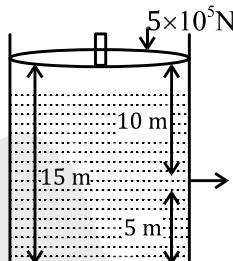


## DPP 2

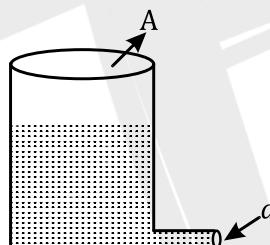
- Q.1** Consider a cylindrical tank of radius  $l = 1\text{ m}$  is filled with water. The top surface of water is at  $15\text{ m}$  from the bottom of the cylinder. There is a hole on the wall of cylinder at a height of  $5\text{ m}$  from the bottom. A force of  $5 \times 10^5\text{ N}$  is applied on the top surface of water using a piston. The speed of efflux from the hole will be

(Given atmospheric pressure  $P_A = 1.01 \times 10^5\text{ Pa}$ , density of water  $\rho_w = 1000\text{ kg/m}^3$  and gravitational acceleration  $g = 10\text{ m/s}^2$ )



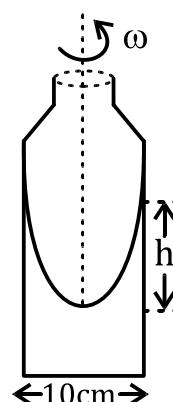
- (A)  $11.6\text{ m/s}$       (B)  $10.8\text{ m/s}$       (C)  $17.8\text{ m/s}$       (D)  $14.4\text{ m/s}$

- Q.2** A light cylindrical vessel is kept on a horizontal surface. Area of base is  $A$ . A hole of cross. sectional area  $a$  is made just at its bottom side. The minimum coefficient of friction necessary to prevent sliding the vessel due to the impact force of the emerging liquid is ( $a \ll A$ )



- (A)  $\frac{2a}{A}$       (B)  $\frac{a}{A}$       (C)  $\frac{A}{2a}$       (D) none of these

- Q.3** A cylindrical vessel containing a liquid is rotated about its axis so that the liquid rises at its sides as shown in the figure. The radius of vessel is  $5\text{ cm}$  and the angular speed of rotation is  $\omega\text{ rads}^{-1}$ . The difference in the height,  $h$  (in cm) of liquid at the centre of vessel and at the side will be

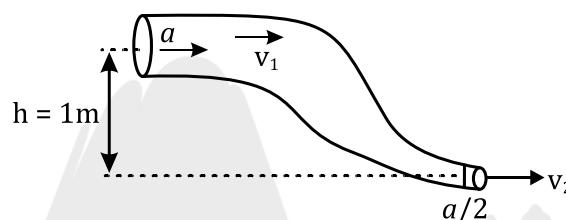


- (A)  $\frac{2\omega^2}{25g}$       (B)  $\frac{5\omega^2}{2g}$       (C)  $\frac{25\omega^2}{2g}$       (D)  $\frac{2\omega^2}{5g}$

- Q.4** A liquid of density  $\rho$  is coming out of a hose pipe of radius  $a$  with horizontal speed  $v$  and hits a mesh. 50% of the liquid passes through the mesh unaffected. 25% loses all of its momentum and 25% comes back with the same speed. The resultant pressure on the mesh will be

(A)  $\rho v^2$       (B)  $\frac{1}{4} \rho v^2$       (C)  $\frac{3}{4} \rho v^2$       (D)  $\frac{1}{2} \rho v^2$

- Q.5** An ideal fluid density  $800 \text{ kg m}^{-3}$ , flows smoothly through a bent pipe (as shown in figure) that tapers in cross-sectional area from  $a$  to  $a/2$ . The pressure difference between the wide and narrow sections of pipe is  $4100 \text{ Pa}$ . At wider section, the velocity of fluid is  $\frac{\sqrt{x}}{6} \text{ m s}^{-1}$  for  $x =$   
(Given  $g = 10 \text{ m s}^{-2}$ )



- Q.6** A liquid of density  $750 \text{ kg m}^{-3}$  flows smoothly through a horizontal pipe that tapers in cross-sectional area from  $A_1 = 1.2 \times 10^{-2} \text{ m}^2$  to  $A_2 = \frac{A_1}{2}$ . The pressure difference between the wide and narrow sections of the pipe is  $4500 \text{ Pa}$ . The rate of flow of liquid is  $\times 10^{-3} \text{ m}^3 \text{ s}^{-1}$ .

- Q.7** The water is filled upto height of  $12 \text{ m}$  in a tank having vertical sidewalls. A hole is made in one of the walls at a depth  $h$  below the water level. The value of  $h$  for which the emerging stream of water strikes the ground at the maximum range is  $\text{m}$ .

- Q.8** Water is flowing continuously from a tap having an internal diameter  $8 \times 10^{-3} \text{ m}$ . The water velocity as it leaves the tap is  $0.4 \text{ m s}^{-1}$ . The diameter of the water stream at a distance  $2 \times 10^{-1} \text{ m}$  below the tap is close to

(A)  $5.0 \times 10^{-3} \text{ m}$       (B)  $7.5 \times 10^{-3} \text{ m}$       (C)  $9.6 \times 10^{-3} \text{ m}$       (D)  $3.6 \times 10^{-3} \text{ m}$

- Q.9** Water is filled in a container upto height  $3 \text{ m}$ . A small hole of area  $a$  is punched in the wall of the container at a height  $52.5 \text{ cm}$  from the bottom. The cross-sectional area of the container is  $A$ . If  $a/A = 0.1$  then  $v^2$  is (where  $v$  is the velocity of water coming out of the hole)

(A)  $50 \text{ m}^2 \text{ s}^{-2}$       (B)  $51 \text{ m}^2 \text{ s}^{-2}$       (C)  $48 \text{ m}^2 \text{ s}^{-2}$       (D)  $51.5 \text{ m}^2 \text{ s}^{-2}$

- Q.10** A cylinder of height  $20 \text{ m}$  is completely filled with water. The velocity of efflux of water (in  $\text{ms}^{-1}$ ) through a small hole on the side wall of the cylinder near its bottom is

(A) 10      (B) 20      (C) 25.5      (D) 5



ANSWER KEY

- |    |     |    |     |     |     |    |     |    |     |    |    |    |   |
|----|-----|----|-----|-----|-----|----|-----|----|-----|----|----|----|---|
| 1. | (C) | 2. | (A) | 3.  | (C) | 4. | (C) | 5. | 326 | 6. | 24 | 7. | 6 |
| 8. | (D) | 9. | (A) | 10. | (B) |    |     |    |     |    |    |    |   |

