PHYSICS

BOOKS - KUMAR PRAKASHAN KENDRA PHYSICS (GUJRATI ENGLISH)

MECHANICAL PROPERTIES OF FLUIDS

Section A

1. What is fluid ?

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2. Liquid and gas both are fluid , distinguish between them and which property is common between them ?

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3. Distinguish between liquid body and solid body.

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4. Write two parts of fluid mechanics and what studies are made in them ?

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5. Define thrust and pressure and give their unit and dimensional formula.

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6. Is pressure a scalar or a vector ? Give reason.

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7. Show that force exerted by rest fluid is perpendicular to its contact surface .

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8. Give the names of physical quantities which are needed to describe fluid.

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9. Explain pressure measuring device at any point in fluid in short.

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10. Define density .Write its unit and dimensional formula.

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11. Explain specific density or relative density of substance.

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12. State and prove Pascal's law.

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13. Show that the pressure produced due to fluid column depend on the height of fluid column and density of fluid.

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14. Discuss the variation of pressure with depth or pressure produced due to fluid depth h and density of fluid ρ.

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15. Explain Hydrostatic Paradox.

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16. What is atmospheric pressure ?

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17. Describe mercury barometer for measurement of atmospheric pressure.

OR Describe Torricelli experiment for measurement of atmospheric pressure.

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18. Give information for the units of pressure torr and bar .

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19. Explain that how does an open ended tube manometer measure pressure.

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20. Explain : Solar cells

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21. Write Pascal's law . Explain its use in hydraulic lift.

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22. Write short note on hydraulic brakes .

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23. What is buoyant force ?

Watch Video Solution

24. Write and prove Archimedes principle.

Watch Video Solution

25. Write the law of floatation and describe its cases.

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26. Determine the equation for the volume of body's partially part immersed in a fluid for the floating body.

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27. Explain steady flow .

Watch Video Solution

28. Explain streamlines and streamline flow.

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29. Explain Tube of flow.

Watch Video Solution

30. Explain characteristics of streamlines.

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31. Explain streamlines and streamline flow.

Watch Video Solution

32. Derive the equation of continuity of steady flow of incompressible fluid.

Watch Video Solution

33. Explain critical speed , White Water Rapids and turbulent flow .

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34. Prove Bernoulli 's Principle . OR Obtain Bernoulli's equation for steady incompressible irrotational and viscous liquid.

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35. Write limitations of Bernoulli's theorem.

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36. Obtain Bernoulli's equation of rest fluid.

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37. Why Bernoulli's equation does not apply to unsteady or turbulent flow ?

Watch Video Solution

38. Write limitations of Bernoulli's theorem.

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39. When a container open to atmmosphere , obtain the velocity of liquid coming out of the narrow hole from the wall of container by using Bernoulli's equation and obtain Torricelli's law

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40. What is a venturi - meter ? Explain its constuction and working..

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41. Using principle explain carburetor and spray pump.

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42. Explain blood flow and heart attack with the help of Bernoulli's principle.

Watch Video Solution

43. What is dynamic lift ?

Watch Video Solution

44. Explain with the help of Bernoulli's principle that why does a spinning ball follows a curve path during flight ?

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45. Explain Aerofoil or lift in aircraft wing .

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46. What is viscosity ? What is the cause of it ?

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47. Explain with a simple illustration that viscous force exerted in liquid.

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48. Explain velocity gradient and coefficient of viscous and gives their units.

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49. Discuss coefficient of viscosity in the contex of stress and strain .

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50. Give the uses of visosity.

Watch Video Solution

51. Write stokes law.

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52. State stokes'law .By using it deduce the expression for :

(i) Initial acceleration of smooth sphere and

(ii) Equation of terminal velocity of sphere falling freely through the viscous medium.

(iii) Explain : Upward motion of bubbles produced in fluid.

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53. Explain Reynolds Number.

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54. What is turbulent flow ? Give its illustration.

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55. Deduce the formula of Reynolds number in the form of inertial force and viscous force .

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56. What is critical velocity ? Write its equation.

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57. Give the limitations and uses of turbulence.

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58. Explain surface tension in the context of potential energy.

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59. Explain surface energy and surface tension.

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60. In case of surface of one fluid in contact with other fluid or solid surafce , surface tension/surface energy depends on what ? Explain with illustration.

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61. Give the definition of surface tension and formula in the context of (i) inter molecular forces (ii) potential energy (iii) work done.

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62. On what the value of surface tension depends ?

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63. A microscope using suitable photons is employed to locate an electron in an atom within a distance of 0.1 A .what is the uncertainty involved in the measurement of its velocity .

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64. Explain angle of contact in the context of intermolecular forces.

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65. Why clothes are easily washed by soap or detergent ?

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66. Why small drops of liquid are spherical in shape ?

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67. Derive an expression for excess of pressure (pressure difference) inside the drop and bubble.

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68. What is capillary action ? Derive the formula for rise of liquid in a capillary tube immersed vertically in liquid.

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Section A Try Yourself Vsqs

1. What is fluid ?

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2. Liquid is ..... While gas is ..... . (fill in the blank) (incompressible ,compressible]

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3. What is fluid statics ?

Watch Video Solution

4. What is fluid statics ?

Watch Video Solution

5. What is fluid mechanics ?

Watch Video Solution

6. How many times the shearing stress of fluid is to the shearing stress of solid ?

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7. What is thrust ?

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8. Define pressure .

Watch Video Solution

9. Give the SI and CGS unit of pressure.

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10. 1 atm = ... Pascal

Watch Video Solution

11. 1 torr = ... Pascal

Watch Video Solution

12. 1 bar = ... Pa

Watch Video Solution

13. 1 atm = ...cm Hg

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14. Is pressure a scalar or a vector ? Give reason.

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15. How fluid always exerts force to each point of surface of vessel ?

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16. What force acting on an area of 0.5m 2 will produce a pressure of 500 Pa?

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17. Define density .Write its unit and dimensional formula.

Watch Video Solution

18. Give the MKS and CGS unit of density.

Watch Video Solution

19. The density changes with pressure for which fluid ? Give reason.

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20. Explain specific density or relative density of substance.

Watch Video Solution

21. The relative density of Kerosene is 0.8 ,then find its density.

Watch Video Solution

22. Write pascal law.

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23. Two points A and B are at same depth in arest liquid . Then pressure on them $P_A \ldots\ldots\ldots P_B$.

A. $>$

B. $<$

C. $>_1$

D. $=$

Answer:

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24. Explain Pascal's law of pressure transmission.

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25. What suggest the pascal law for pressure transmission ?

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26. Name two devices working on Pascal law.

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27. As the depth increases in vessel filled with liquid ,the pressure ..... (increases , decreases , remain unchanged)

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28. Write the formula of pressure at depth h in liquid .

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29. What is absolute pressure ?

Watch Video Solution

30. What is gauge pressure ?

Watch Video Solution

31. Explain Hydrostatic Paradox.

Watch Video Solution

32. What is atmospheric pressure ?

Watch Video Solution

33. The pressure at sea surface .....P_a.

Watch Video Solution

34. Mention two instruments which meansure the atmospheric pressure.

Watch Video Solution

35. Who devised for first time , a method for measuring atmospheric pressure ?

Watch Video Solution

36. What is buoyant force ?

Watch Video Solution

37. What is the direction of buoyant force ?

Watch Video Solution

38. Write Archimedes' principle.

Watch Video Solution

39. Write the law of floatation .

Watch Video Solution

40. Write the olny equation for the volume of partially immerged part of body float on the surface of liquid.

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41. When body sink in liquid ?

Watch Video Solution

42. A body remain in equilibrium at which depth of liquid ?

Watch Video Solution

43. When a body float on the surface of liquid ?

Watch Video Solution

44. Explain steady flow .

Watch Video Solution

45. Define line of flow .

Watch Video Solution

46. Define streamline .

Watch Video Solution

47. The velocity of fluid particle at a point on streamline in which direction it obtain ?

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48. Can two streamline cross each other ? Why ?

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49. Explain Tube of flow.

Watch Video Solution

50. What is the effect on velocity of fluid if streamlines are closely spaced ?

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51. What is the effect on the velocity of fluid if streamlines are widely spaced ?

Watch Video Solution

52. What is turbulent flow ?

Watch Video Solution

53. Give an example of turbulent flow .

Watch Video Solution

54. What is critical velocity ? Write its equation.

Watch Video Solution

55. Write Bernoull's equation in formula and in words .

Watch Video Solution

56. what type of fluid can be applied in Bernoull's equation ?

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57. Write the limitations of Bernoull's equation.

Watch Video Solution

58. Write the uses of Bernoulli's equation.

Watch Video Solution

59. Give the meaning of efflux.

Watch Video Solution

60. Write Torricelli's law.

Watch Video Solution

61. What is a venturi meter ?

Watch Video Solution

62. Give the formula for measurement of velocity of fluid in a broader part of venturi -meter .

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63. What is dynamic lift ?

Watch Video Solution

64. What is aerofoil ?

Watch Video Solution

65. What is viscosity ? What is the cause of it ?

Watch Video Solution

66. What is viscous force ?

Watch Video Solution

67. Define laminal flows .

Watch Video Solution

68. When stirring by spoon is stop in a milk , it become at rest after sometime . Why ?

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69. Explain velocity gradient and coefficient of viscous and gives their units.

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70. Write dimensional formula of velocity gradient.

Watch Video Solution

71. On which factors viscous force depends ?

Watch Video Solution

72. What is coefficient of viscosity .

Watch Video Solution

73. What is coefficient of viscosity .

Watch Video Solution

74. Write SI and CGS unit of coefficient of viscosity .

Watch Video Solution

75. 1 poiselle =..... poise

Watch Video Solution

76. Write one of the practical use of viscosity .

Watch Video Solution

77. Write stokes law.

Watch Video Solution

78. Write the equation of terminal velocity .

Watch Video Solution

79. On which factors terminal velocity depends ?

Watch Video Solution

80. Why bubbles rise in soda water bottle ?

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81. Show that Reynolds number is dimensionless.

$R_e = \frac{\rho v d}{\eta}$

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82. If $R_e < 1000$, then which type of flow exist ?

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83. If $R_e > 2000$, then which type of flow exist ?

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84. What is the value of Reynolds number for unsteady flow ?

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85. What is critical velocity ? Write its equation.

Watch Video Solution

86. Write a formula for critical velocity .

Watch Video Solution

87. Give the limitations and uses of turbulence.

Watch Video Solution

88. Give the limitations and uses of turbulence.

Watch Video Solution

89. What are cohesive forces ?

Watch Video Solution

90. Write the necessary condition for water drop to stick to glass .

Watch Video Solution

91. What is called maximum distance for which the molecules can exert attraction force on each other ?

Watch Video Solution

92. What is sphere of molecular action ?

Watch Video Solution

93. Define surface of the liquid .

Watch Video Solution

94. In what direction the force exert on the molecular of surface ? OR What tendency molecules of surface possess ?

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95. Which molecule has more potential energy ?

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96. For stability of system , what should be its potential energy ? More or less ?

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97. As the area of surface is large then potentials energy of molecules is .... (more /less)

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98. As the area of surface is small then potential energy of its molecule is ....(more/less)

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99. Why the surface of a liquid have tendency to minimize its area ?

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100. The free surface of liquid has a tendency to contract . The property is called ..... .

Watch Video Solution

101. Give the definition of surface tension and formula in the context of (i) inter molecular forces (ii) potential energy (iii) work done.

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102. Give two practical illustrations of surface tension.

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103. Explain surface energy and surface tension.

Watch Video Solution

104. A surface of one liquid , is in contact with other liquid or surface of solid then in this case surface tension depend on what ?

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105. If the molecules of substance attracts each other then the area of surface and ..... And surface energy .....(increases / decreases , write proper word)

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106. If the molecules of body repel to each other then the area of surface ..... and surface energy .....(increases decreases write proper word)

Watch Video Solution

107. Explain surface tension in the context of potential energy.

Watch Video Solution

108. Explain surface tension in the context of potential energy.

Watch Video Solution

109. Write two units of surface tension .

Watch Video Solution

110. Show that `("Joule")/("metre")=("Newton")

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111. Give the dimensional formula of surface tension.

Watch Video Solution

112. On what the value of surface tension depends ?

Watch Video Solution

113. What is the effect of increasing temperature on surface tesion ?

Watch Video Solution

114. Define angle of contact .

Watch Video Solution

Watch Video Solution

115. Give reason : Wing of duck cannot wet in water

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116. Liquid is stick to the glass then angle of contact for liquid glass will be obtain .....(acute /obtuse)

Watch Video Solution

117. The angle of contact between mercury and glass is ..... Angle

Watch Video Solution

118. The cohesive force between the molecules of liquid is more than the cohesive force between the molecules of plate then angle of contact obtain is .....(acute /obtuse) and free surface has shape ..... (concave/convex)

Watch Video Solution

119. The cohesive force between the molecules of liquid is less than the cohesive force between the molecules of plate then angle of contact obtain is .... (acute /obtuse) and free surface has shape ....(concave/convex)

Watch Video Solution

120. A large pressure exerted on the surface of liquid having shape of .....(concave /convex)

Watch Video Solution

121. Bubble in water have ..... Free surface

Watch Video Solution

122. Bubble in air have ..... free surface

Watch Video Solution

123. Rain drop have ..... Free surface

Watch Video Solution

124. Write the equation of excess pressure (pressure difference) for the bubble in air annd bubble in water.

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125. At a depth of 1000m in an ocean (a) What is the absolute pressure? (b) what is the gauge pressure? (c) find the force acting on the window of area $20cm \times 20cm$ of a submarine at this depth, the interior of which is maintained at sea level atmospheric pressure. the density of sea water is $1.03 \times 10^3 kgm^{-3}. g = 10ms^{-2}$

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126. What is capillary ?

Watch Video Solution

127. Give two practical illustrations of caplilary.

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128. When the capillary is kept in water , water ..... In capillary while it kept in mercury ,the mercury .... In capillary. (write proper word : depressed /rising up

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129. Write the formula for height of liquid column in capillary .

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130. Smaller the radius of the capillary tube ,..... The height of the column.

Watch Video Solution

131. If meniscus is convex then liquid ..... In capillary and it is concave then liquid ..... in capillary . (depressed/rising up)

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132. Give reason : Lighting of lamp is due to wick of lamp .

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Section B Numericals

1. A 14.5 kg mass, fastened to the end of a steel wire of unstretched 1.0 m, is whirled in a vertical circle with an angular velocity of 2 rev/s at the bottom of the circle. The cross- sectional area of the wire is $0.065 \ \ \mathrm{cm}^2$. Calculate the elongation of the wire when the mass is at the lowest point of its path.

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2. What is the pressure on a swimmer 10 m below the surface of a lake ? (Density of water = $10^3 kgm^{-3}$, Acceleration of gravity $g = 10ms^{-2}$ and atm pressure $P_a = 1.01 \times 10^5 Pa$)

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3. The density of the atmosphere at sea level is $1.29kg/m^3$. Assume that it does not change with altitude . Then how high would the atmosphere extended ? $(g = 9.8ms^{-2})$

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4. At a depth of 1000 m in an ocean (a) What is the absolute pressure ? (b) What is the gauge pressure ? © Find the force

acting on the window of area $20cm \times 20cm$ of a submarine at this depth the interior of which is maintained at sea level atmospheric pressure. (the density of sea water $= 1.03 \times 10^3 \times 10^3 kgm^{-3}, g = 10ms^{-2}$)

Watch Video Solution

5. Two syringes of different cross sections (without needles)filled with water are connected with a tightly fitted rubber tube filled with water .Diameters of the smaller piston and larger piston 1.0 cm and 3.0 cm respectively . (a)Find the force exerted on the large piston when a force of 10 N is applied to the smaller piston .(b) If the smaller piston is pushed in through 6.0 cm how much does the larger piston move out ?

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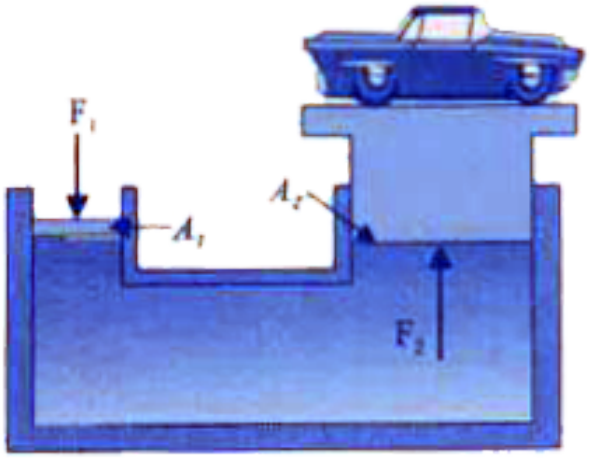
6. In a car lift compressed air exerts a force F_1 on a small piston having a radius of 5.0 cm . This pressure is transmitted to a second piston of radius 15 cm . (See figure).If the mass of the car to be lifted is $1350kg$ .Calculate F_1 . What is the pressure necessary to accomplish this task ? $\left(g = 9.8ms^{-2}\right)$



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7. The flow of blood in large artery of anesthetised dog is diverted through a venturi meter . The wider part of the meter has a cross sectional area equal to that of the artery. $A = 8mm^2$. The narrower part has an area $a = 4mm^2$. The narrower part has an area $a = 4mm^2$. The pressure drop in the artery is 24 Pa . What is the speed of the blood in the artery ? $\left(1.60 \times 10^3 kgm^{-3}\right)$

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8. A fully loaded boeing aircraft has a mass of $3.3 \times 10^5 kg$. Its total wing area is $500m^2$ .It is in level flight with a speed of $96. km/h.$

(a) Estimate the pressure difference between the lower and upper surfaces of the wings .

(b) Estimate the fractional increase in the speed of the air on the upper surface of the wing relative to the lower surface. (The density of air is $\rho = 1.2 kgm^{-3}) (g = 9.8 ms^{-2})$

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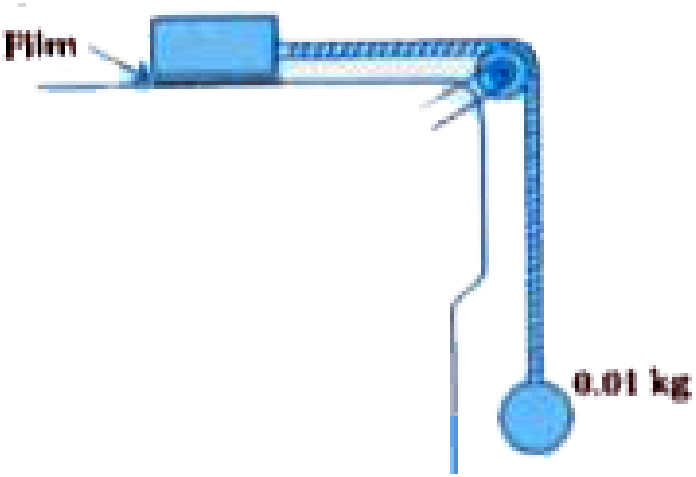
9. A metal block of area $0.10 m^2$ is connected to a $0.010 kg$ mass via a string that passes over an ideal pulley (considered massless and frictionless) as in figure . A liquid with a film thickness of 0.30mm is placed between the block and the right with a constant speed of $0.085 ms^{-1}$. Find

the coefficient of viscosity of the liquid.



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10. The terminal velocity of a copper ball of radius 1.0 mm falling through a tank of oil at $20^\circ C$ is $8.5 cm s^{-1}$ .Compute the viscosity of the oil at $20^\circ C$ .Density of oil is $1.5 \times 10^3 kgm^{-3}$, density of copper is $8.9 \times 10^3 kgm^{-3}$

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11. The flow rate of water from a tap of diameter $1.25cm$ is 0.48 L/ min . The coefficient of viscosity of water is 10^{-3} Pa s . After sometime the flow rate is increased to 3L/min. Characyerise the flow for both the flow rates .

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12. The lower end of a capillary tube of diameter 2.00 mm is dipped 8.00 cm below the surface of water in a beaker . What is the pressure required in the tube in order to blow a hemispherical bubble at the end in water ? The surface tension of water at temperature of the experiments is $7.30 \times 10^{-2} Nm^{9-1}$.

1 atmospheric pressure $= 1.01 \times 10^5 Pa.$

Density of water $= 1000 kg/m^3$, $g = 9.80 ms^{-2}$.

Also calulate the excess pressure .

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13. The two thigh bones (femurs),each of cross - sectional area $10 cm^2$ support the upper part of a human body of mass 50kg Estimate the average pressure sustained by the femurs. $\left(g = 10 ms^{-2}\right)$.

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14. The two thight bones (femurs) each of cross- sectional area $12 cm^2$ support the upper part of a human body of

mass 40 kg . Estimate the average pressure sustained by the femurs. $\left(g = 10ms^{-2}\right)$.

Watch Video Solution

15. What is the pressure on a swimmer 10 m below the surface of a lake ? (Density of water $= 1gcm^{-3}$, acceleration of gravity $g = 9.8ms^{-2}$ and atm pressure $P_a = 1.01 \times 10^5 Pa$)

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16. The density of the atmosphere ats ea level is $1.31kg/m^3$. Assume that it does not change with altitude . The how high would the atmosphere extend ? $\left(g = 10ms^{-2}\right)$

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17. At a depth of 1000 m in an ocean (a) What is the absolute pressure ? (b) What is the gauge pressure ? © Find the force acting on the window of area $20cm \times 20cm$ of a submarine at this depth the interior of which is maintained at sea level atmospheric pressure. (the density of sea water $= 1.03 \times 10^3 \times 10^3 kgm^{-3}, g = 10ms^{-2}$)

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18. At a depth of 1000 m in an ocean (a) What is the absolute pressure ? (b) What is the gauge pressure ? © Find the force acting on the window of area $20cm \times 20cm$ of a submarine at this depth the interior of which is maintained

at sea level atmospheric pressure. (the density of sea water $= 1.03 \times 10^3 \times 10^3 kgm^{-3}, g = 10ms^{-2}$)

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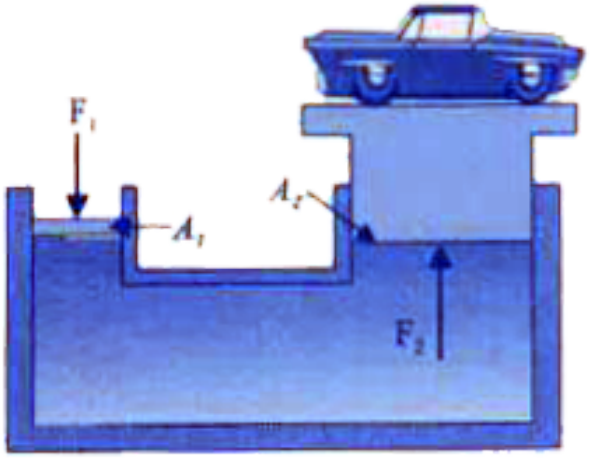
19. Two syringes of different cross sections (without needles)filled with water are connected with a tightly fitted rubber tube filled with water .Diameters of the smaller piston and larger piston 1.0 cm and 3.0 cm respectively . (a)Find the force exerted on the large piston when a force of 10 N is applied to the smaller piston .(b) If the smaller piston is pushed in through 6.0 cm how much does the larger piston move out ?

Watch Video Solution

20. In a car lift compressed air exerts a force F_1 on a small piston having a radius of 5.0 cm . This pressure is transmitted to a second piston of radius 15 cm . (See figure).If the mass of the car to be lifted is $1350kg$ .Calculate F_1 . What is the pressure necessary to accomplish this task ? $\left(g = 9.8ms^{-2}\right)$



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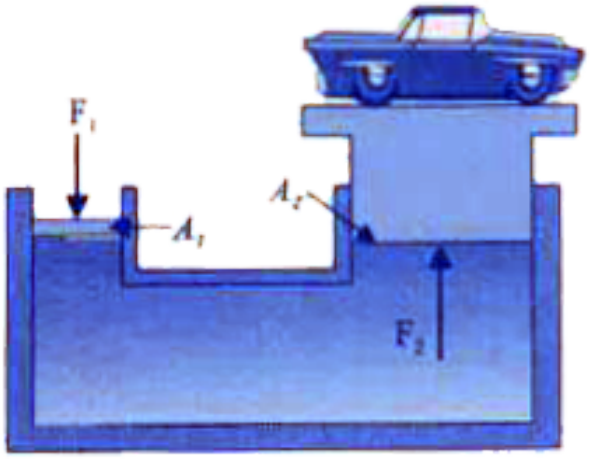
21. In a car lift compressed air exerts a force F_1 on a small piston having a radius of 5.0 cm . This pressure is transmitted to a second piston of radius 15 cm . (See figure).If the mass of the car to be lifted is $1350kg$ .Calculate F_1 . What is the pressure necessary to accomplish this task ? $\left(g = 9.8ms^{-2}\right)$



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23. The flow of blood in large artery of anesthetised dog is diverted through a venturi meter . The wider part of the meter has a cross sectional area equal to that of the artery. $A = 8mm^2$. The narrower part has an area $a = 4mm^2$. The narrower part has an area $a = 4mm^2$. The

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24. A fully loaded boeing aircraft has a mass of $3.3 \times 10^{5} kg$. Its total wing area is $500 m^{2}$ .It is in level flight with a speed of $96. \ km / h.$

(a) Estimate the pressure difference between the lower and upper surfaces of the wings .

(b) Estimate the fractional increase in the speed of the air on the upper surface of the wing relative to the lower surface. (The density of air is $\rho = 1.2 kgm^{-3}) \left(g = 9.8 ms^{-2}\right)$

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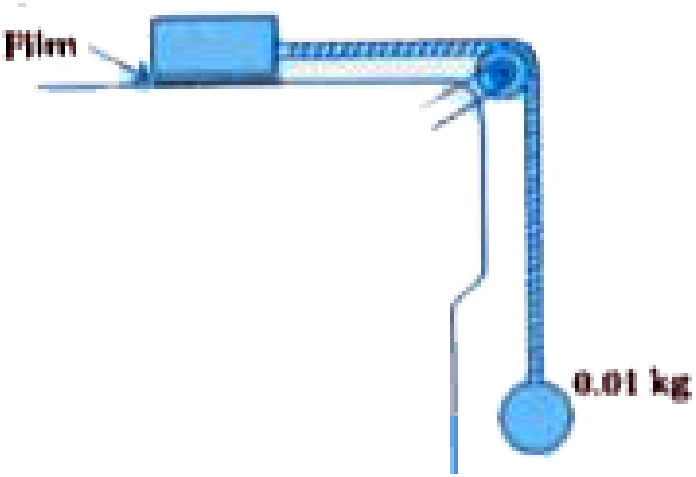
25. A metal block of area $0.10m^2$ is connected to a $0.010kg$ mass via a string that passes over an ideal pulley (considered massless and frictionless) as in figure . A liquid with a film thickness of 0.30mm is placed between the block and the right with a constant speed of $0.085ms^{-1}$. Find the coefficient of viscosity of the liquid.



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26. The terminal velocity of a copper ball of radius 1.0 mm falling through a tank of oil at $20^\circ C$ is $8.5 cm s^{-1}$ .Compute the viscosity of the oil at $20^\circ C$ .Density of oil is $1.5 \times 10^3 kgm^{-3}$, density of copper is $8.9 \times 10^3 kgm^{-3}$

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27. The terminal velocity of a iron ball of radius 2.0 mm talling through a tank of oil at $20^\circ C$ is $6.5 cm s^{9-1}$ .Compute the viscosity of the oil at $20^\circ C$. Density of oil is $1.5 \times 10^3 kgm^{-3}$. Density of iron is $7.8 \times 10^3 kgm^{-3}$.

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28. The flow rate of water from a tap of diameter $1.25cm$ is $0.36L/\ \min\ $. The coefficient of viscosity of water is 10^{-3} Pas. After sometimes the flow rate is increased to 3L/min. Characterise the flow for both the flow rates.

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29. The lower end of a capallary tube of diameter 2.50 mm is dipped 8.00 cm below the surface of water in a beaker .What is the pressure required in the tube in order to blow a hemispherical bubble at the end in water ? The surface tension of water at temperature of the experiments is $7.30 \times 10^{-2} Nm^{-1}$. 1 atmospheric pressure $1.01 \times 10^{5} Pa$. Density of water $= 1000kg/m^{3}, g = 9.80ms^{-2}$.Also calculate the excess pressure .

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Section B Numerical From Textual Exercise

1. Explain why

(a) The blood pressure in humans is greater at the feet than at the brain.

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

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3. Hydrostatic pressure is a scalar quantity even though pressure is force divided by area.

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4. Explain why

(a) The angle of contact of mercury with glass is obtuse , while of water with glass is acute .

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5. 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

6. Surface tension of a liquid is independent of the area of the surface.

Watch Video Solution

7. Water with detergent dissolved in it should have small angles of contact.

Watch Video Solution

8. A drop of liquid under no external forces is always spherical in shape.

Watch Video Solution

9. Fill in the blanks using the word (s) from the list appended with each statement :

(a) Surface tension of liquids generally ..... with temperatures

Watch Video Solution

10. Viscosity of gases ..... With temperature , whereas viscosity of liquids ..... With temperature

Watch Video Solution

11. For solids with elastic modulus of rigidity , the shearing force is proportional to .....

Watch Video Solution

12. For a fluid in a steady flow , the increase in flow speed at a constriction follows

Watch Video Solution

13. For the model of a plane in a wind tunnel , turbulence occurs at a .... Speed for turbulence for an actual plane

Watch Video Solution

14. Explain why

(a) To keep a piece of paper horizontal ,you should blow over , not under , it

Watch Video Solution

15. When we try to close a water tap with our fingers , fast jets of water gush through the oopenings between our fingerss

Watch Video Solution

16. 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

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

Watch Video Solution

18. A spinning cricket ball in air does not follow a parabolic trajectory

Watch Video Solution

19. 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

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

Watch Video Solution

21. A vertical offshore 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

22. A hydraulic automobile lift is designed to lift cars with a maximum mass of $3000kg$. 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

23. A U- tube contains water and methlated spirit separated by mercury . The mercury columns in the two arms are in level with 10.0 cm of spirit in the other. What is the specific grvity of spirit ?

Watch Video Solution

24. 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

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

Watch Video Solution

26. Does it matter if one uses gauge instead of absolute pressures in applying Bernoulli's equation ? Explain.

Watch Video Solution

27. Glycerine flows steadily through a horizontal tube of length 1.5m and radius 1.0 cm . If the amount of glycerine collected per second at one is $4.0 \times 10^{-3} kgs^{-1}$, what is the pressure difference between the two ends of the tube ? (Density of glycerine $= 1.3 \times 10^{10^3 kgm^{-3}}$ 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]

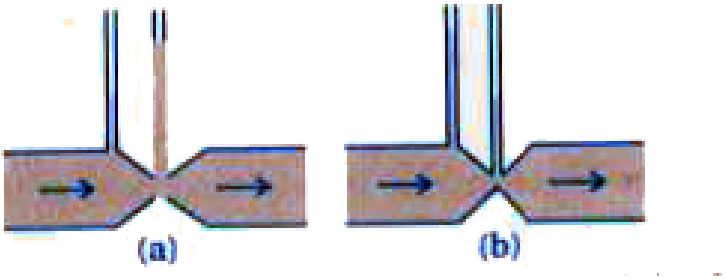
Watch Video Solution

28. 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

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



Watch Video Solution

30. 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

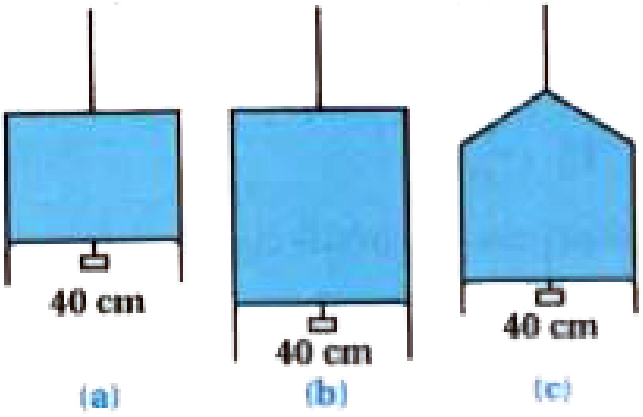
diameter $1.0mm$. If the liquid flow inside the tube is $1.5m \min^{-1}$, what is the speed of ejection of the liquid through the holes ?

Watch Video Solution

31. 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

32. Figure (a) shows a thin liquid film supporting a small weight $= 4.5 \times 10^{-2} N$. What is the weight supported by a film of the same liquid at the same temperature in figure (b) and (c) ? Explain your answer physically .



Watch Video Solution

33. What is the pressure inside the drop of mercury of radius 3.00 mm at room temperature $(20^{\circ} C)$ is

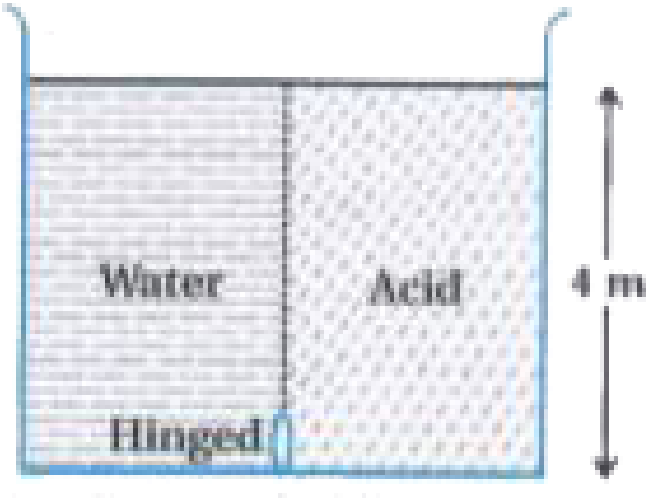
$4.65 \times 10^{-1} Nm^{-1}$. The atmospheric pressure is 1.01×10^5 Pa. Also give excess pressure inside the drop.

Watch Video Solution

34. What is the excess pressure inside a bubble of soap solution of radius 5.00 mm , given that the surface of soap solution at the temperature $(20^\circ C)$ is $2.50 \times 10^{-2} Nm^{-1}$? 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 is $1.01 \times 10^5 Pa)$.

Watch Video Solution

35. A tank with a square base of area $1.0m^2$ 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 compartement , and 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.



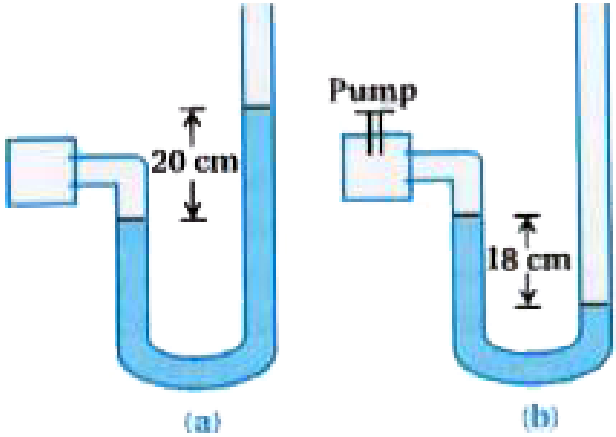
Watch Video Solution

36. A manometer reads the pressure of a gas in an enclosure as shown in figure (a) When a pump removes some of the gas , the manometer reads as in figure (b). The liquid used in the manometers is mercury and the atmospheric pressure is 76 cm of mercury.

(a) Give the absolute and gauge pressure of the gas in the enclosure for cases (a) and (b) , in units of cm of mercury.

(b) 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

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

Watch Video Solution

38. During blood transfusion the needle is inserted 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

39. 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. (a) What is the largest average velocity of blood flow in an artery of diameter $2 \times 10^{-3} m$ if the flow must remain laminar ? (b) Do the dissipative force become

more important as the fluid velocity increases ? Discuss quanlitatively .

Watch Video Solution

40. What is the largest average velocity of blood flow in an artery of radius $2 \times 10^{-3} m$ if the flow must remain laminar > (b) What is the corresponding flow rate ? (Take vicosity of blood to be 2.084×10^{-3}Pa s).

Watch Video Solution

41. A plane is in level flight at constant speed and each of its two wings has an area of $25 m^2$ If the speed of the air is 180/h over the lower wing and 234km/h over the upper wing

suface , determine the plane's mass . (Take air density to be $1kgm^{-3}$).

Watch Video Solution

42. In Millikan's oil drop experiment , what is the terminal speed of an uncharged drop of radius $2.0 \times 10^{-5}m$ 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

43. 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

44. Two narrow bores of diameters 3.0 mm and 6.0mm 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 $7.3 \times 10^{-2} Nm^{-1}$. Take

the angle of contact to be zero and density of water to be $1.0 \times 10^3 kgm^{-3} (g = 9.8ms^{-2})$.

Watch Video Solution

Section B Numerical From Darpan Based On Textbook

1. It is known that density ρ of air decreases with height y as $-y/y_0$

$\rho = \rho_o e$

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

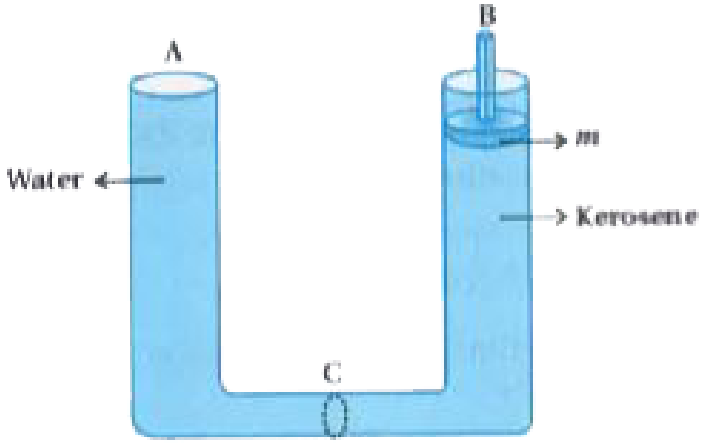
constant.

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

Watch Video Solution

2. As shown in the figure two cylindrical vessels A and B are interconnected . Vessel A contains water up to 2m height and vessel B contains kerosene . Liquids are separated by movable, airtight disc C . If height of kerosene is to be maintained at 2m , calculate the mass to be placed on the piston kept in vessel B. Also calulate the force acting on disc C due to this mass. Area of piston $= 100cm^2$, area of disc $C = 10cm^2$, Density of water $= 10^3kgm^{-3}$, specific

density of kerosene $= 0.8$.



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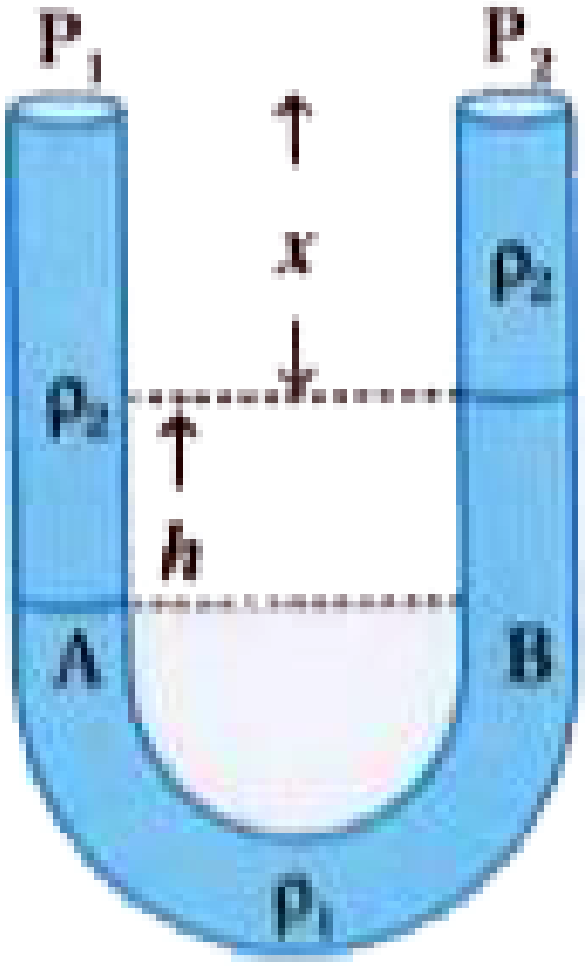
3. As shown in figure lower portion of the manometer tube contains fluid of density ρ_1 and the upper part contains fluid of density $\rho_2(\rho_1 > \rho_2)$.

If pressures on the top of these two arms are P_1 and P_2,

calculate pressure differnce $(P_1 - P_2)$.



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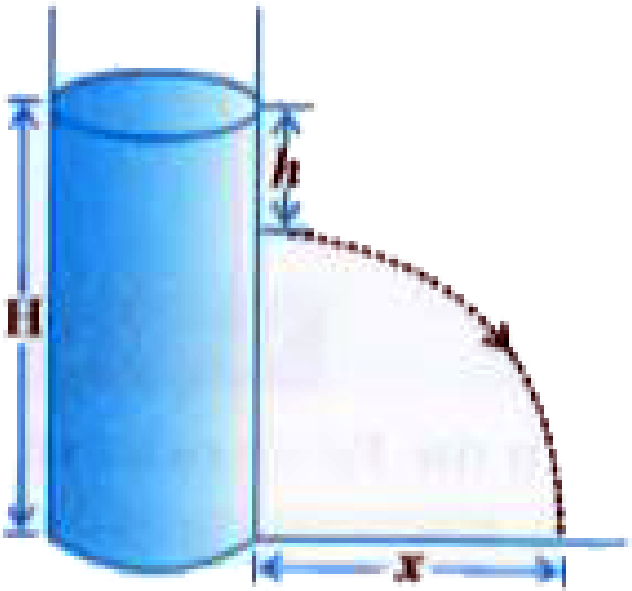
4. The diameter of one end of a tube is 2 cm and that of another end is 3 cm . Velocity and pressure of water at narrow end are $2ms^{-1}$ and $1.5 \times 10^5 Nm^{9-2}$ respectively . If the height differnce between narrow and broad ends is 2.5 m , find the velocity and pressure of water at the broad end .(Density of water is $1 \times 10^3 kgm^{-3}$). The narrow end is higher .

Watch Video Solution

5. Water is filled in a container upto height H as shown in the figure . A small hole is board on the surface of a container at the depth h from the surface of water . What will be the distance of a point along the horizontal where the jet of the water strikes the ground ? For which value of

h will this distance be maximum ? Also find this maximum distance.



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6. The velocities of cylindrical layers of liquid flowing through a tube , situated at distances $0.8cm$ and $0.82cm$ from the axis of the tube are $3cms^{-1}$ and $2.5cms^{-1}$

respectively . Find the viscous force acting between these layers , if the length of the tube is 10 cm and the coefficient of viscosity of the liquid is 8 poise .

Watch Video Solution

7. Two rain drops of equal volume , falling with terminal velocity $10cms^{-1}$, merge while falling and forms a larger drop . Find the terminal velocity of the larger drop .

Watch Video Solution

8. The radius of a pipe decreases according to $r = r_o e^{-\propto x}$, where $\alpha = 0.50m^{-1}$ and x is the distance of a cross - section from the first end (x=0) . Find the ratio of Reynolds

number for two cross -sections lying at the distance of 2m from each other . (take $e = 2.718$)

Watch Video Solution

9. Find the pressure in a bubble of radius 0.2 cm formed at the depth of 5cm from the free surface of water . The surface tension of water is 70 dyne cm^{-1} and its density is $1gcm^{-3}$. Atmospheric pressure is 10^6 dyne cm^{-2} .The gravitational acceleration is $980cms^{-2}$.

Watch Video Solution

10. Radius of a glass capillary is 0.5 mm . Find the height of the column of water when it is held vertical in water . The

density of water is $10^3 kg$

m^{-3} and the the angle of contact between glass and water is $0^\circ, g = 9.8 ms^{-2}$ and the surface tension of water $T = 0.0727 Nm^{-1}$.

Watch Video Solution

11. The piston and nozzle of a syringe kept horizontal have diameters 5 mm and 1 mm. the piston is pushed with constant velocity of$0.2 ms^{-2}$ Find the horizontal distance travelled by water jet before touchig water $\left[g = 10 m / s^2\right]$. Height of syringe from ground is 1 m.

Watch Video Solution

12. Water is flowing through a horizontal pipe of irregular cross section . If the pressure at a point where the velocity is $0.2ms^{-1}$ is 30 mm Hg , what will be the pressure at a point where the velocity is $1.2ms^{-1}$? (Density of mercury $= 13.6gcm^{-3}, g = 1000cms^{-2}$, Density of water $= 1gcm^{-3}$)

Watch Video Solution

13. Find the work required to be done to increase the volume of a bubble of soap solution having a radius 1mm to 8 times . (surface tension of soap solution is 30 dyne cm^{-1})

Watch Video Solution

14. Diameters of the arms of a U tube are 10 mm and 1 mm . It is partially filled with water and it is held in a vertical plane . Find the difference in heights of water in both the arms . (Surface tension of water =70 dyne cm^{-1} angle of contact $= 0^{\circ}$. $g = 980 cms^{-2}$)

Watch Video Solution

15. A bubble of air of diameter 0.2 cm rises up uniformly in water with a velocity of $200 cm/s$. If the density of water is $1 gcm^{-3}$, find coefficient of viscosity of water. Neglect density of air w.r.t that of water.$(g = 9.8 m/s^2)$

Watch Video Solution

16. The velocity of a cylindrical layer of liquid at a distance 0.4 cm from the axis of a tube of radius 0.5 cm is $3.6cm/s$ .Find the velocity of a layer lying at a distance of 0.3 cm from axis .

[Hint : $v = \frac{P}{4\eta l}\left(r^2 - x^2\right)$]

Watch Video Solution

17. What should be the difference in pressure across the ends of a 4 km long horizontal pipe line of diameter 8 cm to make water flow at the rate 20 litre/s$\eta_{\text{water}} = 10^{-2} MKS.$ Neglect all forces other than viscous force.

[Hint : $V = \frac{\pi P r^4}{8hl}$]

Watch Video Solution

Section C Objective Questions Vsqs

1. Bag and suitcase have broad (wide) handle why ?

Watch Video Solution

2. Why railway tracks are laid on large sized wooden sleepers ?

Watch Video Solution

3. Explain why is it easy to cut an apple with a sharp knife than with a blunt knife .

Watch Video Solution

Watch Video Solution

4. Why is walking barefooted on a sharp gravel (grift) road difficult ?

Watch Video Solution

5. Explain why water does not run out of a dropper unless it's rubber bulb is pressed.

Watch Video Solution

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

Watch Video Solution

7. Why bottom filled with liquid breakdown when cork is hit ?

Watch Video Solution

8. Give two uses of Pascal's law

Watch Video Solution

9. How mush force is exerted on our body at atmospheric pressure ?

Watch Video Solution

10. What is 1 Torr pressure ?

Watch Video Solution

11. What is 1 bar ?

Watch Video Solution

12. Write relation between torr and millibar .

Watch Video Solution

13. On what factors does the pressure of any place depends ?

Watch Video Solution

14. Express 1 atm pressure into N/m^2 and bar.

Watch Video Solution

15. Why does food cook faster in a pressure cooker ?

Watch Video Solution

16. Explain that you can't make a decent cup of tea up on a mountain ?

Watch Video Solution

17. When air plane fly at higher altitude it is not right to keep a fountain pen in a pocket.

Watch Video Solution

18. Mountaineers suffer from nose bleeding (nostril) at higher altitudes.

Watch Video Solution

19. It is difficult to heal wound on mountain.

Watch Video Solution

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

Watch Video Solution

21. Explain why are water storage dam walls thicker at the bottom.

Watch Video Solution

22. Why does an air bubble form in water grow in size from bottom when it rises ?

Watch Video Solution

23. Why is mercury used in a barometer ?

Watch Video Solution

24. What are difficulties arised by using water in a barometer instead of mercury ?

Watch Video Solution

25. What does it mean when a height of a barometer is falling ?

Watch Video Solution

26. What does it mean when a height of a barometer is rising ?

Watch Video Solution

27. A barometer kept in a elevator accelerating upwards with acceleration a . Fing most likely pressure inside the elevator.

Watch Video Solution

28. A barometer kept in an elevator accelerating downwards with acceleration Q . The most liekly pressure inside the elevator is ?

Watch Video Solution

29. What is buoyant force ?

Watch Video Solution

30. Why does a ship made of iron float while a piece of iron sinks in water?

Watch Video Solution

31. A person is sitting in aboat floating in a lake . This person fills a bucket of water from lake and puts in the boat , then will the water level go down in the lake ?

Watch Video Solution

Watch Video Solution

32. A container of liquid is free fall without flyout of liquid is this container obay the principle of Archimedes ?

Watch Video Solution

33. When two corks , one small and one big are taken into a vessel filled with water and released which cork will come fast on the surface of water ? Why ?

Watch Video Solution

34. Why is it easier to swim in sea water than in river water ?

Watch Video Solution

35. When stirring by spoon is stop in a milk , it become at rest after sometime . Why ?

Watch Video Solution

36. Give the dimensional formula of coefficient of viscosity .

Watch Video Solution

37. Define Poise .

Watch Video Solution

38. Relation between poise and decapoise.

Watch Video Solution

39. Hot liquid flow easily than cold liquid .Give reason .

Watch Video Solution

40. Why machine parts becomes sticky in winter ?

Watch Video Solution

41. Give two uses of Stoke's law.

Watch Video Solution

42. Which one of the force does not depend on the velocity - frictional force between contact surface of two solid or viscous force ?

Watch Video Solution

43. The flow of water of river at banks is slow than at middle of river .Explain .

Watch Video Solution

44. Which falls faster , big rain drops or small rain drops ?

Watch Video Solution

45. Why not rain drops do not posses greater velocity than some velocity ?

Watch Video Solution

46. Why is dust particles settled down on floor in a closed room ?

Watch Video Solution

47. Give an illustration of steady flow.

Watch Video Solution

48. Explain Reynolds Number.

Watch Video Solution

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

Watch Video Solution

50. What is the value of Reynolds number for unsteady flow ?

Watch Video Solution

51. What is the value of Reynold's number for turbulent flow ?

Watch Video Solution

52. What is inertial force ?

Watch Video Solution

53. Which of the ratio of forces represents the Reynolds number Re ?

Watch Video Solution

54. Why does fluid flow faster at a narrow tube ?

Watch Video Solution

55. Which fundamental law forms the basis of equation of continuity ?

Watch Video Solution

56. Which types of energies are present in streamline flow of fluid ?

Watch Video Solution

57. Which fundamental law forms the basis of Bernoullis equation ?

Watch Video Solution

58. Write Bernoulli's principle in word.

Watch Video Solution

59. Why is it dangerous to stand on the edge of platform near the line ,when the train is passing with speed ?

Watch Video Solution

60. Why two rowing boats moving parallel to each other come closer (attract) to each other ?

Watch Video Solution

61. When a fluid passes through a constricted part of a pipe ,what happens to its velocity and pressure ?

Watch Video Solution

62. Why does a flag (or ensign) flutter when there is strong wind ?

Watch Video Solution

63. Explain why roof of building flyout during stormy wind.

Watch Video Solution

64. Why does an airplane run a certain length on the runway first before taking off ?

Watch Video Solution

65. Explain why bullets of gun are cylinder in shape ?

Watch Video Solution

66. What is magnus effect ?

Watch Video Solution

67. Give reason why mercury does not wet glass .

Watch Video Solution

68. Why free surface of liquid tend to contract their surface ?

Watch Video Solution

69. When drops of mercury are placed on a clean surfaces of glass , they merge and becomes single drop explain .

Watch Video Solution

70. Give reason why are some insects able to walk on water surface ?

Watch Video Solution

71. Why surface tension of antiseptics kept less ?

Watch Video Solution

72. Explain why is hot soup more testy than the colder one ?

Watch Video Solution

73. It is better to wash clothes in hot water than in cold water .Explain .

Watch Video Solution

74. Detergents is added to water for removing dirt from clothes.Explain .

Watch Video Solution

75. Why colours and lubricating oil have less surface tension ?

Watch Video Solution

76. Arrange the following liquids in increasing order of surface tension .Water ,Mercury ,Soap solution.

Watch Video Solution

77. If a liquid does wet the surface ,its angle of contact is acute or obtuse ?

Watch Video Solution

78. Liquid is stick to the glass then angle of contact for liquid glass will be obtain .....(acute /obtuse)

Watch Video Solution

79. On what factors does the value of angle of contact depend ?

Watch Video Solution

80. How angle of contact depend on temperature ?

Watch Video Solution

81. Why tefllon is coated ,the angle of contact between oil and non -stick frying pan ?

Watch Video Solution

82. Why raincoat does not wet in rain ?

Watch Video Solution

83. Water rises to a height of 20 mm in a capillary . If the radius of the capillary is made $\frac{1}{3}$ rd of its previous is made then what is the new value of the capillary rise ?

Watch Video Solution

84. How the oil lamp produces light through a wick that is lit using a match ?

Watch Video Solution

85. Why the moisture is retained in soil when a farm is being plough ?

Watch Video Solution

86. Why it is better to wear cotton clothes in summer ?

Watch Video Solution

87. Why the refill of marker pen which is used to write on white board is made of fibers ?

Watch Video Solution

88. Why does the water rise in a capillary tube Explain .

Watch Video Solution

89. Why does the mercury fall in a capillary tube ?

Watch Video Solution

90. A 20 cm long capillary tube is dipped in water The water rises upto 8 cm . If the entire arrangement is put in freely falling elevator,the length of water column in capillary tube will be ?

Watch Video Solution

91. In incompressible flow the density of a fluid changes with time and position .

Watch Video Solution

92. Non -viscous flow can be a streamline.

Watch Video Solution

93. In a steady flow velocity of the fluid at each point remains identical with time .

Watch Video Solution

94. The Bernoulli equation can be considered to be a statement of the conservation of energy .

Watch Video Solution

95. The angle of contact between drop of water and material of raincoat is acute angle.

Watch Video Solution

96. Absence of roughness between two consecutive layers of fluid is the viscosity .

Watch Video Solution

97. If the weight of body is greater than the buoyant force of liquid then this body float on the surface of liquid.

Watch Video Solution

98. Velocity of water at the depth in river is always slow.

Watch Video Solution

99. Assertion : For turbulent flow Reynolds number $R_e > 2000$.

Reason : For high value of Reynold number internal force is more effective than viscous force.

A. Both assertion and reason are true and the reason is the correct explanation of the assertion.

B. Both assertion and reason are true but reason is not the correct explanation of the assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: a

Watch Video Solution

100. Assertion : A needle placed carefully placed on the surface of water may float.

Reason : When buoyant force balanced with weight of body, the body can float.

A. Both assertion and reason are true and the reason is the correct explanation of the assertion.

B. Both assertion and reason are true but reason is not the correct explanation of the assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: c

Watch Video Solution

Section C Objective Questions Vsqs Fill In The Blank

1. Angle of contact increases with rising temperature of liquid .

Watch Video Solution

2. The lines of flow and streamlines are coincide each other in ..... flow.

Watch Video Solution

3. The formula for value of horizontal velocity of water coming from hole at the bottom at a height h from the surface of water is .....

Watch Video Solution

4. 1 Pa = ... dyne/cm^2.

Watch Video Solution

5. The relative velocity of two parallel leyers of water is $6cms^{-1}$ .If perpendicular distance between two layers is 0.1 mm, then velocity gradient will be .....

Watch Video Solution

6. The surface tension of water at critical temperature is .....

Watch Video Solution

7. Bernoulli's equation is based on conservation of .....

Watch Video Solution

8. The energy would be .... If 1 large drop of water drop splitting into 8 small drop of water.

Watch Video Solution

9. When the strong wind passing over the building the force acting on building is in .....

Watch Video Solution

Section C Objective Questions Vsqs Match Type Questions

1. Force in Column -I and its use is in Column -II are given .Match them appropriately.

Column-I		Column-II	
(a)	Cohesive force	(i)	Useful for writing by chalk on blackboard.
(b)	Adhesive force	(ii)	Useful in soldering.
		(iii)	Useful for formation of spherical drops of liquid.

Watch Video Solution

2. Formation of bubble are in Column-I and pressure difference between them are given in Column -II Match

them appropriately.

Column-I		Column-II	
(a)	Liquid drop in air	(i)	$\frac{4T}{R}$
(b)	Bubble of liquid in air	(ii)	$\frac{2T}{R}$
		(iii)	$\frac{2R}{T}$

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3. Different heads are in Column -I and its formulas are given in Column -II.Match them appropriately .

Column-I		Column-II	
(a)	Velocity head	(i)	$\frac{P}{\rho g}$
(b)	Pressure head	(ii)	h
		(iii)	$\frac{v^2}{2g}$

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4. Range of Raynolds number are given in Column -I and types of flow are given in Column -II.Match them appropriately.

Column-I		Column-II	
(a)	$R_e > 2000$	(i)	Streamline
(b)	$1000 < R_e < 2000$	(ii)	Turbulent
		(iii)	Unsteady

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5. Different processes are given in Column -I and its reasons are given in Column -II .Match the appropriately .

Column-I		Column-II	
(a)	Rain drops moves downwards with constant velocity.	(i)	Viscous liquids
(b)	Floating clouds at a height in air.	(ii)	Viscosity
		(iii)	Less density

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6. Different physical quantities are given in Column -I and their dimensional formula are given in Column -II . Match them appropriately.

Column-I		Column-II	
(a)	Viscous force	(i)	$[M^1 L^1 T^{-2}]$
(b)	Coefficient of viscosity	(ii)	$[M^1 L^{-1} T^{-1}]$
		(iii)	$[M^1 L^{-1} T^{-2}]$

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Section C Objective Questions Vsqs Assertion And Reason Type Questions

1. Assertion : Hydraulic lift work on Pascal's law.

Reason :Pressure is equal to force acting per unit.

A. Both assertion and reason are true and the reason is the correct explanation of the assertion.

B. Both assertion and reason are true but reason is not the correct explanation of the assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: a

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2. Assertion : When water flow from wider tube to narrow tube ,its velocity increases.

Reason : According to equation of continuity multiplication of area and velocity remain constant.

A. Both assertion and reason are true and the reason is the correct explanation of the assertion.

B. Both assertion and reason are true but reason is not the correct explanation of the assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: a

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3. Assertion : Certain velocity of object freely falling in viscous liquid is know as terminal velocity .

Reason : Terminal velocity and critical velocity are same .

A. Both assertion and reason are true and the reason is the correct explanation of the assertion.

B. Both assertion and reason are true but reason is not the correct explanation of the assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: c

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4. Assertion : Inside parts of machine are jammed in winter . Reason : The viscosity of lubricant used in machine parts increase at low temperature.

A. Both assertion and reason are true and the reason is the correct explanation of the assertion.

B. Both assertion and reason are true but reason is not the correct explanation of the assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: a

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5. Assertion : It is better to wash clothes by soap with cold liquid.

Reason : The hot liquid of soap have less surface tension than cold one .

A. Both assertion and reason are true and the reason is the correct explanation of the assertion.

B. Both assertion and reason are true but reason is not the correct explanation of the assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: d

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6. Assertion : The concept of surface tension applied to liquid only.

Reason : The concept of surface tension cannot be applied to gases.

A. Both assertion and reason are true and the reason is the correct explanation of the assertion.

B. Both assertion and reason are true but reason is not the correct explanation of the assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: a

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7. Assertion : The dimension of balloon filled with hydrogen increases as it raises a above.

Reason : Balloon is expanded easily.

A. Both assertion and reason are true and the reason is the correct explanation of the assertion.

B. Both assertion and reason are true but reason is not the correct explanation of the assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: b

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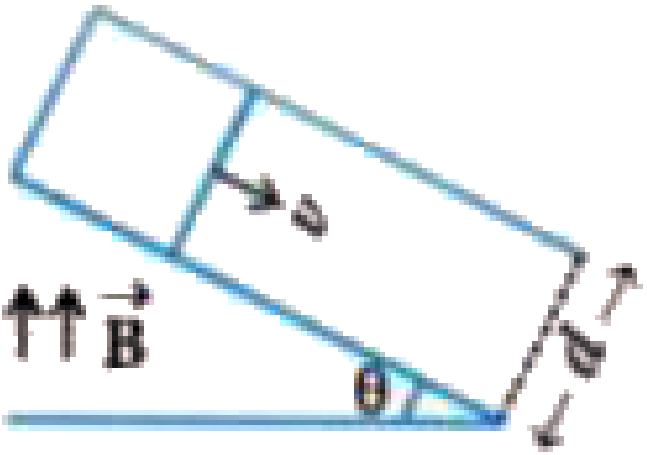
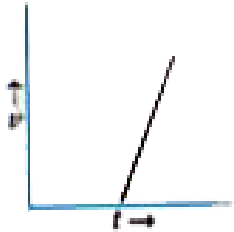
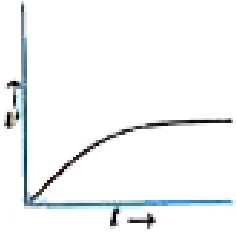
Section D Ncert Exemplar Solution

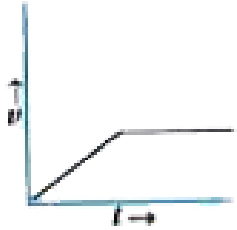
1. A rod of mass m and resistance R slides smoothly over two parallel conducting wires kept sloping at an angle θ with respect to the horizontal as shown in figure. The circuit is closed through a perfect conductor at the top. There is a constant magnetic field $\vec{B}$ along the vertical direction. If the rod is initially at rest, find the velocity of the rod as a function of time.



A. 

B. 

C. 

D. 

Answer: c

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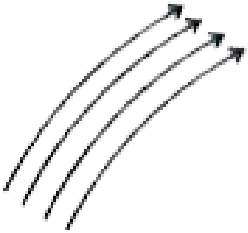
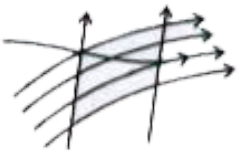
2. Which of the following diagrams does not represent a streamline flow ?

A. 

B. 

C. 

D. 

Answer: d

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3. Along a streamline .....

A. the velocity of a fluid particle remains constant.

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

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

D. the speed of a fluid partical remains constant

Answer: b

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4. An ideal fluids flows through a pipe of circular cross - section made of two sections with diameters 2.5 cm and 3.75cm .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: a

Watch Video Solution

5. The angle of contact at the interface of water glass is 0° ethylalcohol glass is 0° mercury glass is 140° and methyliodide glass is 30° A glass capillary 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. ethylacohal

C. mercury

D. methyliodide

Answer: c

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6. 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: b,d

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7. Pressure is a scalar quantity because .....

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 normal to the area

C. it is the ratio of component of force normal to the area

D. it does not depend on the size of the area chosen

Answer: b,c

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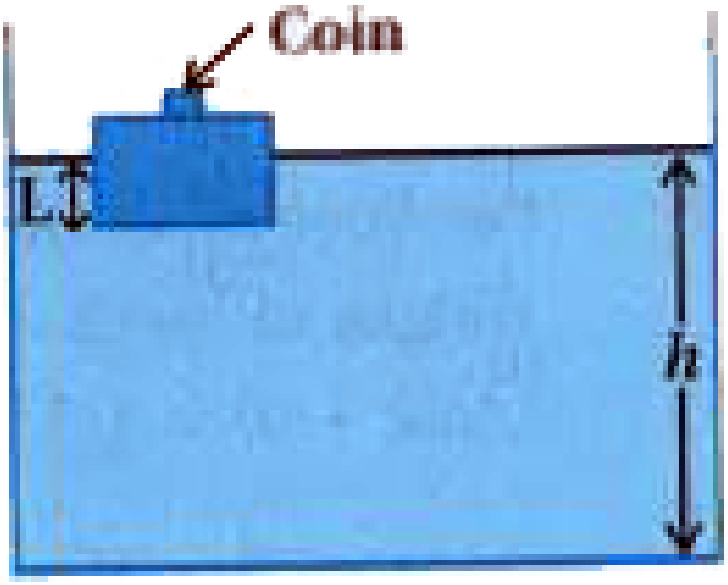
8. A wooden block with a coin placed on its top, floats in water as shown in figure . The distance L and H are shown in

the figure .after sometime the coin falls into the water , then



A. L decreases

B. h decreases

C. L increases

D. h increases

Answer: a,b

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9. With increases in temperature the viscosity .....

A. of gases decreases

B. of liquid increases

C. of gases increases

D. of liquids decreases

Answer: c,d

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Section D Ncert Exemplar Solution Very Short Answer Type Questions

1. Streamline flow is more likely for liquids with ..... .

A. high density

B. high coefficient of viscosity

C. low density

D. low coefficient of viscosity

Answer: b,c

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2. Is viscosity a vector or a scalar ?

Watch Video Solution

3. Is surface tension a vector ?

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4. Iceberg floats in water with part of it submerged .What is the fraction of the volume of inceberg submerged if the density of ice is $\rho_i = 0.917 g / cm^3$.

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

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

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Section D Ncert Exemplar Solution Short Answer Type Questions

1. The sap in trees , which consists mainly of water in summer , rises in a system of capillaries 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 ?

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2. What will be the change in phase of wave dueto reflection from free support?

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3. 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 $T = 435.5 \times 10^{-3} Nm^{-1}$

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

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5. 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 $20^\circ C$?

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Section D Ncert Exemplar Solution Long Answer Type Questions

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

(b) 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_o.

(c) If $P_o = 1.03 \times 10^5 N/m^{-2}$, $\rho_o = 1.29 kg/m^3$ and $g = 9.8 m/s^2$ what height will the pressure frop to $\frac{1}{10}$ the value at the surface of earth ?

(d) This model of the atmosphere works for relatively small

distance .Identify the underlying assumption that limits the model.

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2. Surafce tension is exhibited by liquids due to force of attraction between the molecules of the liquid .The surface tension decreases with increases in temperature and vanishes at boiling point Given that the latent heat of vaporization for water $L_v = 540 \frac{kcal}{kg}$ the mechanical equivalent of heat $J = 4.2 \frac{J}{cal}$ density of water $\rho_w = 10^3 kgl^{-1}$,Avogadro'sno.

$N_A = 6.0 \times 10^{26} k \ \text{mole}^{-1}$.

Molecular weight of water $M_A = 10kg$, for 1k mole .

(a) Estimate the energy required for one molecule of water to evaporated.

(b) Show that the inter molecular distance for water is $d = \left(\frac{M_A}{N_A} \times \frac{1}{\rho_w} \right)^{\frac{1}{3}}$ and find its value.

(c) 1 g of water in the vapour state at 1 atm occupies $1601 cm^3$, estimate the intermolecular distance at boiling point in the vapour state.

(d) During vaporisation a molecule overcomes a force F, assumed constant to go from an inter molecular distance d to d .Estimate the value of F.

(e) Caculate $\frac{F}{d}$, which is a measure of the surface tension.

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3. A hot air balloon is a sphere of radius 8m . The air inside is at a temperature of $60^\circ C$. How large a mass can the balloon lift when the outside temperature is $20^\circ C$?

Assume air is an ideal gas , R $= 8.314 J \ \ \text{mole}^{-1} k^{-1}$, 1 atm $= 1.013 \times 10^5 Pa$, the membrane tension is $= 5 N/m.$

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Section E Mcqs

1. Velocity of water in a river is .....

A. same everywhere.

B. increase from one bank to other bank.

C. more in the middle and less near its banks.

D. less in the middle and more near its banks.

Answer: c

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2. Two droplets merge with each other and forms a larger droplet .In this process....

A. energy is liberated.

B. some mass is converted into energy.

C. energy is absorbed.

D. energy is neither liberated nor absorbed.

Answer: a

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3. Bernoulli's equation is based on conservation of .....

A. energy

B. linear momentum

C. angular momentum

D. mass

Answer: a

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4. Two small drops of mercury each of radius r coalesce to form a single large drop of radius R. The ratio of the total surface energies before and after the change is .....

A. $1:2^{\frac{1}{3}}$

B. $2^{\frac{1}{3}}:1$

C. $2:1$

D. $1:2$

Answer: b

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5. A sphere of mass M and radius R is falling in a viscous fluid .The terminal velocity attained by the falling object will be proportional to .....

A. R^2

B. R

C. $\frac{1}{R}$

D. $\frac{1}{R^2}$

Answer: a

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6. By sucking through a straw a student can reduce the pressure in his lungs to 750 mm of Hg (density $= 13.6 g / cm^3$). Using the straw , he can drink water from a glass upto a maximum depth of .....

A. 10 cm

B. 75 cm

C. 13.6 cm

D. 1.36 cm

Answer: c

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7. In old age arteries carrying blood in the human body become narrow resulting in an increases in the blood pressure .This follows from .....

A. Pascal's law

B. Stokes' law

C. Bernoulli's principle

D. Archimedes principle

Answer: c

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8. Work of 3.0×10^{-4} Joule is required to be done in increasing the size of a soap film from $10cm \times 6cm$ to $10cm \times 11cm$. The surface tension of the film is .....

A. $5 \times 10^{-2} N/m$

B. $3 \times 10^{-2} N/m$

C. $1.5 \times 10^{-2} N/m$

D. $1.2 \times 10^{-2} N/m$

Answer: b

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9. When is the work done by a force is positive and negative ?

A. becomes concave towards A

B. becomes convex towards B

C. either (A) or (B) depending on the size of A with respect to B.

D. remains in the initial position

Answer: c

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10. Neglecting the density of air ,the terminal velocity obtained by a raindrop of radius 0.3 mm falling through air of viscosity $1.8 \times 10^{-5} Nsm^{-2}$ will be ....

A. $10.9ms^{-1}$

B. $7.48ms^{-1}$

C. $3.7ms^{-1}$

D. $12.8ms^{-1}$

Answer: a

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11. Two spherical soap bubbles of radii a and b in vacuum coalesce under isothermal condition. The resulting bubbles

has a radius given by .....

A. $\frac{a+b}{2}$

B. $\frac{ab}{a+b}$

C. $\sqrt{a^2+b^2}$

D. a+b

Answer: c

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12. A liquid is kept in a cylindrical vessel which is being rotated about a vertical axis through the centre of the circular base .If the redius of the vessel is r and angular

velocity of rotation is ω, then the difference in the heights of the liquid at the centre of the vessel and the edge is .....

A. $\frac{r\omega}{2g}$

B. $\frac{r^2\omega^2}{2g}$

C. $\sqrt{2gr\omega}$

D. $\frac{\omega^2}{2gr^2}$

Answer: b

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13. A capillary tube of radus r is immersed in water and water rises in it to a height h. The mass of water in the capillary tube is 5g . Another capillary tube of radius 2r is

immersed in water. The mass of water that will rise in this tube is .....

A. $2.5g$

B. $5.0g$

C. 10 g

D. 20 g

Answer: c

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14. Water is flowing with velocity $4ms^{-1}$ in a cylinder of diameter 8 cm .It is connectedto a pipe with it end tip of

diameter 2cm . Calculate the velocity of water at this free end.

A. $4ms^{-1}$

B. $8ms^{-1}$

C. $32ms^{-1}$

D. $64ms^{-1}$

Answer: d

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15. Assertion : Surface tension decreases with increase in temperature .

Reason : On increasing temperature kinetic energy increases and intermolecular forces decreases .

A. Assertion and reason are true and reason is the correct explaination of assertion.

B. Assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: a

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16. Water is flowing in a non viscous tube as shown in the diagram .The diameter of point A and point B are 0.5 m and 0.1 m respectively . The pressure difference between point A and B are $\Delta P = 0.8$m, then the rate of flow is .....$m^3 s^{-1}$.

A. 0.0314

B. 0.00314

C. 0.000314

D. 0.0000314

Answer: c

Watch Video Solution

17. Two spherical soap bubbles of radii a and b in vacuum coalesce under isothermal condition. The resulting bubbles has a radius given by .....

A. $\frac{r_1 + r_2}{2}$

B. $\frac{r_1 r_2}{r_1 + r_2}$

C. $\sqrt{r_1 r_2}$

D. $\sqrt{r_1^2 + r_2^2}$

Answer: d

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18. A small bulb is placed at the bottom of a tank containing water to a depth of 80cm. What is the area of the surface of

water through which light from the bulb can emerge out? Refractive index of water is 1.33. (Consider the bulb to be a point source.)

A. $\sqrt{400}ms^{-1}$

B. $\sqrt{600}ms^{-1}$

C. $\sqrt{60}ms^{-1}$

D. None of these

Answer: a

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19. The wettability of a surface by a liquid depends primarily on .....

A. density

B. angle of contact between the surface and the liquid

C. viscosity

D. surface tension

Answer: b

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20. A wind with speed $40m/s$ blows parallel to the roof of a house .The area of the roof is $250m^2$. Assuming that the pressure inside the house is atmospheric pressure ,the force exerted by the wind on the roof and the direction of the force will be $\left(\rho_{air} = 1.2kg/m^3\right)$

A. $4.8 \times 10^5 N$, downward

B. $4.8 \times 10^5 N$, upward

C. 2.4×10^5N, upward

D. $2.4 \times 10^5 N$, downward

Answer: c

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21. The cylindrical tube of a spray pump has radius R, one end of which has 'n' fine holes each of radius r. If the speed of the liquid in the tube is v, then what is the speed of the ejection of the liquid through the hole ?

A. $\frac{v^2 R}{nr}$

B. $\frac{vR^2}{n^2r^2}$

C. $\frac{vR^2}{nr^2}$

D. $\frac{vR^2}{n^3r^2}$

Answer: c

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22. Water rises to height h' in capillary tube .If the length of capillary tube above the surface of water is made less than 'h' then .....

A. water does not rise at all .

B. water rises upto the tip of capillary tube and then starts overflowing like a fountain.

C. water rises upto the top of capillary tube and stays there without overflowing .

D. water rises upto a point a little below the top and stays there.

Answer: c

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23. Two non -mixing liquids of densities ρ and np $(n > 1)$ are put in container . The height of each liquid is h.A solid cylinder of length L and density d is put in this container . The cylinder floats with its axis vertical and length $PL(P < 1)$ in the denser liquid .The density d is equal to .....

A. $[2+(n+1)P]\rho$

B. $[2+(n-1)P]\rho$

C. $[1+(n-1)P]\rho$

D. $[1+(n+1)P]\rho$

Answer: c

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24. A rectangular film of liquid is extended from $4cm \times 2cm to 5cm \times 4cm$ If the work done is $3 \times 10^{-4} J$, the value of the surface tension of the liquid is .....

A. $0.2 Nm^{-1}$

B. $8.0 Nm^{-1}$

C. $0.250Nm^{-1}$

D. $0.125Nm^{-1}$

Answer: d

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25. Three liquids of densities ρ_1, ρ_2 and $\rho_3(\rho_1 > \rho_2 > \rho_3)$ having same value of surface tension T,rise to the same heitht in three identical capillaries . The following relation is remain true ?

A. $\frac{\pi}{2} < \theta_1 < \theta_2 < \theta_3 < \pi$

B. $\pi > \theta_1 > \theta_2 > \theta_3 > \frac{\pi}{2}$

C. $\frac{\pi}{2} > \theta_1 > \theta_2 > \theta_3 > 0$

D. $0 \leq \theta_1 < \theta_2 < \theta_3 < \frac{\pi}{2}$

Answer: d

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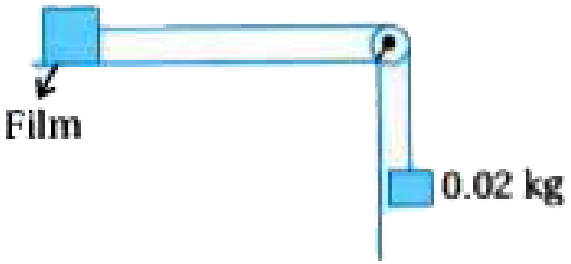
26. A metal block of base area $0.2m^2$ is connected to a 0.02 kg mass via a string that passes over an ideal pulley as shown in figure.A liquid film of thickness 0.6 mm is placed between the block moves to the right with a constant speed of 0.17 m/s The coefficient of viscosity of liquid is .....



A. $3.45 \times 10^{3} Pa \cdot s$

B. $3.45 \times 10^{-2} Pa \cdot s$

C. $3.45 \times 10^{-3} Pa \cdot s$

D. $3.45 \times 10^{2} Pa \cdot s$

Answer: c

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27. A small sphere of radius 'r' falls from rest in a viscous liquid As a result heat is produced due to viscous force .the rate of production of heat when the sphere attains its terminal velocity is proportional to :

A. r^{1}

B. r^3

C. r^5

D. r^2

Answer: c

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Section F Questions From Module

1. Bernoulli's equation is based on conservation of .....

A. energy

B. linear momentum

C. angular momentum

D. mass

Answer: a

2. When a large bubble rises from the bottom of a lake to the surface , its radius doubles .The atmospheric pressure is equal to that of a column of water of height H. What is the depth of the lake ?

A. 7H

B. 8H

C. H

D. 2H

Answer: a

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3. What is the work done in blowing a soap bubble from a radius of 3 cm to 5cm ? Surface tension of the soap solution is $0.03Nm^{9-1}$.

A. $0.2\pi mJ$

B. $2\pi mJ$

C. $0.4\pi mJ$

D. $4\pi mJ$

Answer: c

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4. A body of weight W and density ρ floats on liquid . What will its apparent weight ?

A. $W(\rho - \rho_1)$

B. $\frac{\rho - \rho_1}{W}$

C. $W(\rho_1 - \rho)$

D. $W\left(1 - \frac{\rho_1}{\rho}\right)$

Answer: d

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5. Soap bubble form in air .The excess pressure inside a soap bubble is twice the excess pressure in second bubble .The

first bubble has n times the volume of the second bubble , finf n ....

A. 1

B. 0.5

C. 0.25

D. 0.125

Answer: d

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6. Neglecting the density of air ,the terminal velocity obtained by a raindrop of radius 0.3 mm falling through air of viscosity $1.8 \times 10^{-5} Nsm^{-2}$ will be ....

A. $10.9ms^{-1}$

B. $7.48ms^{-1}$

C. $3.7ms^{-1}$

D. $12.8ms^{-1}$

Answer: a

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7. Work of 3.0×10^{-4} Joule is required to be done in increasing the size of a soap film from $10cm \times 6cm$ to $10cm \times 11cm$. The surface tension of the film is .....

A. $5 \times 10^{-2} N/m$

B. $3 \times 10^{-2} N/m$

C. $1.5 \times 10^{-2} N/m$

D. $1.2 \times 10^{-2} N/m$

Answer: b

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8. Density of ice is ρ and that of water is σ .What will be from following decrease in volume when a mass M of ice melts ?

A. $\frac{M}{\sigma - \rho}$

B. $\frac{\sigma - \rho}{M}$

C. $M\left[\frac{1}{\rho} - \frac{1}{\sigma}\right]$

D. $\frac{1}{M}\left[\frac{1}{\rho} - \frac{1}{\sigma}\right]$

Answer: c

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9. Air is streaming past a horizontal air plane wing such that its speed in $120m/s$ over the upward surface and $90m/s$ at the lower surface . If the density of air is $1.3kg/m^3$ and the wing is 10 m long and has an average width of 2m , then the difference of the pressure on the two sides of the wing of ..... Pascal .

A. 4095.0

B. 409.50

C. 40.950

D. 4.0950

Answer: a

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10. The paressure at the bottom of a tank containing a liquid does not depend on .....

A. acceleration due to gravity.

B. height of the liquid column.

C. area of the bottom surface.

D. nature of the liquid.

Answer: c

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11. A capillary tube of radus r is immersed in water and water rises in it to a height h. The mass of water in the capillary tube is 5g . Another capillary tube of radius 2r is immersed in water. The mass of water that will rise in this tube is .....

A. 2.5 g

B. 5.0 g

C. 10 g

D. 20 g

Answer: c

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12. Liquid is flowing throgh a tube of nonuniform cross section ratio of the radius at entry a and exit end B of the tube is 3 :2. Then the ratio of velocities at entry A and exit B of liquid is .....

A. $4:9$

B. $9:4$

C. $8:27$

D. $1:1$

Answer: a

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13. Under a constant pressure, the rate of flow of liquid through capillary is V. if the length of capillary is doubled and the diameter of the bore is halved, the rate of flow would be .....

A. $\frac{V}{4}$

B. 16 V

C. $\frac{V}{8}$

D. $\frac{V}{32}$

Answer: d

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14. A capillary tube of diameter 0.20 mm is lowered vertically into water in a vessel. What should be the pressure in N/m^2 to be applied on the water in the capillary tube so that water level in the tube is same as that in the vessel ? (surface tension of water is 0.07 N/m and atm pressure is $10^5 N/m^2$)

A. 10^3

B. 99×10^3

C. 100×10^3

D. 101.4×10^3

Answer: d

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15. Give example of situation in which an applied force does not result in a change in kinetic energy .

A. the density of liquid is one fourth to the density of metal.

B. metal floated on water.

C. the density of metal is $7g/cm^3$.

D. the density of liquid is $3kg/m^3$.

Answer: c

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16. Working and design principles of submarines are based on ....

A. Archimades principle

B. Bernoulli's equation

C. Pascal 's law

D. Newton's law

Answer: a

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17. Two small drops of mercury each of radius r coalesce to form a single large drop of radius R. The ratio of the total surface energies before and after the change is .....

A. $1:2^{\frac{1}{3}}$

B. $2^{\frac{1}{3}}:1$

C. $2:1$

D. $1:2$

Answer: b

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18. A vessel contains oil of density $0.8gm/cm^3$ over mercury of density $13.6gm/cm^3$ .Solid sphere floats with half of its volume immersed in mercury and the other half in the oil . The density of the sphere is ..... gm/cm^3.

A. 3.3

B. 6.4

C. 7.2

D. 12.8

Answer: c

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19. Two droplets each radius r of mercury merge and form a bigger drop . If surface tension of mercury is T.Then what will be the surface energy ?

A. $2^{\frac{5}{3}}\pi r^2 T$

B. $4\pi r^2 T$

C. $2\pi r^2 T$

D. $2\frac{8}{3}\pi r^2 T$

Answer: d

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20. A drop of liquid of diameter 2.8 mm split into 125 identical drops .The change in energy is .....(Surface tension T=75dyne/cm)

A. zero

B. 19 erg

C. 46 erg

D. 71 erg

Answer: d

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21. If the terminal speed of a sphere of gold (density = $19.5kgm^{-3}$) density of liquid $= 1.5kgm^{-3}$) is $0.2ms^{-1}$ in a viscous liquid . What is the terminal speed of a sphere of silver (density $= 10.5kgm^{-3}$) of the same size in the same liquid ?

A. $0.2ms^{-1}$

B. $0.4ms^{-1}$

C. $0.133ms^{-1}$

D. $0.1ms^{-1}$

Answer: d

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Question Paper Section A

1. Give the unit of pressure head , velocity head and elevation head.

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2. What is change in value of Reynolds number when fluid flow from broad tube to narrow tube ? [Tube is horizontal]

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3. Some insects are able to walk on water .Give reason.

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4. Which fact is recognized as the hydrostatic paradox ?

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5. Write Torricelli's law.

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6. Air bubble formed in liquid is considered as a sphere of air .initially ,bubble obtained acceleration is in upward

direction and it is rising in liquid why ?

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Question Paper Section B

1. Explain Pascal's law of pressure transmission.

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2. Write the formula of initial acceleration of sphere falling in a viscous medium and derive the formula of its terminal velocity from it .

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Question Paper Section C

1. Glycerine flows steadily through a horizontal tube of length 1.5m and radius 1.0 cm . If the amount of glycerine collected per second at one is $4.0 \times 10^{-3} kgs^{-1}$, what is the pressure difference between the two ends of the tube ? (Density of glycerine $= 1.3 \times 10^{10^3 kgm^{-3}}$ 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]

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2. A U- tube contains water and methlated spirit separated by mercury . The mercury columns in the two arms are in

level with 10.0 cm of spirit in the other. What is the specific grvity of spirit ?

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3. What is the excess pressure inside a bubble of soap solution of radius 5.00 mm , given that the surface of soap solution at the temperature $(20^{\circ}C)$ is $2.50 \times 10^{-2} Nm^{-1}$? 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 is $1.01 \times 10^{5} Pa)$.

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