure. Give their units. Show that when a liquid is in equilibrium, forces acting on the liquid must be perpendicular to its free surface.

Watch Video Solution

205. What is the difference betwen pressure and stress?

Watch Video Solution

206. Discuss Hydraulic lift.

Watch Video Solution

207. Discuss Hydraulic brakes.

Watch Video Solution

208. Obtain the expression for Pascal's law in the presence of gravity.

Watch Video Solution

209. What is the effect of gravity on Pascal's law?

Watch Video Solution

210. What is normal atmospheric pressure ?

Watch Video Solution

211. What is force ? Give its units.

Watch Video Solution

212. Why don't we feel effect of atmoshpheric pressure?

Watch Video Solution

213. Define buoyancy.

Watch Video Solution

214. State Archimedes' principle.

Watch Video Solution

215. Define viscosity.

Watch Video Solution

216. Define coefficient of viscosity. Give its unit.

Watch Video Solution

217. What is difference between viscosity and friction? What are the similarities between viscosity and friction?

Watch Video Solution

218. What is the difference between viscosity and friction? Derive the expression for the terminal velocity of a sphere falling through a viscous fluid.

Watch Video Solution

219. What is an ideal liquid?

Watch Video Solution

220. Derive the equation of continuity for steady flow of an ideal liquid.

Watch Video Solution

221. What are the various forms of energy possessed by a flowing liquid ?

Write their expressions.

Watch Video Solution

222. State and prove Bernoulli's theorem for liquid having streamline flow.

Watch Video Solution

223. Give some practicle applications of Bernoulli's theorem.

Watch Video Solution

224. What is venturimeter? Find expression for flow of liquid throgh a venturimeter.

Watch Video Solution

225. Water stands at a depth 'H' in a tank whose side walls are vertical. A hole is made on one of the walls at a depth 'h' below the water surface. What is the velocity of efflux?

Watch Video Solution

226. Water stands at a depth 'H' in a tank whose side walls are vertical. A hole is made on one of the walls at a depth 'h' below the water surface.

AT what distance R from the foot of the wall does themerging stream of water strike tha floor?

Watch Video Solution

227. Water stands at a depth 'H' in a tank whose side walls are vertical. A hole is made on one of the walls at a depth 'h' below the water surface. For what value of 'h' this range is maximum?

Watch Video Solution

228. Define surface tension.

Watch Video Solution

229. Define surface tension.

Watch Video Solution

230. What are cohesive and adhesive forces? Give examples to illustrate these forces.

Watch Video Solution

231. Give molecular theory to explain surface tension.

Watch Video Solution

232. Define surface energy. Find the relation between surface energy and surface tension.

Watch Video Solution

233. How will you measure surface tension?

Watch Video Solution

234. Discuss excess of pressure on curved surface of a liquid.

Watch Video Solution

235. Determine excess of pressure in side liquid drop

Watch Video Solution

236. Determine excess of pressure in side air bubble

Watch Video Solution

237. Determine excess of pressure in side soap solution bubble.

Watch Video Solution

238. Two drops of mercury when brought together coalesce into one. Why?

Watch Video Solution

239. A liquid drop of Diameter 'D' breaks up into 27 tiny drops. Find the resulting change in energy.

Watch Video Solution

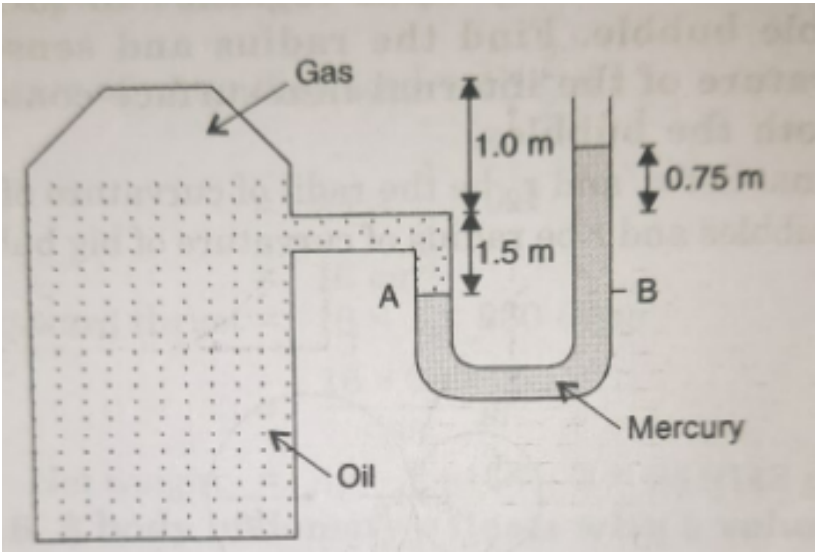
240. Derive an expression for the rise of liquid in a capillary tube and show that the height of the liquid column supported is inversely proportional to the radius of the tube.

Watch Video Solution

241. In a hydraulic press used for compressing wool, the area of the pistion is 0.1 m^2 and the force exerted along the piston rod is 200 N. find the pressure and If the area of larger cylinder 0.8 m and the total crushing force exerted on a bale of wool.

Watch Video Solution

242. What is the absolute and gauge pressure of the gas above the liquid surface in the tank shown in the following figure? Density of oil $= 820kgm^{-3}$, density of mercury $= 13.6 \times 10^3 kgm^{-3}$, 1 atmosphere pressure $= 1.01 \times 10^5 pa.$



Watch Video Solution

243. A piece of wood of relative density 0.25 floats in a pail containing oil of relative density 0.81 . What is the fraction of volume of the wool above the surface of the coil?

Watch Video Solution

244. Calculate the amount of energy evolved when 8 droplets of water (Surface tension 0.072 Nm^{-1}) of radius $\frac{1}{2}$ mm each combines into one.

Watch Video Solution

245. Two separate air bubbles (radii 0.002 m and 0.004 m) formed of the same liquid (surface tension `0.70 Nm^-1)~ came together to form a double bubble. Find the radius and sense of curvature of the internal film surface common to both the bubbles.

Watch Video Solution

246. The density of air in atmoshpere decreases with height and can be expressed by the relaton $\rho = \rho_0 e^{-\alpha h}$ where ρ_0 is the density at sea level , α is a constant and h is the height, Calculate the atmospheric pressure at sea level. Assume g to be constatn. The numerical values of constants are : $g = 9.8 ms^{-2}$, $\rho_0 = 1.3 kgm^{-3}$, $\alpha = 1.2 \times 10^{-4} m^{-1}$

Watch Video Solution

247. A tank containing water upto the height 15 m from the bottom of the tank. Find the speed and horizontal range of the water jet coming out through an orifice which is at 5 m above the bottom of the wtawer tank . {(Use g $= 10 ms^{-2}$)

Watch Video Solution

248. With what terminal velocity will an air bubble 0.8 m in diameter rise in a liquid of viscosity 0.15 Ns m^-2` and specific gravity 0.9 ? What is the terminal velocity fo the sam ebubble in water?

Watch Video Solution

249. A glass plate of length 10 cm, breadth 4 cm and thickness 0.4 cm weighs 40 g in air. If it is held vertically with long side horizontal and the plate half immersed in water, what will be its apparent weight? Surface tension of water $= 70dy \neq cm^{-1}$.

Watch Video Solution

250. A body of density ρ floats with a volume V_1 of its total volume V immersed in one liquid of density ρ_1 and with the remainder of volume V_2 immersed in antoher liquid of density ρ_2 where $\rho_1 > \rho_2$. Find the relative volumes immersed int wo liquids.

Watch Video Solution

Watch Video Solution

Exercise

1. What is the unit of torr?

Watch Video Solution

2. What is the expression for pressure of the liquid at a depht h?

Watch Video Solution

3. What is poise?

Watch Video Solution

4. What is the main difference in the applicatoin of Poiseuille's equation and Stokes' law?

Watch Video Solution

5. What is the effect of pressure on viscosity of gases?

Watch Video Solution

6. Hotter liquids flow faster than cold liquids. Why?

Watch Video Solution

7. Explain the following : It is easier of swim in sea water than in river water.

Watch Video Solution

8. End of a glass tube becomes round on heating Explain.

Watch Video Solution

9. Explain why oil spreads over the surface of water?

Watch Video Solution

10. How is the rise of a liquid affected if the top of the capillary tube is closed?

Watch Video Solution

11. State and prove Gauss's theorem in electrostatics.

Watch Video Solution

12. Derive an expression for the pressure exerted by a liquid column.

Watch Video Solution

13. State and prove Bernoulli's theorem for liquid having streamline flow.

Watch Video Solution

14. Discuss excess of pressure on curved surface of a liquid.

Watch Video Solution