PRERNA EDUCATION

IIT-JEE | NEET | BOARDS | NTSE | KVPY | OLYMPIADS

Chapter : MECHANICAL PROPERTIES OF FLUIDS

Assignment 2

Class 11

DPP
DAILY PRACTICE PROBLEMS

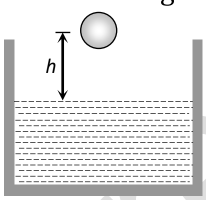
CLASS : XITH **SUBJECT : PHYSICS**
DATE : **DPP NO. : 2**

Topic :- MECHANICAL PROPERTIES OF FLUIDS

1. Two communicating vessels contain mercury. The diameter of one vessel is n times larger than the diameter of the other. A column of water of height h is poured into the left vessel. The mercury level will rise in the right-hand vessel (s = relative density of mercury and ρ = density of water) by

a) $\frac{n^2h}{(n+1)^2s}$ b) $\frac{h}{(n^2+1)s}$ c) $\frac{h}{(n+1)^2s}$ d) $\frac{h}{n^2s}$

2. A ball of radius r and density ρ falls freely under gravity through a distance h before entering water. Velocity of ball does not change even on entering wate r. If viscosity of water is η, the value of h is given by

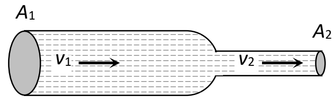


a) $\frac{2}{9}r^2\left(\frac{1-\rho}{\eta}\right)g$ b) $\frac{2}{81}r^2\left(\frac{\rho-1}{\eta}\right)g$ c) $\frac{2}{81}r^4\left(\frac{\rho-1}{\eta}\right)^2 g$ d) $\frac{2}{9}r^4\left(\frac{\rho-1}{\eta}\right)^2 g$

3. A solid of density D is floating in a liquid of density$d$. If v is the volume of solid submerged in the liquid and V is the total volume of the solid, then v/V is equal to

a) $\frac{d}{P}$ b) $\frac{D}{d}$ c) $\frac{D}{(D+d)}$ d) $\frac{D+d}{D}$

4. A liquid flows in a tube from left to right as shown in figure A_1 and A_2 are the cross-sections of the portions of the tube as shown. Then the ratio of speeds v_1/v_2 will be



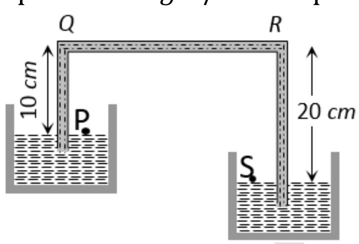
a) A_1/A_2 b) A_2/A_1 c) $\sqrt{A_2}/\sqrt{A_1}$ d) $\sqrt{A_1}/\sqrt{A_2}$

5. From a steel wire of density ρ is suspended a brass block of densityρ_B. The extension of steel wire comes to l. If the brass block is now fully immersed in a liquid of density ρ_L, the extension becomes l'. The ratio l/l' will be

a) $\frac{\rho_B - \rho}{\rho_L - \rho}$ b) $\frac{\rho_L}{\rho_B - \rho_L}$ c) $\frac{\rho_B - \rho_L}{\rho_B}$ d) $\frac{\rho_B}{\rho_B - \rho_L}$

6. The excess pressure inside a spherical drop of radius r of a liquid of surface tension T is
a) Directly proportional to r and inversely proportional to T
b) Directly proportional to T and inversely proportional to r
c) Directly proportional to the product of T and r
d) Inversely proportional to the product of T and r

7. A siphon in use is demonstrated in the following figure. The density of the liquid flowing in siphon is 1.5 gm/cc. The pressure difference between the point P and S will be



a) $10^5\ N/m$
b) $2 \times 10^5 N/m$
c) Zero
d) Infinity

8. A hole in the bottom of the tank having water. If total pressure at bottom is 3 atm (1 atm $= 10^5$ Nm^{-2}), then velocity of water flowing from hole is

a) $\sqrt{400}$ ms^{-1} b) $\sqrt{600}$ ms^{-1} c) $\sqrt{60}$ ms^{-1} d) None of these

9. A large tank filled with water to a height h is to be emptied through a small hole at the bottom. The ratio of times taken for the level of water to fall from h to $h/2$ and $h/2$ to zero is

a) $\sqrt{2}$ b) $\frac{1}{\sqrt{2}}$ c) $\sqrt{2} - 1$ d) $\frac{1}{\sqrt{2} - 1}$

10. A block of steel of size $5\ cm \times 5\ cm \times 5\ cm$ is weighed in water. If the relative density of steel is 7, its apparent weight is
a) $6 \times 5 \times 5 \times 5\ gf$ b) $4 \times 4 \times 4 \times 7\ gf$ c) $5 \times 5 \times 5 \times 7\ gf$ d) $4 \times 4 \times 4 \times 6\ gf$

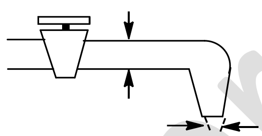
11. There are two holes one each along the opposite sides of a wide rectangular tank. The cross-section of each hole is $0.01 m^2$ and the vertical distance between the holes is one meter. The tank is filled with water flows out of the holes is (density of water= $1000\ kgm^{-3}$)
a) 100 b) 200 c) 300 d) 400

12. Water in river 20 m deep is flowing at a speed of $10\ ms^{-1}$. The shearing stress between the horizontal layers of water in the river in $N\ m^{-2}$ is (coefficient of viscosity of water= 10^{-3} SI units)
a) $1 \times 10^{-2}\ Nm^{-2}$ b) $0.5 \times 10^{-2}\ Nm^{-2}$ c) $1 \times 10^{-3}\ Nm^{-2}$ d) $0.5 \times 10^{-3}\ Nm^{-2}$

13. Ice pieces are floating in beaker A containing water also in a beaker B containing miscible liquid of specific gravity 1.2. When ice melts, the level of
a) water increases in A b) water decreases in A
c) liquid in B decreases d) liquid in B increases

14. On the surface of the liquid in equilibrium, molecules of the liquid possess
a) maximum potential energy b) maximum potential energy
c) maximum kinetic energy d) minimum kinetic energy

15. Water flowing out of the mouth of a tap and falling vertically in streamline flow forms a tapering column, *ie* the area of cross-section of the liquid column decreases as it moves down. Which of the following is the most accurate explanation for this?



a) Falling water tries to reach a terminal velocity and hence, reduces the area of cross-section to balance upward and downward forces
b) As the water moves down, its speed increases and hence, its pressure decreases. It is then compressed by atmosphere
c) The surface tension causes the exposed surface area of the liquid to decrease continuously The mass of water flowing out per second through any cross-section must remain constant.
d) As the water is almost incompressible, so the volume of water flowing out per second must remain constant. As this is equal to velocity × area, the area decreases as velocity increases

16. Speed of 2 cm radius ball in a viscous liquid is $20\ cms^{-1}$. Then the speed of 1 cm radius ball in the same liquid is
a) $5\ cms^{-1}$ b) $10\ cms^{-1}$ c) $40\ cms^{-1}$ d) $80\ cms^{-1}$

17. The fraction of a floating object of volume V_0 and density d_0 above the surface of a liquid of density d will be

a) $\frac{d_0}{d}$ b) $\frac{dd_0}{d+d_0}$ c) $\frac{d-d_0}{d}$ d) $\frac{dd_0}{d-d_0}$

18. A piece of ice is floating in a jar containing water. When the ice melts, then the level of water

a) rises b) Falls c) remains unchanged d) rises or falls

19. A cork is submerged in water by a spring attached to the bottom of a bowl. When the bowl is kept in an elevator moving with acceleration downwards, the length of spring

a) Increases b) Decreases c) Remains unchanged d) None of these

20. A body of density d_1 is counterpoised by Mg of weights of density d_2 in air of density d. Then the true mass of the body is

a) M b) $M\left(1-\frac{d}{d_2}\right)$ c) $M\left(1-\frac{d}{d_1}\right)$ d) $\frac{M(1-d/d_2)}{(1-d/d_1)}$