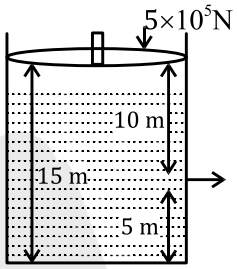
DPP 2

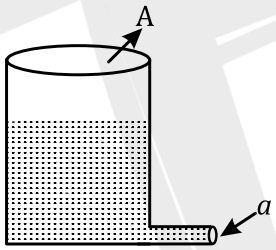
Q.1 Consider a cylindrical tank of radius l 1 m is filled with water. The top surface of water is at 15 m from the bottom of the cylinder. There is a hole on the wall of cylinder at a height of 5 m from the bottom. A force of 5×10^5 N is applied on the top surface of water using a piston. The speed of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

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



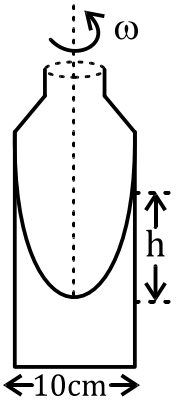
(A) 11.6 m/s (B) 10.8 m/s (C) 17.8 m/s (D) 14.4 m/s

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 cm and the angular speed of rotation is ω $rads^{-1}$. The difference in the height, h(in cm) of liquid at the centre of vessel and at the side will be



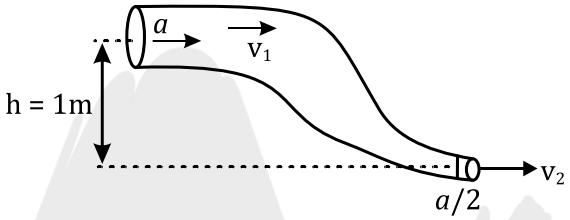
(A) $\frac{2\omega^2}{25g}$ (B) $\frac{5\omega^2}{2g}$ (C) $\frac{25\omega^2}{2g}$ (D) $\frac{2\omega^2}{5g}$

Q.4 A liquid of density ρ 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% looses all of its momentum and 25% comes back with the same speed. The resultant pressure on the mesh will be

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

(Given g = 10 m s^{-2})



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

Q.7 The water is filled upto height of 12 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 m.

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

(A) 5.0×10^{-3} m (B) 7.5×10^{-3} m (C) 9.6×10^{-3} m (D) 3.6×10^{-3} m

Q.9 Water is filled in a container upto height 3 m. A small hole of area a is punched in the wall of the container at a height 52.5 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 m^2 s^{-2} (B) 51 m^2 s^{-2} (C) 48 m^2 s^{-2} (D) 51.5 m^2 s^{-2}

Q.10 A cylinder of height 20 m is completely filled with water. The velocity of efflux of water (in 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)						