PHYSICS

BOOKS - MARVEL PHYSICS (HINGLISH)

FRICTIONAL IN SOLIDS AND LIQUIDS

Mcq

1. The limiting force of friction betwwen two bodies in contact independent of

A. nature of the surfaces in contact

B. the materials of the bodies

C. the area of the surfaces in contact

D. normal reaction between the surfaces

Answer: C

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2. Frictional forces are

A. gravitational forces

B. nuclear forces

C. electromagnetic forces

D. pseudo forces

Answer: C

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3. Why frictional force gets increased when two surfaces in contact are polished beyond a certain limit ?

A. irregularities are increased

B. surface projections are shapened

C. actual contact area is decreased

D. actual contact area is increased

Answer: D

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4. Why are wheels of an automoile made circular ?

A. It is easy to pump in air in the circular tyres

B. The quantity of material required is very less as compared to other shapes

C. Rolling friction is very small as compared to sliding friction

D. They are very cheap and have a longer life

Answer: C

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5. In a machine, a block continously slides forward and backward on a horizontal platform. When lubricating oil is applied to their surfaces n contact, then the friction between them

A. increases

B. decreases considerably

C. become zero

D. remains constant

Answer: B

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6. When a bicycle is in motion but not pedalled, the force of friction exerted by the ground on the two wheels is such that it acts

A. in the forward direction on both the wheels

B. in the forward direction on the front wheel and in the backward direction on the rear wheel

C. in the backward direction on the front wheel and in the forward direction on the rear wheel

D. in the backward direction on both the wheels

Answer: D

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7. The block of mass 4kg is placed on a rough horizontal surface having the coefficient of kinetic and static friction as 0.4 and 0.5

respectively. If a force of 4N is applied to the body, then the frictional force acting on the body will be [g=$\frac{m}{s^2}$]

A. 20N

B. 10N

C. 4N

D. 8N

Answer: C

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8. A wooden block of mass 100 Kg is kept on a horizontal platform. A force of 60 N is required to just slide the block. But a force of 49N is just sufficient to keep the block.moving with uniform velocity. What is the coefficient of kinetic friction?

A. 0.5

B. 0.25

C. 0.05

D. 0.005

Answer: C

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9. A rectangular block is held against a vertical wall by applying a force of 200N normal to the wall. If the frictional froce just prevents the block from sliding down the wall, what is the mass of the block? (The coefficient of static friction between the block and the wall is 0.49)

A. 5 kg

B. 7.5 kg

C. 10 kg

D. 15 kg

Answer: C

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10. A man slides down on a telegraphic pole with an acceleration equal to one-fourth of acceleration due to gravity.The frictional force between man and pole is equal to (in terms of man's weight W)

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

B. $\frac{W}{2}$

C. $\frac{W}{3}$

D. $\frac{3W}{4}$

Answer: D

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11. A block placed on a rough harizontal surface is imparted a velocity of 10 m/s. the coefficient of kinetic friction between the block and the surface is 0.5 and g=$10m/s^2$. How much distance the block will cover, before coming to rest?

A. 5 m

B. 7.5 m

C. 12 m

D. 10 m

Answer: D

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12. A rectangular block of mass 6 kg is to be held against a rough vertical wall by appplying a force perpendicular to the wall. What is the minimum force to be applied, if the coefficient of friction is 0.42?

A. 140 N

B. 120 N

C. 100 N

D. 80 N

Answer: A

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13. A body of mass m, kept on a rough horizontal surface, is pulled by a force P as shown in the figure. The coefficient of friction

between the body and the surface is μ. What si the limiting force of friction between the body and the surface?

A. $\mu\left[mg+\frac{P}{2}\right]$

B. $\mu\left[mg-\frac{P}{2}\right]$

C. $\mu\left[mg-\frac{P}{2}\right]^{1/2}$

D. $\mu\left[mg+\frac{P}{\sqrt{3}}\right]$

Answer: B

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14. A ladder wighing 300 N is placed against a smooth vertical wall having a coefficient of friction between it and the floor of 0.2. What is the maximum force of friction available at the point of contact between the ladder and the floor?

A. 40 N

B. 50 N

C. 60 N

D. 70 N

Answer: C

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15. A20 kg block is initally at rest. A 75 N force is required to set the block in motion. After the motion starts, a force of 60 N is required to keep the block moving with constant speed. The coefficient of static friction is

A. 0.52

B. 0.44

C. 0.6

D. 0.38

Answer: D

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16. A block of mass 2 kg is kept on the floor. The coefficient of static friction is 0.4. If a force F of 2.5 newton is applied to the block as shown in the figure below, the frictional force between the block and the floor will be

A. 2.5 N

B. 10 N

C. 5 N

D. 7.84 N

Answer: A

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17. A rectanglar body is held at rest by pressing it againts a vertical wall for which $\mu < 1$. Which of the following is generally ture?

A. It will be easier to hold the block if the surfaces in contact are smooth and polished

B. the required pressing force is smaller than the weight mg of the body

C. The required pressing force is greater than the weight mg of the body

D. The required pressing force is independent of friction between surfaces in contact

Answer: C

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18. A force of 200 N is required to push a car of mass 1000 kg slowly at a constant speed along a level road. If a force of 700 N is applied, then the acceleration of the car will be

A. zero

B. $0.2m/s^2$

C. $0.5m/s^2$

D. $1.0m/s^2$

Answer: C

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19. A marble block of mass 2 kg lying on ice when given a velocity of $6m/s$ is stopped by friction in 10s. Then the coefficient of friction is

A. 0.06

B. 0.01

C. 0.02

D. 0.03

Answer: A

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20. Consider a car moving on a straight road with a speed of $100m/s$. The distance at which car can be stopped is $[\mu_k = 0.5]$

A. 100m

B. 400m

C. 800m

D. 1000m

Answer: D

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21. A block of mass 1 kg lies on a horizontal surface in a truck. The coefficient of static friction between the block and the surface is 0.6. If the acceleration of the truck is $5m/s^2$, the frictional force acting on the block is.....newtons.

A. 10 N

B. 5 N

C. 20 N

D. 2.5 N

Answer: B

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22. A block of mass $10kg$ is placed on a rough horizontal surface having coefficient of friction $\mu = 0.5$. If a horizontal force of $100N$ is acting on it, then acceleration of the will be.

A. $0.5m/s^2$

B. $10m/s^2$

C. $5m/s^2$

D. $15m/s^2$

Answer: C

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23. A block B is pushed momentarily along a horizontal surface with an initial velocity v. If μ is the coefficient of sliding friction between B and the surface, block B will come to rest after a time t equal to

A. $\frac{v}{g\mu}$

B. $\frac{v}{g}$

C. $g\frac{\mu}{v}$

D. $\frac{g}{v}$

Answer: A

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24. A horizontal force of 20 N is applied to a block of 10 kg resting on a rough horizontal surface. How much additional force is

required to just move the block, if the coefficient of static friction between the block and the surface is 0.4 ?

A. 15.5 N

B. 10.3 N

C. 8.5 N

D. 19.2 N

Answer: D

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25. What is the angle of friction, if the coefficient of friction between two surfaces is 0.25 ?

A. $\theta = \sin^{-1}\left(\frac{1}{\sqrt{17}}\right)$

B. $\theta = \cos^{-1}\left(\frac{1}{\sqrt{17}}\right)$

C. $\theta = \tan^{-1}(0.5)$

D. $\theta = \cot^{-1}(2)$

Answer: A

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26. A block of 5 kg is resting on a horizontal surface. The coefficient of kinetic friction between the block and the surface is 0.2. What is the acceleration with which the block will remove if a force of 9.8 N is applied to it ?

A. $2m/s^2$

B. $3m/s^2$

C. $1.5m/s^2$

D. $2.5m/s^2$

Answer: A

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27. A body of mass 200 kg is dragged through a distance of 8m on a level ground. What is the work done, if the coefficient of friction is 0.25?

A. 2520 J

B. 3020 J

C. 3520 J

D. 3920 J

Answer: D

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28. A body of mass 60 kg is dragged with just enough force to start moving on a rough surface with coefficient of static and kinetic frictions 0.5 and 0.4 respectively . On applying the same force , what is the acceleration ?

A. $0.49m/s^2$

B. $0.75m/s^2$

C. $0.98m/s^2$

D. $1.5m/s^2$

Answer: C

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29. A rectangular block of mass 2 kg is to be held against a rough vertical wall by applying a force of 98 N perpendicular to the wall.

What is the coefficients of friction if the applied force is the minimum required force?

A. 0.1

B. 0.15

C. 0.2

D. 0.3

Answer: C

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30. A body of 100 kg is placed on a truck. The coefficient of static friction between the body and the truck is 0.2. The truck suddenly decreases its speed from 90 km/hr to 36 km/hr in 5 second. Then

A. The block does not move

B. the block slips forward and hits the driver's cabin

C. block shifts backward

D. nothing can be said about the block

Answer: B

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31. A block slides with a velocity of 10 m/s on a rough horizontal surface. It comes to rest after covering a distance of 50 metre. If g is $10m/s^2$, then the coefficient of dynamic friction between the block and the surface is

A. 0.1

B. 1

C. 10

D. 5

Answer: A

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32. What is the value of frictional forces between the blocks A and B between B and the ground?

(Take g=$10 m / s^2$)

A. 90 N, 5 N

B. 5 N, 90 N

C. 5 N, 75 N

D. 0 N, 80 N

Answer: D

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33. Consider a car moving along a straight horizontal road with a speed of 72 km/h. If the coefficient of static friction between the tyres and the road is 0.5, the shortest distance in which the car can be stopped is $[g = 10ms^{-1}]$

A. 20 m

B. 40 m

C. 30 m

D. 72 m

Answer: B

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34. What is the power of an engine required to move a train of mass 400 metric tons with a speed of 36 km/h, on a level track, if

the force of friction is 10 N/metric ton?

A. 20 kW

B. 30 kW

C. 40 kW

D. 50 kW

Answer: C

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35. A block of mass M is using on a rough horizontal surface. μ_R is the coefficient of kinetic friction between the block and the surface. What is the net force exerted by the surface on the block?

A. Mg

B. μMg

C. $Mg\sqrt{1+\mu_K^2}$

D. $Mg\sqrt{1-\mu_K^2}$

Answer: C

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36. A block A of mass 5 kg and a block 8 are connected by a massless string passing over a fri ctionless pulley as shown in the figure. The coeffici ent of friction (μ) between th e block A and the table is 0.3. What should be the maximum mass oft he block 8. so th at both the blocks do not move ? [Use g $= 10m/s^2$]

A. 1 kg

B. 1.25 kg

C. 1.5 kg

D. 2 kg

Answer: C

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37. A horizontal force just sufficient to move a body of mass $4kg$ lying on a rought horizontal surface is applied on it .The coefficient of static and kinetic friction the body and the surface are $0.8 \text{ and } 0.6$ respectively If the force contines to act even after the block has started moving the acceleration of the block in ms^{-2} is $\left(g = 10ms^{-2}\right)$

A. $\frac{1}{4}m/s^2$

B. $\frac{1}{2}m/s^2$

C. $2m/s^2$

D. $4m/s^2$

Answer: C

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38. The coefficient of static friction, μ5 , between the block A of mass 2 kg and the table as shown in the figure, is 0.2. What would be the maximum mass of the block B, so that the two blocks do not move ? The string and the pulley are assumed to be smooth and massless

(g $= 10m/s^2$)

A. 2.0 kg

B. 0.2 kg

C. 4.0 kg

D. 0.4 kg

Answer: D

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39. A block of mass M is kept on as rough horizontal surface. The coefficient of static friction between the block and the surface is μ. The block is to be pulled by applying a force to it. What minimum force is needed to slide the block? In which direction should this force act?

A. $\theta = \tan^{-1}(\mu)$

B. $\theta = \cos^{-1}(\mu)$

C. $\theta = \sin^{-1}(\mu)$

D. $\theta = \cot^{-1}(\mu)$

Answer: A

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40. A block of mass 5 kg is placed on a rough horizontal surface and a pushing force of20 N is applied to the block as shown in the figure. If the coefficient of static friction between the block and the surface is 0.2, then the frictional force is [g $= 10m/s^2$]

A. 3.2 N

B. 6..4 N

C. 12.8 N

D. 16 N

Answer: C

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41. A block of mass 20 kg is placed on a rough horizontal surface. When a force of 80 N is applied at an angle of $30^{\circ}$with the horizontal, the block just begins to slide. What is the coefficient of static friction ? (g=$10m/s^2$)

A. 0.253

B. 0.433

C. 0.63

D. 0.75

Answer: B

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42. A block of mass 1kg is at rest on a horizontal table. The coeficient of static friction between the block and the table is 0.5 .

The magnitude of the force acting upward at an angle of 60° from the horizontal that will just start the block moving is.

A. 5 N

B. 5.36 N

C. 74.6 N

D. 10 N

Answer: B

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43. A block of mass 1 kg is resting on a rough inclined plane which rises·3 in every 5. What is the minimum force required to move the block up the inclined plane ifμ == 0.5? (g $= 10m/s^2$)

A. 10 N

B. 8 N

C. 6 N

D. 4 N

Answer: A

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44. A block weighing 10 kg just starts sliding down a rough inclined plane, which rises 5 in every 13 . What is the coefficient of friction ?

A. 0.325

B. 0.515

C. 0.416

D. 0.632

Answer: C

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45. A block of mass l O kg is kept at the top of a rough inclined plane ofi_nclination 60° with the horizontal. The length of the inclined plane is 5 m and the coefficient of sliding friction between the block and the surface is 0.3. What is the work done on the block against the force of friction , when it reaches the bottom? (g $= 10m/s^2$)

A. 25 J

B. 40 J

C. 35 J

D. 75 J

Answer: D

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46. A block rests on a rough inclined plane making an angle of 30° with the horizontal. The coefficient of static friction between the block and the plane is 0.8. If the frictional force on the block is 10N, the mass of the block (in kg) is

A. 2

B. 4

C. 1.6

D. 2.5

Answer: A

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47. An ice cube is kept on an inclined plane of angle 30°. The coefficient to kinetic friction between the block and incline plane is

the $1/\sqrt{3}$. What is the acceleration of the block ?

A. zero

B. $2m/s^2$

C. $1.5m/s^2$

D. $5m/s^2$

Answer: A

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48. A block of mass 2kg rests on a rough inclined plane making an angle of 30° with the horizontal. The coefficient of static friction between the block and the plane is 0.7. The frictional force on the block is

A. 0.78×9.8 N

B. 9.8 N

C. $9.8 \times \sqrt{3}$ N

D. $0.7 \times 9.8 \times \sqrt{3}$ N

Answer: B

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49. A block has been placed on an inclined plane . The slope angle of θ of the plane is such that the block slides down the plane at a constant speed . The coefficient of kinetic friction is equal to :

A. gravitational forces

B. $\sin\theta$

C. $\cos\theta$

D. $\tan\theta$

Answer: D

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50. A block of mass 2 kg, slides down a rough inclined plane of length I rn and inclination 60^{o}. The coefficient ofkinetic friction is 0.4. What is the work done against friction, when it slides from the top to the bottom?

A. 2.5 J

B. 1.25 J

C. 3.25 J

D. 3.92 J

Answer: D

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51. A mass of 1 kg is just able to slide down the slope of a rough inclined surface when the angle of inclination is 60°. What is the minimum force necessary to pull the mass up the inclined plane? (g $= 10m/s^2$)

A. 17.32 N

B. 34.64 N

C. 10 N

D. 5.5 N

Answer: A

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52. 300J of work is done in slinding a 2 kg block up an inclined plane of height 10m. Taking g =$10m/s^2$, work done against friction is

A. 200 J

B. 100 J

C. zero

D. 1000 J

Answer: B

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53. A block is at rest at the top of a rough inclined plane of inclination 30° with the horizontal. What is the coefficient of kinetic friction between the block and the plane, if the . block slides down with an acceleration of $\frac{g}{5}$?

A. 0.25

B. 0.275

C. 0.325

D. 0.346

Answer: D

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54. A trolley of mass M is attached to a block of mass m by a string passing over a frictionless pulley as shown in the figure. The coefficient of friction between the troll ey and the surface of the table is μ. What is the acceleration of the trolley and the block when they are released ?

A. $\left(\frac{m-M}{m+M}\right)g$

B. $\left(\frac{m}{M}\right)g$

C. $\left(\frac{m-M}{m+\mu M}\right)g$

D. $\left(\frac{\mu m-M}{m+M}\right)g$

Answer: C

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55. A body is in limiting equilibrium (i.e. just at the point of moving down) on a rough inclined plane of inclination 45°. What is its acceleration , if the angle of inclination is increased to 60° ?

A. 2.5 m/s

B. $3.66m/s^2$

C. $4.5m/s^2$

D. $5.5m/s^2$

Answer: B

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56. What is the time required for a block to slide down from the top to the bottom ofan inclined plane 6.4 m long if the inclination of the plane with the horizonta l is 30^{o} and the coefficient of friction= 0.2?

A. 2s

B. 1.5s

C. 3s

D. 2.5s

Answer: A

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57. A block is projected upwards with a velocity of 5 m/s from the bottom of a rough inclined plane of inclination 30^{o} with the

horizontal. It stops after 0.5 s. What is the coefficient of friction ? (g $= 10m/s^2$)

A. $\sqrt{3}$

B. $\frac{1}{\sqrt{3}}$

C. $\sqrt{2}$

D. $\sqrt{5}$

Answer: B

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58. Which instrument is used to measure atmospheric pressure ?

A. Pyrometer

B. Barometer

C. Spherometer

D. Hygrometer

Answer: B

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59. Which one of the following is based on 'Pascal's Law' ?

A. Sprayer

B. Hydraulic lift

C. Aneroid Barometer

D. Venturimeter

Answer: B

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60. The pressure at the bottom of a tank containing a liquid does not depend on

A. acceleration due to gravity

B. density of the liquid

C. area of the bottom surface

D. height of the liquid column

Answer: C

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61. 1 torr is the hydrostatic pressure exerted by a mercury column of height.

A. 10 cm

B. 76 cm

C. 1 mm

D. 1 cm

Answer: C

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62. Which one of the following is not a unit of pressure ?

A. Pascal

B. Bar

C. Torr or N/m^2

D. Newton

Answer: D

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63. The hydrostatic pressure exerted by a liquid does not depend upon the

A. depth of the liquid

B. density of the air

C. acceleration due to gravity

D. volume of the liquid

Answer: D

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64. Pascal's law is not applied in

A. a hydraulic press

B. a hydraulic jack

C. an atomiser (or sprayer)

D. a hydraulic brakes

Answer: C

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65. By sucking a straw a student can reduce the pressure in his lungs to $750mm$ of $Hg(\text{density}) = 13.6kg/cm^3)$ Using the straw, he can drink water from a glass up to a maximum depth of :

A. 10 cm

B. 75 cm

C. 13.6 cm

D. 1.36 cm

Answer: C

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66. P_A and P_B are the pressures exerted by water columns on the bottoms of vessels A and B respectively. Then, we conclude that

A. $P_A > P_B$

B. $P_A < P_B$

C. $P_A = P_B$

D. Pressure depends upon the shape of the vessel

Answer: C

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67. A cylindrical vessel is filled with mercury and water of equal weights. The total height of the two liquid layers is 29.2 cm. If the specific gravity of mercury is 13.6, then the height of mercury column will be

A. 1 cm

B. 1.5 cm

C. 2 cm

D. 3 cm

Answer: C

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68. Two thin circular metal plates A and B ofradii 2 cm and 3 cm are kept in water at depths of 75 cm and 150 cm respectively below th e

free surface of water. F_A and F_B are the thrusts on the plates A and B respectively. What is the ratio $\frac{F_A}{F_B}$?

A. $\frac{1}{3}$

B. $\frac{2}{5}$

C. $\frac{2}{9}$

D. $\frac{3}{4}$

Answer: C

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69. 1 atmospheric pressure is taken as the pressure exerted by a mercury column of height 76 cm . Wh at is the approximate height of an air column that will produce one atmospheric pressure on its bottom ? [Assume that the temperature and density of a ir and th e

value ofg remains constant throughout the a ir column .]

$[\rho_{\text{mercury}} = 13.6 \times 10^3 kg/m^3$ and $\rho_{\text{air}} = 1.3 kg/m^3]$

A. 8 km

B. 6 km

C. 5 km

D. 4 km

Answer: A

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70. The manual of a truck in structs th e driver to inflate the tyres to a pressure of210 kPa. Wh at is the recommended absolute pressure?

A. 210 kPa

B. 311 kPa

C. 109 kPa

D. 250 kPa

Answer: B

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71. A man of height 1.8 m is in a standing position . What is the difference in the blood pressure between th e blood in his feet and the topmost level of his head, if the density or blood is $1.06kg/m^3$ [Assume that the blood vessels in a human body act as extremely thin pipes and g =$10/s^2$]

A. 12.8 kPa

B. 15.8 kPa

C. 19.8 kPa

D. 23.8 kPa

Answer: C

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72. In a hydraulic press the small cylinder has a diameter of $'d_1'cm$, while the large piston has a diameter of $'d_2'cm$. If a force $'F_1'$ is applied to a small piston, the force on the large piston $'F_2'$ is given by.

A. $F_2 = \frac{d_2^2}{d_1^2}F_1$

B. $F_2 = \frac{d_2^2}{d_1^2}\frac{1_1}{F_1}$

C. $F_2 = \frac{d_1^2}{d_2^2}F_1$

D. $F_2 = \frac{d_1^2}{d_2^2}\frac{1_1}{F_1}$

Answer: A

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73. A small cylinder of2 cm diamete r is connected to a large cylinder of 20 cm di ameter and each cylinder is fitted with suitable pistons. An incompressibl e fluid is fi lled in the cylinders. If a force of 60 N is appl ied to the piston of the small cylinder, then the force exerted on the p iston of the large cylinder will be

A. 600 N

B. 6000 N

C. 12000 N

D. 1200 N

Answer: B

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74. A rectangular glass vessel measuring $25cm \times 12cm \times 20$ cm contains water of height 8 cm. Wh at is the thrust on the base of the vessel ?

[Density of water $= 1000kg/m^3, g = 10m/s^2$]

A. 24 N

B. 20 N

C. 16 N

D. 10 N

Answer: A

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75. The two thigh bones (femur bones) each of cross-sectional area $10cm^2$ support the upper part of a human body of mass 40 kg .

Estimate the average pressure sustained by the femurs. $g = 10m/s^2$

A. $200N/m^2$

B. $2 \times 10^5 N/m^2$

C. $2 \times 10^4 N/m^2$

D. $2 \times 10^3 N/m^2$

Answer: B

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76. In car lift compressed air exerts a force F_1 on a small piston having a radius of 5 cm. This pressure is transmitted to a second piston of radius 15 cm. If the mass of the car to be lifted is 1350 kg, what is F_1? What is the pressure necessary to ac complish this task ?

A. 1500 N

B. 2000 N

C. 1200 N

D. 800 N

Answer: A

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77. During blood transfusion the needle is inserted in a veinn where the gauge pressure is 2000 Pa. At what height must the blood container be placed so that blood may just enter the vein? [density of hole blood $= 1.06 \times 10^3 kgm^{-3}$]

(a). 0.192

(b). 0.182

(c). 0.172

(d). 0.162

A. 0.2 m

B. 0.1 m

C. 0.7 m

D. 0.15

Answer: A

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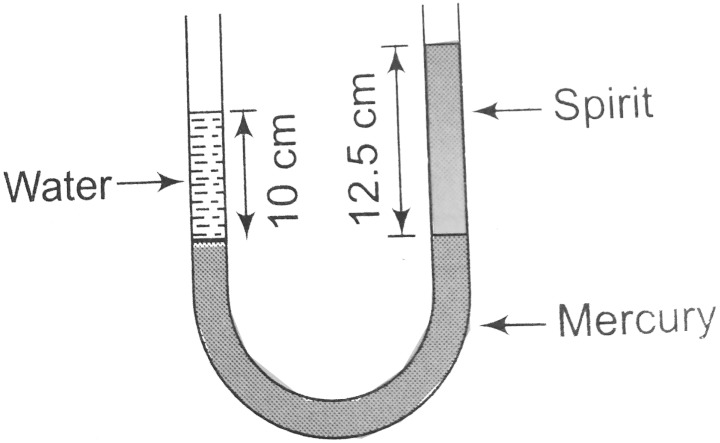
78. A U tube contains water and methylated spirit separated by mercury. The mercury columns in the two arms are at the same level with 10 cm of water in one arm and 12.5 cm of spirit in the

other as shown in figure. The relative density of the spirit is



A. 1.25

B. 0.8

C. 0.65

D. 1.1

Answer: B

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79. Two syringes of different cross-section (without needle filled with water are connected with a tightly fitted rubber tube filled with water. Diameters of the smaller piston an larger piston are $1cm$ and $3cm$ respectively. If a force of 10N is applied to the smaller piston then the force exerted on the larger piston is

A. 30 N

B. 50 N

C. 70 N

D. 90 N

Answer: D

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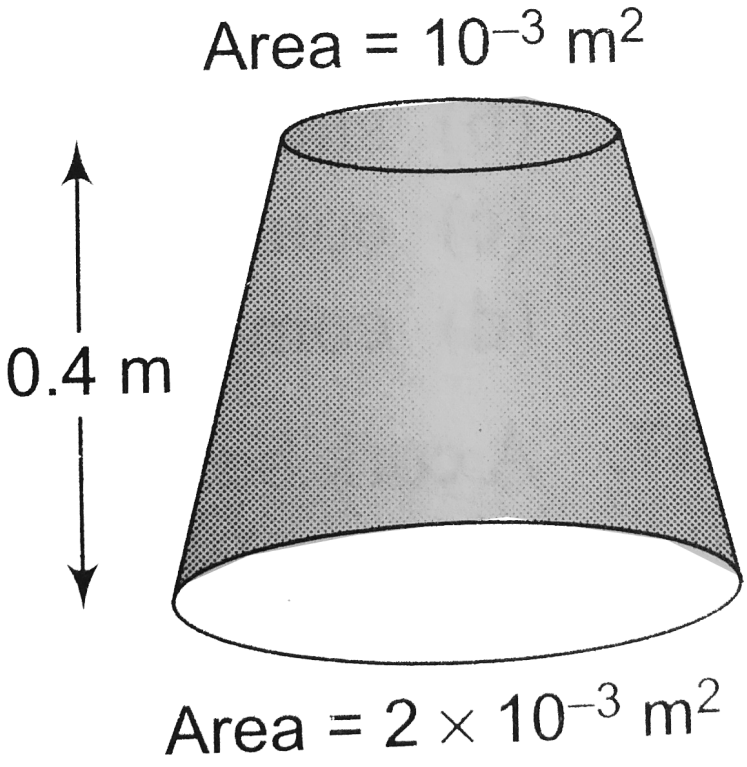
80. A uniformly tapering vessel is filled with a liquid of density $900km/m^3$. The force that acts on the base of the vessel due to the liquid is $(g = 10ms^{-2})$



A. 9.8 N

B. 14.4 N

C. 12.5 N

D. 16 N

Answer: D

Watch Video Solution

81. The dimensions of a rectangular vessel are $2m \times 2m \times 1m$. It is completely filled with water. What is the total force acting against any vertical face ?

$[\rho_{\text{water}} = 10^3 kg/m^3$

A. 4.9×10^3N

B. 9.8×10^3 N

C. 7.5×10^2 N

D. 12.5×10^3 N

Answer: B

Watch Video Solution

82. The barometric height at a certain place is 0.75 m of mercury. What will be the barometric height ifa liquid of density $3.4 \times 10^3 k \frac{g}{m^3}$ is used to llll the barometric tube?

$\left[P_{\text{mercury}} = 13.6 \times 10^3 kg/m^3\right]$

A. 2m

B. 2.5m

C. 3 m

D. 3.5 m

Answer: B

Watch Video Solution

83. A cylinder is fill ed with a liquid of density p upto a height h. What is the hydrostatic pressure exerted by the liquid on the bottom of the cylinder, if the cylinder is kept in a lifi moving upwa rds with an acceleration a ?

A. ρgh

B. $\rho(g+a)$

C. $\rho(g-a)$

D. $\frac{\rho gh}{a}$

Answer: C

Watch Video Solution

84. A barometer kept in a lift reads 11 cm of mercury, when the lift is stationary. Then the lift starts moving down with an acceleration a,

where a lt g. What is the air pressure in the lift, as read by the barometer ?

A. ρgh

B. $\rho(g+a)$

C. $\rho(g-a)$

D. $\frac{\rho gh}{a}$

Answer: B

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85. The force acting on a window of area $50cm \times 50cm$ of a submarine at a depth of $2000m$ in an ocean, the interior of which is maintained at sea level atmospheric pressure is (Density of sea water = 10^(3)kgm^(-3), g = 10ms^(-2)`)

A. 10^6 N

B. 5×10^5 N

C. 25×10^6 N

D. 5×10^6 N

Answer: C

Watch Video Solution

86. A cylindrical vessel of radius r is filled with a homogeneous liquid upto a height h. It is found that the force exerted by the liquid column on the bottom of the cylinder is equal to the force exerted by the liquid on the sides of the cylinder. What is the relation between r and h?

A. $r = \frac{h}{2}$

B. r=h

C. r=2h

D. $r = \frac{3}{2}h$

Answer: D

Watch Video Solution

87. An air bubble doubles in radius on string from the bottom of a lake to its surface. If the atmospheric pressure is equal to that of a column of water of height H, the depth of the lake is

A. H

B. 2 H

C. 7 H

D. 8 H

Answer: B

Watch Video Solution

88. A tank with a square base of area $1.0m^2$ is divided by a vertical parition in the middle. The bottom of the partition has a small hinged door of area $20cm^2$. The tank is filled with water and an acid (of relative density 1.7) in the other, both to a height of $4.0m$. Compute to force necessary the force nec cessary to keep the door closed.

A. 50 N

B. 60 N

C. 70 N

D. 80 N

Answer: C

Watch Video Solution

89. Atmospheric pressure can be measured in terms of pascal, millibar and torr. Which is the correct relation between one torr and one millibar.

A. 1 torr=5.5 millibar

B. 1 torr=1.333 millibar

C. 1 torr=7.238 millibar

D. 1 torr=50 millibar

Answer: C

Watch Video Solution

90. The menual of a car instructs the owner to inflate the tyres to pressure of 200 kPa. (a) What is the recommended gauge pressure ? (b) What is the recommended absolute pressure ? (c) If after the

required inflation of the tyres, the car is driven to a mountain peak. where the atmospheric pressrre is 10 % below that at sea level, what will be the tyre gauge read ? Atmospehric pressure $= 1.01 \times 10^5 Pa.$

A. 210 kPa

B. 220 kPa

C. 215 kPa

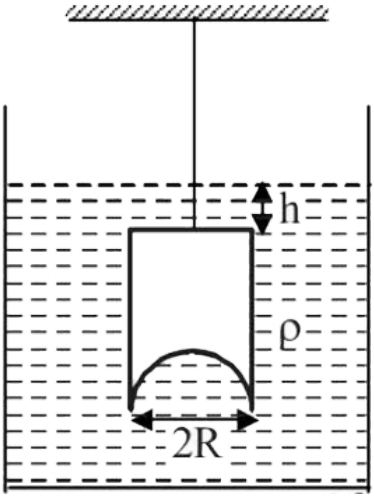
D. 230 kPa

Answer: B

Watch Video Solution

91. A hemispherical portion of radius R is removed from the bottom of a cylinder of radius R. The volume of the remaining cylinder is V and its mass M. It is suspended by a string in a liquid of density ρ

where it stays vertical. The upper surface of the cylinder is at a depth h below the liquid surface. The force on the bottom of the cylinder by the liquid is



A. Mg

B. Mg-$v\rho g$

C. $Mg + \pi R^2 hg\rho$

D. $\rho g\left(V + \pi R^2 h\right)$

Answer: D

Watch Video Solution

92. Which of the following has the highest viscosity ?

A. Water

B. Kerosene

C. Glycerine

D. Mercury

Answer: D

Watch Video Solution

93. The relative velocity of two parallel layers of water is 8 cm/sec. If the perpendicular distance between the layers is 0.1 cm, then velocity gradient will be

A. 60/s

B. 50/s

C. 40/s

D. 80/s

Answer: C

Watch Video Solution

94. The unit of dynamic viscosity is

A. Poiuselle

B. watt

C. stokes

D. dyne/cm^2

Answer: D

Watch Video Solution

95. A metal plate of area 20 cm^2, is separated from a large plate by a layer of glycerine I mm thick. The coefficient of Viscosity of the glycerine is 20 poise. What is the honz?ntal force required to keep the plate moving with a velocity of 2 cm/s?

[poise=$10^{-1}N-s/m^2$]

A. 0.4 N

B. 0.05 N

C. 0.06 N

D. 0.08 N

Answer: C

Watch Video Solution

96. Water is flowing steadjly in a river. P and Q are two layers of water at heights of20 cm and 50 cm from the bottom. The velocity of the layer A is 15 cm/sec. What is the velocity of the layer 8 ?

A. 15cm/s

B. 22.5 cm/s

C. 30 cm/s

D. 37.5 cm/s

Answer: D

Watch Video Solution

97. A square plate of 0.1 m side moves parallel to a second plate with a velocity of $0.1m/s$, both plates being immersed in water. If

the viscous force is 0.002 N and the coefficient of viscosity is 0.01 poise , distance between the plates in m is

A. 5×10^{-2}m

B. 5×10^{-3} m

C. 5×10^{-4} m

D. 5×10^{-5} m

Answer: D

Watch Video Solution

98. What is the force due to viscosity acting on a layer of water of area $4 \times 10^{-2} m^2$, if the relative velocity between the two layers of water, separated by 0.4 mm is 5 cm/s ? The coefficient of viscosity of water = 0.01 poise.[1 poise=0.1 Ns/m^2]

A. 5×10^{-3} N

B. 8×10^{-4} N

C. 12×10^{-3} N

D. 5×10^{-5} N

Answer: C

Watch Video Solution

99. A metal plate ofarea 100 sq. cm, rests on a layer of oil 2mm thick. A force of 0.1 N applied parallel to the plate horizontally keeps it moving with uniform speed of 1cm/ s. What is the coefficient of viscosity of oil ?

A. $0.5Ns/m^2$

B. $1Ns/m^2$

C. $1.5Ns/m^2$

D. $2Ns/m^2$

Answer: A

Watch Video Solution

100. The velocity of water in a river is 18 km/h near the upper surface. The river 5 m deep. What is the shearing stress between the horizontal layers of water ? (Coefficient of viscosity of water= 10^{-2} Poise)

A. $10^{-1}N/m^2$

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

C. $10^{-3}N/m^2$

D. $10^{-4}N/m^2$

Answer: D

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101. If the Reynold's number for the flow ofa liquid in a tube is 3800, then the flow of the liquid is

A. laminar

B. Streamline

C. turbulent

D. unsteady

Answer: C

Watch Video Solution

102. The onset of turbulence in a liquid is determined by

A. Pascal's law

B. Stoke's law

C. Bernoulli's principle

D. Reynold's number

Answer: C

Watch Video Solution

103. The dimensional formula for Reynold's number is

A. $L^1M^1T^{-2}$

B. $L^0M^0T^0$

C. $L^{-1}M^2T^{-1}$

D. $L^1M^1T^1$

Answer: D

Watch Video Solution

104. A copper ball of radius r travels with a uniform speed v in a viscous fluid if the ball is changed with another ball of radius 2r then new uniform speed will be

A. 8v

B. 2v

C. 4v

D. v

Answer: B

Watch Video Solution

105. If a small raindrop fulls through air. its velocity

A. goes on increasing

B. goes on decreasing

C. remains constant initially for some time and then it starts decreasing

D. goes on increasing for some time and then becomes constant

Answer: C

Watch Video Solution

106. Water is flowing through a cylindrical pipe of diameter 1.5 m. The coefficient of viscosity of water is 80 Ns/m^2 and the Reynold's number is 1500. What is the maximum velocity of water, to avoid a turbulent flow?

A. 60 m/s

B. 80 m/s

C. 100 m/s

D. 40 m/s

Answer: D

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107. A glass tube of uniform cross section is connected to a tap with a rubber tube. The tap is opened slowly. Initially the flow of water in the tube is streamline. What should be the speed of fl.ow of water to convert h into a turbulent flow?

[Given : radius of the tube=1cm, $\eta = 1 \times 10^{-3}$ Pas and Reynold's number=2500]

A. 0.15m/s

B. 0.2 m/s

C. 0.125 m/s

D. 0.3 m/s

Answer: B

Watch Video Solution

108. The terminal velocity v of a small steel ball ofradius r fal ling under gravity through a column ofa viscous liquid of coefficient of viscosity η depends on mass of the ball m, acceleration due to gravity g, coefficient of viscosity η and radius r. Which of the following relations is dimensionally correct?

A. $v_r \propto \frac{\eta mg}{r}$

B. $v_r \propto \frac{mgr}{\eta}$

C. $v_r \propto \frac{mg}{r\eta}$

D. $v_r \propto mg \quad \eta r$

Answer: C

Watch Video Solution

109. The speed ofa ball ofradius 2 cm in a viscous liquid is 20 cm/s. Then the speed of ball of radius I cm in the same liquid is

A. 5 cm/s

B. 8 cm/s

C. 10 cm/s

D. 4 cm/s

Answer: C

Watch Video Solution

110. A steel ball of radius 2 mm and of relative density 8.2 is falling through a liquid of relative density 1.9. Its terminal velocity is 0.7 m/s. What is the viscosity of the liquid if the acceleration due to gravity is $10m/s^2$?

A. $4 \times 10^{-2} PI$

B. 8PI

C. 4 PI

D. 8×10^{-2} PI

Answer: A

Watch Video Solution

111. (a) What is the largest average velocity of blood flow in an artery of radius $2 \times 10^{-3} m$ if the flow must remian laminar?

(b) What is the corresponding flow rate? Take viscosity of blood to be $2.084 \times 10^{-3} Pa - s$. Density of blood is $1.06 \times 10^{3} kg / m^{3}$.

A. 0.75 m/s

B. 0.82 m/s

C. 0.98 m/s

D. 1.2 m/s

Answer: D

Watch Video Solution

112. Water is flowing in a pipe of radius 1.5 cm with an average velocity 15 cm s^{-1}. What is the nature of flow? Given coefficient of viscosity of water is 10^{-3} kg $m^{-1}s^{-1}$ and its density is 10^{3} kg m^{-3}

A. Streamline

B. Turbulent

C. Unstable

D. Critical

Answer: C

Watch Video Solution

113. Eight equal droplets of water each ofradius rare falling through air with a terminal velocity of 7.5 cm/s^2. The drops coalesce to form a big drop in air. What will be the terminal velocity of the big drop.

A. 15 cm/s

B. 20 cm/s

C. 25 cm/s

D. 30 cm/s

Answer: B

Watch Video Solution

114. Spherical balls of radius 'R' are falling in a viscous fluid of viscosity $'\eta'$ with a velocity 'v'. The retarding viscous force acting

on the spherical ball is

A. directly proportional to both radius R and velocity v

B. inversely proportional to R but directly proportional to velocity v

C. directly proportional to R but in inversely proportional to velocity v

D. inversely proportional to both radius R and velocity

Answer: D

Watch Video Solution

115. The terminal speed of a sphere of gold (density = 19.5 kg m^{-3}) is 0.2 ms^{-1} in a viscous liquid (density = 1.5 kg m^{-3}). Then, the terminal speed of a sphere of silver (density = 10.5 kg m^{-3}) of the same size in the same liquid is

A. $0.133ms^{-1}$

B. $0.4ms^{-1}$

C. $0.2ms^{-1}$

D. $0.1ms^{-1}$

Answer: A

Watch Video Solution

116. A metal ball ofradius 10^{-4} m and density $10^4kg/m^3$ falls freely under gravity through a distance 'h' and enters a tank of water. It is found that after entering the water, the velocity of ball does not change. What is the value of h?

$[\eta \text{for water} \quad 10^{-5} \quad \text{Pas} \quad , g = 10m/s^2 \quad \text{and} \quad \text{or} \quad h_{\text{water}} = 10^3kg/m^3$

]

A. 10m

B. 15m

C. 18m

D. 20m

Answer: D

Watch Video Solution

117. Two water drops of the same radius are falling through air with a velocity 5cm/s. If the two drops coalesce to form one drop, the terminal velocity of the drop will be

A. 10 cm/s

B. $5\sqrt{2}cm/s$

C. 2.5 cm/s

D. $5 \times 4^{1/3}cm/s$

Answer: D

Watch Video Solution

118. 27 identical drops of water are falling down vertically in air each with a terminal velocity of 0.15 m/s. If they combine to form a single bigger drop , what will be its terminal velocity?

A. 0 m/s

B. 1.35 m/s

C. 0.3 m/s

D. 0.45 m/s

Answer: D

Watch Video Solution

119. Two rain drops reach the earth with different terminal velocities having ratio $9:4$. Then , the ratio of their volumes is

A. $\frac{3}{2}$

B. $\frac{9}{4}$

C. $\frac{27}{8}$

D. $\frac{8}{27}$

Answer: B

Watch Video Solution

120. The velocity of small ball of mass M and density d_1 when dropped a container filled with glycerine becomes constant after some time. If the density of glycerine is d_2, the viscous force acting on ball is

A. $Mg(d_1 - d_2)$

B. $Mg\left(1-\frac{d_2}{d_1}\right)$

C. Mgd_1d_2

D. $M\frac{g(d_1)}{d_2}$

Answer: C

Watch Video Solution

121. A sphere of radius R and density ρ_1 is dropped in a liquid of density σ. Its terminal velocity is v_1. If another sphere of radius R and density ρ_2 is dropped in the same liquid, its terminal velocity will be:

A. $\left(\frac{P_1-\sigma}{P_2-\sigma}\right)v_1$

B. $\left(\frac{P_1}{P_2}\right)v_1$

C. $\left(\frac{P_2}{P_1}\right)v_1$

D. $\left(\frac{P_2-\sigma}{P_1-\sigma}\right)v_1$

Answer: B

Watch Video Solution

122. Two hail stones with radii in the ratio of $1:2$ fall from a great height through the atmosphere. Then the ratio of their momentum after they have attained terminal velocity is

A. $1:1$

B. $1:4$

C. $1:32$

D. $1:16$

Answer: D

Watch Video Solution

123. The terminal speed of a sphere of gold (density = 19.5 kg m^{-3}) is 0.2 ms^{-1} in a viscous liquid (density = 1.5 kg m^{-3}). Then, the terminal speed of a sphere of silver (density = 10.5 kg m^{-3}) of the same size in the same liquid is

A. $0.1m/s^{-1}$

B. $0.2m/s^{-1}$

C. $0.4m/s^{-1}$

D. $0.133m/s^{-1}$

Answer: C

Watch Video Solution

124. Bernouli's equation for a steady streamline flow of a non-viscous incompressible fluid expresses the principle of

A. conservation of mass

B. conservation of linear momentum

C. conservation of angular momentum

D. conservation of energy

Answer: A

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125. In old age arteries carrying blood in the human body become narrow resulting in an increase in the blood pressure, this follows from

A. Stoke's law

B. Pascal's law

C. Archimede's principle

D. Bernoulli's principle

Answer: D

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126. A liquid flows through a horizontal tube of variable diameter. Then the pressure is lowest where

A. The velocity is zero

B. the velocity is maximum

C. the diameter is maximum

D. Both diameter and velocity are maximum

Answer: D

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127. High speed wind blows over a house. The force on the roof is

A. in the horizontal direction

B. in the upward direction

C. in the downward direction

D. zero

Answer: B

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128. Water flows out of the hole on the side of a bucket and follows a parabolic path. If the bucket falls freely under gravity, then ignoring air resistance, the water flow

A. follows a straight line path relative to the falling bucket

B. Follows a parabolic path relative to the falling bucket

C. decreases but continues to flow

D. stops

Answer: B

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129. A cylinder of height 20m is completely filled with water. The velocity of effux of water $\left(\in ms^{-1} \right)$ through a small hole on the side wall of the cylinder near its bottom is

A. 10 m/s

B. 25.5 m/s

C. 20 m/s

D. 5 m/s

Answer: D

Watch Video Solution

130. There are two holes P and Q at depths h and 4h from the top of a large vessel, completely filled with water. P is a square hole of side L and Q is a circular hole of radius r. If the same quantity of water flows out per second from both the holes, then the relation between L and r is

A. $L = \frac{r}{2}$

B. $L = \sqrt{2\pi r}$

C. $L - 2\pi r$

D. $L = \frac{\sqrt{2\pi}}{r}$

Answer: C

Watch Video Solution

131. Water from a tap of cross sectional area $1cm^2$ starts falling down vertically, with a speed of $1m/s$. What is the area of cross section of the stream of water at a distance of 20cm below the mouth of the tap?

[Assume that (1) the flow is steady, (2) pressure is constant throughout the stream of water and g=$10m/s^2$]

A. $3 \times 10^{-5} m^2$

B. $4 \times 10^{-5} m^2$

C. $5 \times 10^{-5} m^2$

D. $6 \times 10^{-5} m^2$

Answer: B

Watch Video Solution

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

A. proportional to h

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

C. proportional to h^2

D. independent of h

Answer: C

Watch Video Solution

133. A cylindrical vessel is filled with water as shown in the figure. A hole should be bored so that the water comes out upto maximum distance.

A. H/4 height from the surface

B. H/2 height from the surface

C. 3H/4 height from the surface

D. H height from the surface

Answer: B

View Text Solution

134. The water level on a tank is 5m high. There is a hole of $1cm^2$ cross-section at the bottom of the tank. Find the initial rate with which water will leak through the hole. ($g = 10ms^{-2}$)

A. $10^{-3}m^3/s$

B. $10^{-2}m^3/s$

C. $10^{-4}m^3/s$

D. $10^3 m^3 / s$

Answer: B

Watch Video Solution

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

A. $1/2v^2/g$ and p/ρ

B. $1/2v^2/g$ and $p/\rho g$

C. $1/2v$ and p/ρ

D. $1/2v$ and $p/\rho g$

Answer: A

Watch Video Solution

136. Water flows through a tube of non-uniform areas of cross-section. The cross section of the parts A, B and C are 25, 5 and 35 cm^2 respectively. Which parts has the highest velocity ?

A. A

B. B

C. conservation of angular momentum

D. all have same velocity

Answer: B

View Text Solution

137. Water flow through a horizontal pipe whose internal diameter is $2.0cm$ at a speed of $1.0ms^{-1}$ What should be the diameter of the nozzle, If the water is to emerge at a speed of $4.0ms^{-1}$?

A. 1cm

B. 2cm

C. 0.5 cm

D. 1.5 cm

Answer: B

Watch Video Solution

138. In a test experiment on a model aeroplane in a wind tunn el, the flow speeds on the upper and lower surfaces of the win gs are 70m/s and 60m/s respectivel y. Wh at is th e dynamic lift of the win g if its area is $2.4m^2$?

A. 1014 N

B. 2028 N

C. 2315 N

D. 1645 N

Answer: A

Watch Video Solution

139. The flow speeds of air on the lower and upper surfaces of the wing ofan aeroplane are v and $\sqrt{2}v$ respectively. A is the area of the wing and ρ is the density of th e surrounding air. What is the force of the dynamic lift on the wing ?

A. $\frac{1}{2}\rho vA$

B. $\frac{1}{2}\rho v^2 A$

C. $\rho v^2 A$

D. $\frac{\rho v^2}{2A}$

Answer: B

Watch Video Solution

140. Water is flowing in a horizontal pipe ofnonuniform cross section. The velocities of water at points A and Bin the tube, are in the ratio of 4 : 1, what is the ratio of the diameters of the pipe at A and B ?

A. $1:1$

B. `1:2:

C. $2:1$

D. $2:3$

Answer: B

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141. A tank of height 9.8 mis completely filled with water. It has an orifice at the centre of one vertical wall. What is the velocity of discharge (efflux) of water through the orifice ?

A. 4.9 m/s

B. 9.8 m/s

C. 7.5 m/s

D. 19.6 m/s

Answer: B

Watch Video Solution

142. The horizontal pipe lines supplying water to a city are as shown in the figure. Their areas of cross section and the velocities of water in them are also shown in the figure. What is the velocity

of water in the pipe R.

- 2 m/s
- 2.5 m/s
- 3 m/s
- 4 m/s

Answer: B

View Text Solution

143. There is a stream line flow of water in a horizontal pipeline ofnon-unifon11 cross-section . The velocities of water at two points. A and B in the pipe are 1 m/s and 2 m/s. The pressure at A is 2000 pascal. What is the pressure at B ?

A. 300 Pa

B. 400 Pa

C. 500 Pa

D. 600 Pa

Answer: C

Watch Video Solution

144. Blood is flowing at the rates of 200 $cm^3/\sec$ in a capillary of cross-sectional area $0.5m^2$. The velocity of flow, (in mm/sec) is:

A. 0.1

B. 0.2

C. 0.3

D. 0.4

Answer: C

Watch Video Solution

145. A cylinder contains water upto a height H. It has three orifices o_1, o_2, o_3. Let v_1, v_2, v_3, be the speeds of efflux of water from the three orifices. Then

A. $v_1 = v_2 = v_3$

B. $v_1 < v_2 < v_3$

C. $v_1 > v_2 > v_3$

D. $v_1 = v_3 > v_2$

Answer: D

View Text Solution

146. The cylindrical tube of a spray pump has a cross-section of $8cm^2$, one end of which has 40 fine holes each of area $10^{-8}m^2$. If

the liquid flows inside the tube with a speed of $0.15m\ \min^{-1}$, the speed with which the liquid is ejected through the holes is.

A. 5 m/s

B. 0.05 m/s

C. 0.5 m/s

D. 50 m/s

Answer: B

Watch Video Solution

147. Water is flowing through two pipes having constrictions at A and B. The manometric levels in the tubes P, Q, R and S are as shown in the figure. Then

A. both figures are correct

B. both figures are wrong

C. figure 1 is correct and figure 2 is wrong

D. figure 1 is wrong and figure 2 is correct

Answer: A

View Text Solution

148. A tank with vertical walls is mounted so that its base is at a height H above the horizontal ground. The tank is filled with water to a depth h. A hole is punched in the side wall of the tank at a depth x below the water surface. To have maximum range of the emerging stream, the value of x is

A. $x = 2[D(H + D)]^{1/2}$

B. $x = 2[D(H - D)]^{1/2}$

C. $x = 2(g \cdot D)^{1/2}$

D. None of these

Answer: C

Watch Video Solution

149. At two points on a horizontal tube of varying cross-section, the radii are 1 cm and 0.4 cm, velocities of the fluid are v_1 and v_2 and the pressure difference $(P_1 - P_2)$ between these point is 4.9 cm of water Then the value of $\sqrt{(v_2)^2 - (v_1)^2}$ is

A. 3.13 cm/sec

B. 98 cm/sec

C. 9.8 cm/sec

D. 60 cm/sec

Answer: B

Watch Video Solution

150. Water from a tap emerges vertically downwards with an initial spped of $1.0ms^{-1}$. The cross-sectional area of the tap is $10^{-4}m^2$. Assume that the pressure is constant throughout the stream of water, and that the flow is steady. The cross-sectional area of the stream 0.15 m below the tap is

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

B. $3 \times 10^{-5}m^2$

C. $4 \times 10^{-5}m^2$

D. $5 \times 10^{-5}m^2$

Answer: B

Watch Video Solution

151. A horizontal pipeline carries water in a streamline flow. At a point along the pipe, where the cross- sectional area is $10cm^2$, the water velocity is $1ms^{-1}$ and the pressure is 2000 Pa. The pressure of water at another point where the cross-sectional area is $5cm^2$, is.....Pa. (Density of water $= 10^3 kg.\, m^{-3}$)

A. 1000 Pa

B. 750 Pa

C. 500 Pa

D. 250 Pa

Answer: D

Watch Video Solution

152. The reading of a pressure gauge attached to a closed horizontal pipe was 3.5×10^5 Pa. When the valve of the pipe was opened , the pressure was reduced to 3×10^5 Pa. What was the speed of water flowing out of the pipe ?

A. 2.5 m/s

B. 5 m/s

C. 7.5 m/s

D. 10 m/s

Answer: C

Watch Video Solution

153. A tank of height 5 m/s completely filled with water. There is a hole of cross sectional area $1cm^2$ near its bottom. What is the

initial volume of water that will come out of the hole per second. (Use g=$10m/s^2$)

A. $10^{-3}m^3/s$

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

C. $3 \times 10^{-2}m^3/s$

D. $4 \times 10^{-3}m^3/s$

Answer: D

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154. A gardening pipe having an internal radius R is connected to a water sprinkler havmg n holes each of radius r. The water in the pipe has a speed v. What is the speed of water leaving the sprinkler ?

A. $\left(\frac{R^2}{r^2}\right)nv$

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

C. $\left(\frac{r^2}{R^2}\right)v$

D. $\left(\frac{nR^2}{r^2}\right)v$

Answer: A

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155. A fluid of density ρ flows through a horizontal pipe having two different cross-section s of areas A and 2A, Th e pressure at the smaller cross-section is P and lluid velocity at that section is v· What is the velocity and pressure at the larger cross-sect ion

A. $\frac{v}{2}, P + \frac{1}{2}\rho v^2$

B. $\frac{v}{4}, P + \frac{3}{8}\rho v^2$

C. $\frac{v}{2}, P + \frac{3}{8}\rho v^2$

D. $v, P + \frac{3}{4}\rho v^2$

Answer: B

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156. Water is flowing continuously from a tap having an internal diameter 8×10^{-3}m. The water velocity as it leves the tap is $0.4ms^{-1}$. The diameter of the water stream at a distance 2×10^{-1} m below the tap is close to $\left(g = 10m / s^2\right)$

A. $5.0 \times 10^{-3}m$

B. $7.5 \times 10^{-3}m$

C. $9.6 \times 10^{-3}m$

D. $3.6 \times 10^{-3}m$

Answer: C

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157. Which of the diagrams corectly shows the change in kinetic energy of an iron sphere falling freely in a lake having sufficient depth to impart it a terminal velocity ?

A. 

B. 

C. 

D. 

Answer: D

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158. 

There are 3 orifices o_1, o_2 and o_3 for a cylindrical vessel containing water upto a height H. Water flowing out from o_1, o_2 and o_3 Strikes

the ground at different points. Which is the correct diagram showing the trajectories of water?

A. 

B. 

C. 

D. 

Answer: B

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159. A viscous fluid is flowing through a cylindrical tube. The velocity distribution of the fluid is best represented by the diagram

A. Figure 2

B. Figure 3

C. Figure 4

D. Figure 1

Answer: C

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160. When a body falls in air, the resistance of air depends to a great extent on the shape of the body. 3 different shapes are given. Arrange the bodies in the ascending order of air resistance. (The cross sectional areas are the same.)

A. 1,2,3

B. 3,2,1

C. 3,1,2

D. 2,1,3

Answer: B

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161. Water flows through a frictionless pipe with a variable cross-section as shown in the figu re. Pressure P at points along the axis is represented by

A. Figure 2

B. Figure 3

C. Figure 4

D. Figure 1

Answer: B

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162. A ball is made of a material of density ρ where $\rho_{oil} < \rho < \rho_{water}$ with ρ_{oil} and ρ_{water} representing the densities of oil and water, respectively. The oil and water are immiscible. If the above ball is in equilibrium in a mixture of this oil and water, which of the following pictures represents its equilibrium position?

A. 

B. 

C. 

D. 

Answer: B

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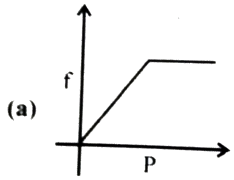
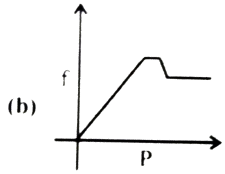
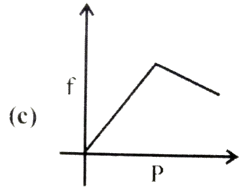
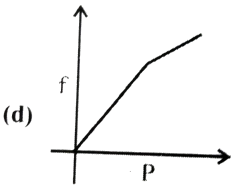
163. An external horizontal force P acts on a block placed on a rough horizontal surface. The force of friction (f) opposes the motion between them. Which of the following graphs represents the relation between P and f correctly?

A. 

B. 

C. 

D. 

Answer: C

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164. A smal l spherical ball is dropped in a viscous liquid. Its velocity al different points in its vertical motion is measured and velocity against distance curves are plotted. Which curve wi ll represent the motion of the ball in the liquid ?

A. curve A

B. Curve B

C. Curve C

D. Curve D

Answer: B

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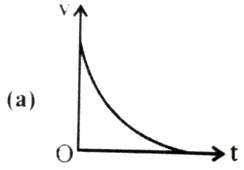
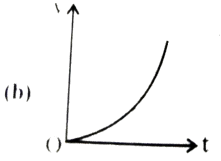
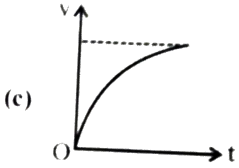
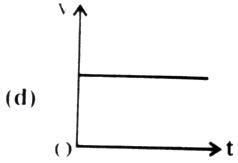
165. In viscosity experiment which one is the graph between, velocity of time for ball falling in viscous fluid .

A. 

B. 

C. 

D. 

Answer: B

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166. When a bicycle is being pedalled, the frictional forces exerted by the ground are

A. in the backward direction on both the wheels

B. in the forward direction on both the wheels

C. in the forward direction on the front wheel and in the backward direction on the rear wheel

D. in the backward direction on the front wheel and in the forward direction on the rear wheel

Answer: C

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Test Your Grasp

1. A wooden block of mass 100 Kg is kept on a horizontal platform. A force of 60 N is required to just slide the block. But a force of 49N is just sufficient to keep the block.moving with uniform velocity. What is the coefficient of kinetic friction?

A. 0.5

B. 0.25

C. 0.05

D. 0.005

Answer: C

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2. A horizontal force just sufficient to move a body of mass $4kg$ lying on a rought horizontal surface is applied on it .The coefficient

of static and kinetic friction the body and the surface are 0.8 and 0.6 respectively If the force contines to act even after the block has started moving the acceleration of the block in ms^{-2} is $(g = 10ms^{-2})$

A. $\frac{1}{4}m/s^2$

B. $\frac{1}{2}m/s^2$

C. $2m/s^2$

D. $4m/s^2$

Answer: C

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3. A block weighing 10 kg just starts sliding down a rough inclined plane, which rises 5 in every 13 . What is the coefficient of friction ?

A. 0.325

B. 0.515

C. 0.416

D. 0.632

Answer: C

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4. A conical vessel having base area $4 \times 10^3 m^2$ and height 40 cm is filled with a liquid of density 0. 9 grarm/cm^3. What is the force acting on the base of the vessel due to the liquid column ?

[Use g $= 10m/s^2$]

A. 9.8 N

B. 14.4 N

C. 12.5 N

D. 16 N

Answer: B

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5. A metal plate of area 20 cm^2, is separated from a large plate by a layer of glycerine I mm thick. The coefficient of Viscosity of the glycerine is 20 poise. What is the honz?ntal force required to keep the plate moving with a velocity of 2 cm/s?

[poise=$10^{-1}N-s/m^2$]

A. 0.04 N

B. 0.05 N

C. 0.06 N

D. 0.08 N

Answer: D

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6. Eight equal droplets of water each ofradius rare falling through air with a terminal velocity of 7.5 cm/s^2. The drops coalesce to form a big drop in air. What will be the terminal velocity of the big drop.

A. 15 cm/s

B. 20 cm/s

C. 25 cm/s

D. 30 cm/s

Answer: D

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7. The water level on a tank is 5m high. There is a hole of $1cm^2$ cross-section at the bottom of the tank. Find the initial rate with which water will leak through the hole. ($g = 10ms^{-2}$)

A. $10^{-3}m^3/s$

B. $10^{-2}m^3/s$

C. $10^{-4}m^3/s$

D. $10n^3/s$

Answer: A

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8. The flow speeds of air on the lower and upper surfaces of the wing ofan aeroplane are v and $\sqrt{2}v$ respectively. A is the area of the

wing and ρ is the density of th e surrounding air. What is the force of the dynamic lift on the wing ?

A. $\frac{1}{2}\rho v A$

B. $\frac{1}{2}\rho v^2 A$

C. $\rho v^2 A$

D. $\frac{\rho v^2}{2A}$

Answer: B

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9. At two points on a horizontal tube of varying cross-section, the radii are 1 cm and 0.4 cm, velocities of the fluid are v_1 and v_2 and the pressure difference $(P_1 - P_2)$ between these point is 4.9 cm of water Then the value of $\sqrt{v_2^2 - v_1^2}$ is

A. 49 cm/sec

B. 98 cm/sec

C. 9.8 cm/sec

D. 60 cm/sec

Answer: B

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10. If the pressure at half the depth of a tank is equal to $\frac{2}{3}$ the pressure at the bottom of the tank, then the height of the water column in the tank is

$\left(\text{Atmospheric pressure} \quad = 10^5 N/m^2\right)$

A. 10m

B. 15m

C. 20m

D. 25m

Answer: C

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