PHYSICS

BOOKS - DISHA PHYSICS (HINGLISH)

FLUID MECHANICS

Physics

1. Calculate the force required to separate the glass plates of area $10^{-2}m^2$ with a film of water 0.05 mm thickness between them

(surface tension of water $= 70 \times 10^{-3} N/m$))

A. 28 n

B. 14 n

C. 50 n

D. 38 N

Answer:

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2. A thin metal disc of radius r floats on water surface and bends the surface downwards along the perimeter making an angle θ with vertical edge of the disc of the disc. If the disc dispplaces a weight of water W and surface tension of water is T, then the weight of metal disc is

A. $2\pi T + W$

B. $2\pi T \cos\theta - W$

C. $2\pi r T \cos\theta + W$

D. $W - 2\pi rT\cos\theta$

Answer:

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3. The amount of work done in blowing a soap bubble such that its diameter increases from d to D is (T=surface tension of the solution)

A. $4\pi\left(D^2 - d^2\right)T$

B. $8\pi\left(D^2 - d^2\right)T$

C. $\pi\left(D^2 - d^2\right)T$

D. $2\pi\left(D^2 - d^2\right)T$

Answer:

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4. A film of water is formed between two straight parallel wires of length 10 cm each separated by $0.5cm$ If their separation is increased by $1mm$ while still maintaining their parallelism, how much work will have to be

done (Surface tension of water $= 7.2 \times 10^{-2} \frac{N}{m}$)

A. 7.22×10^{-6} Joule

B. 1.44×10^{-5} Joule

C. 2.88×10^{-5} Joule

D. 5.76×10^{-5} Joule

Answer:

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5. The liquid meniscus in a capillary tube will be convex, if the angle of contact is

A. Greater than 90^{o}

B. Less than 90^{o}

C. Equal to 90^{o}

D. Equal to 0^{o}

Answer:

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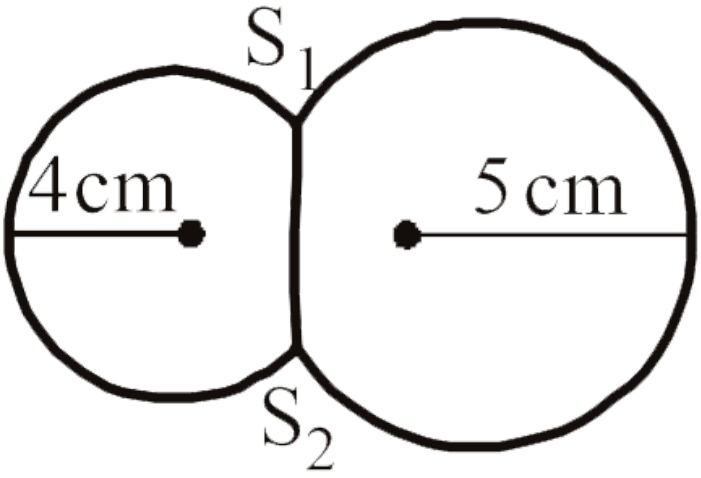
6. Two soap bubbles of radii r_1 and r_2 equal to 4 cm and 5 cm are touching each other over a common surface S_1S_2 (shown in figure). Its radius will be



A. 4 cm

B. 20 cm

C. 5 cm

D. 4.5 cm

Answer:

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7. Prove that if two bubbles of radii r_1 and r_2 coalesce isothermally in vacuum then the radius of new bubble will be $r = \sqrt{r_1^2 + r_2^2}$

A. $R = (r_1 + r_2)/2$

B. $R = r_1(r_1r_2 + r_2)$

C. $R^2 = r_1^2 + r_2^2$

D. $R = r_1 + r_2$

Answer:

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8. Two parallel glass plates are dipped partly in the liquid of denstiy 'd' keeping them vertical. If the distance between the plates is 'x', Surface tension is T and angle of contact is θ

then ries of liquid between the plates due to capillary will be

A. $\frac{T\cos\theta}{xd}$

B. $\frac{2T\cos\theta}{xdg}$

C. $\frac{2T}{xdg\cos\theta}$

D. $\frac{T\cos\theta}{xdg}$

Answer:

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9. A capillary tube of radius R is immersed in water and water rises in it a height H. Mass of water in capillary tube is M. If the radius of the tube is doubled, mass of water that will rise in capillary tube will be

A. M

B. 2M

C. $M/2$

D. 4M

Answer:

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10. In a surface tension experiment with a capillary tube water rises upto $0.1m$. If the same experiment is repeated in an artificial satellite, which is revolving around the earth, water will rise in the capillary tube upto a height of

A. 0.1 m

B. 0.2m

C. 0.98 m

D. Full length of the capillary tube

Answer:

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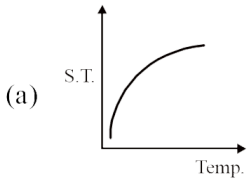
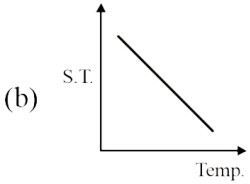
11. Which graph represents the variation of surface tension with temperature over small temperature ranges for water?

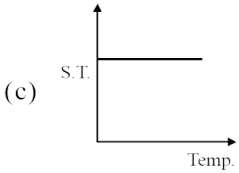
A.



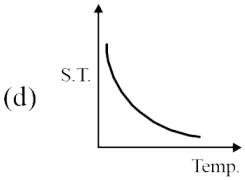
B.



C.



D.



Answer:

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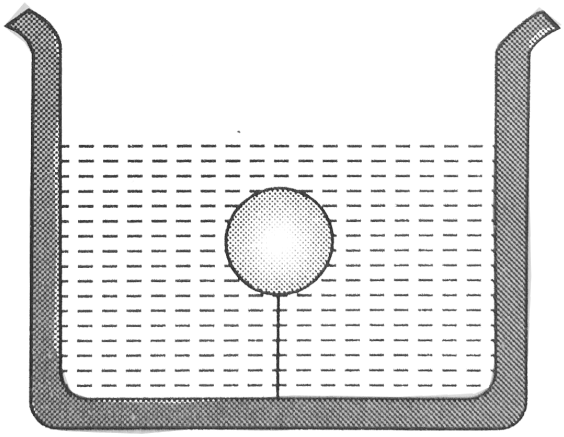
12. A solid sphere of density $\eta(>1)$ times lighter than water is suspended in a water tank by a string tied to its base as shown in fig. if the mass of the sphere is m then the tension in the string is given by



A. $\left(\frac{\eta-1}{\eta}\right)mg$

B. ηmg

C. $\frac{mg}{\eta - 1}$

D. $(\eta - 1)mg$

Answer:

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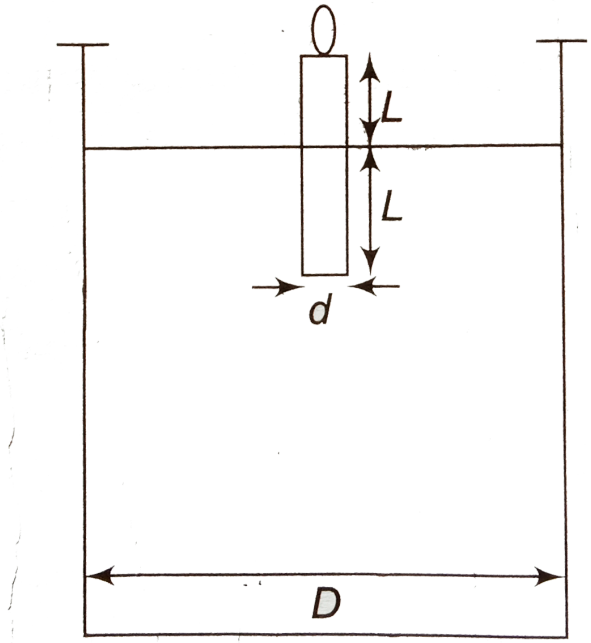
13. A candle of diameter d is floating on a liquid in a cylindrical container of diameter $D(D << d)$ as shown in figure. If is burning at the rate of $2cm/h$ then the top of the

candle will :



A. Remain at the same height

B. Fall at the rate of 1 cm/hour

C. Fall at the rate of 2 cm/hour

D. Go up the rate of 1 cm/hour

Answer:

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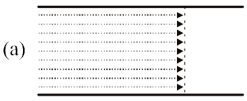
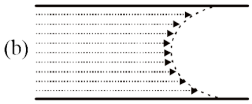
14. A viscous fluid is flowing through a cylindrical tube. The velocity distribution of the fluid is best represented by the diagram

A. 

B. 

C. 

D. None of these

Answer:

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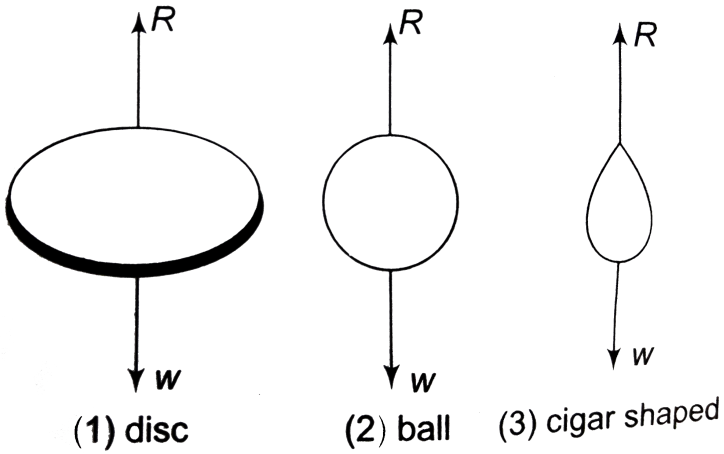
15. When a body falls in a air, the resistance of air depends to a great extent on the shape of the body. The different shapes are given. Identify the combination of air resistance which truly represents the physical situation?

(The cross-sectional areas are the same)



A. $1 < 2 < 3$

B. $2 < 3 < 1$

C. $3 < 2 < 1$

D. $3 < 1 < 2$

Answer:

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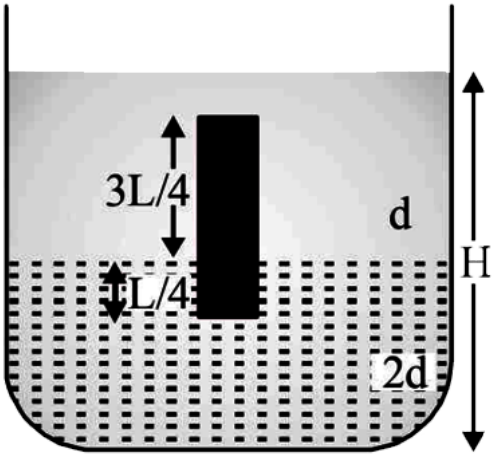
16. A homogeneous solid cylinder of length L(LltH/2), cross-sectional area A/5 is immersed such that it floats with its axis vertical at the liquid-liquid interface with length L/4 in the denser liquid as shown in the figure. The lower density liquid is open to atmosphere having

pressure P_0. Then density D of solid is given by



A. $\frac{5}{4}d$

B. $\frac{4}{5}d$

C. d

D. $\frac{d}{5}$

Answer:

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17. A large open tank has two holes in the wall. One is a square hole of side L at a depth y from the top and the other is a circular hole of radius R at a depth 4y from the top. When the tank is completely filled with water, the quantities of water flowing out per second from both holes are the same. Then, R is equal to

A. $2\pi L$

B. $\frac{L}{\sqrt{2\pi}}$

C. L

D. $\frac{L}{2\pi}$

Answer:

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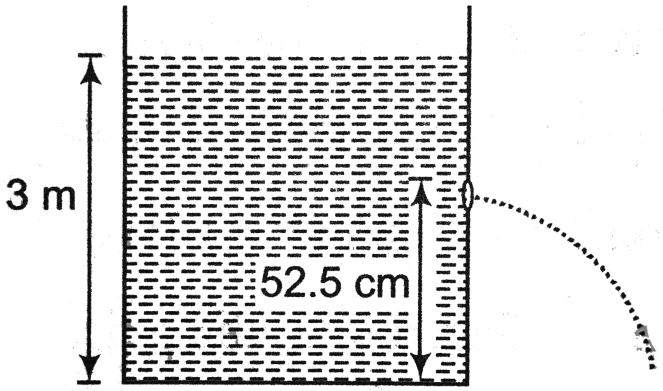
18. Water is filled in a cylindrical container to a height of $3m$. The ratio of the cross-sectional area of the orifice and the beaker is 0.1. The square of the speed of the liquid coming out

from the orifice is $\left(g = 10m/s^2\right)$.



A. $50m^2/s^2$

B. $50.5m^2/s^2$

C. $51m^2/s^2$

D. $52m^2/s^2$

Answer:

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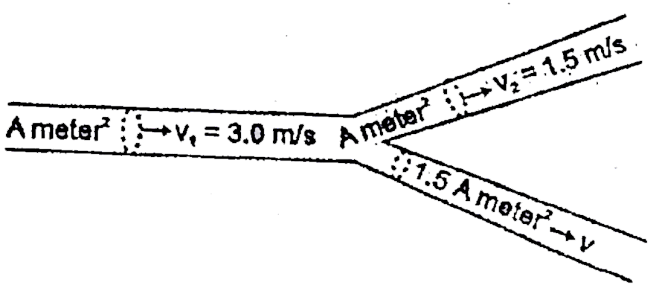
19. An incompressible liquid flows through a horizontal tube as shown in the figure. Then the velocity 'v' of the fluid is:



A. 3.0 m/s

B. 1.5 m/s

C. 1.0 m/s

D. 2.25 m/s

Answer:

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20. Radius of a capillary is $2 \times 10^{-3} m$. A liquid of weight $6.28 \times 10^{-4} N$ may remain in the capillary, then the surface tension of liquid will be:

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

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

C. $5 N/m$

D. $50 N/m$

Answer:

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21. The temperature at which the surface tension of water is zero

(1) $370^{\circ} C$

(2) $0^{\circ} C$

(3) Slightly less than $647K$

(4) $277K$

A. 1,2 and 3 are correct

B. 1 and 2 are correct

C. 2 and 4 correct

D. 1 and 3 are correct

Answer:

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22. Which of the following statements are true in case when two water drops coalesce and make a bigger drop?

(1) Energy is released.

(2) Energy is absorbed.

(3) The surface area of the bigger drop is smaller than the sum of the surface areas of both the drops.

(4) The surface area of the bigger drop is greater than the sum of the surface areas of both the drops.

A. 1,2 and 3 are correct

B. 2 and 2 are correct

C. 3 and 4 correct

D. 2 and 3 are correct

Answer:

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23. An air bubble in a water tank rises from the bottom to the top. Which of the following statements are true?

A. 1,2 and 3 are correct

B. 3 and 2 are correct

C. 4 and 4 correct

D. 3 and 3 are correct

Answer:

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24. There is a small mercury drop of radius $4.0mm$. A surface P of area $1.0mm^2$ is placed at the top of the drop. Atmospheric pressure

$= 10^5 Pa$. Surface tension of mercury $= 0.465 N/m$. Gravity effect is negligible.

The force exerted by air on surface P is

A. $0.1N$

B. $1.0023N$

C. $10^5 N$

D. $1.0N$

Answer:

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25. There is a small mercury drop of radius $4.0mm$. A surface P of area $1.0mm^2$ is placed at the top of the drop. Atmospheric pressure $= 10^5 Pa$. Surface tension of mercury $= 0.465N/m$. Gravity effect is negligible.

The force exerted by mercury drop on the surface P is

A. $0.1N$

B. $1.0023N$

C. $0.00023N$

D. $0.10023N$

Answer:

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26. In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as

(a) If both assertion and reason are true and reason is the correct explanation of assertion.

(b) If both assertion and reason are true but reason is not the correct explanation of assertion.

(c) If assertion is true but reason is false.

(d) If assertion and reason are false.

Q. Assertion: A large soap bubble expands while a small bubble shrinks, when they are connected to each other by a capillary tube.

Reason: The excess pressure inside bubble (or drop) is inversely proportional to the radius.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement -1 is False, Statement-2 is True.

D. Statement -1 is True, Statement-2 is False.

Answer:

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27. Statement-1 : Bernoulli's theorem holds for incompressible, non-viscous fluids. Statement-2 : The factor $\frac{v^2}{2g}$ is called velocity head.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement -1 is False, Statement-2 is True.

D. Statement -1 is True, Statement-2 is False.

Answer:

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28. Assertion: The velocity increases, when water flowing in broader pipe enter a narrow pipe.

Reason: According to equation of continuity, product of area and velocity is constant.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement -1 is False, Statement-2 is True.

D. Statement -1 is True, Statement-2 is False.

Answer:

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