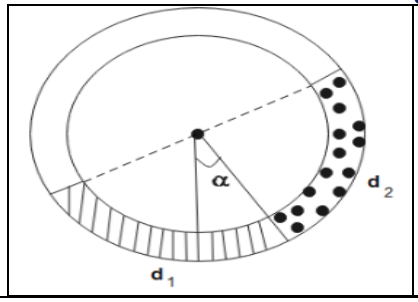
FLUIDS

1	There is a circular tube in a vertical plane . Two liquids which do not mix and of densities d_1 and d_2 are filled in the tube. Each liquid subtends 90^0 angle at centre. Radius joining their interface makes an angle α with vertical. Ratio d_1 / d_2 is  A $\frac{1+\tan\alpha}{1-\tan\alpha}$ B $\frac{1+\sin\alpha}{1-\cos\alpha}$ C $\frac{1+\sin\alpha}{1-\sin\alpha}$ D $\frac{1+\cos\alpha}{1-\cos\alpha}$
2	Two cylindrical vessels of equal cross-sectional area 16 cm^2 contain water up to heights 100 cm and 150 cm respectively. The vessels are interconnected so that the water levels in them become equal. The work done by the force of gravity during the process is [Take density of water = 10^3 kg/m^3 and g = 10 ms^{-2}] (a) 0.25 J (b) 1 J (c) 8 J (d) 12 J
3	If the mercury in the barometer is replaced by water, what will be the resulting height of the water column? Density of water= 1000 kg / m^3, Density of mercury= 13600 kg / m^3 (a) 0.76 m (b) 10.3 m (c) 11.2 m (d) 9.8 m
4	An open glass tube is immersed in mercury in such a way that a length of 8 cm extends above the mercury level. The open end of the tube is then closed and sealed and the tube is raised vertically up by additional 46 cm. What will be length of the air column above mercury in the tube now? [Atmospheric pressure = 76 cm of Hg] (a) 16 cm (b) 22 cm (c) 38 cm (d) 6 cm
5	A hydraulic press can lift 100 kg when a mass m is placed on the smaller piston . The diameter of the larger piston is increased by 4 times and that of the smaller piston is decreased by 4 times keeping the same mass m on the smaller piston. The hydraulic press will now be able to lift: (a) 400 kg (b) 1600 kg (c) 6400 kg (d) 25600 kg
6	A solid cylinder of length L is in equilibrium in two different liquids A and B as shown in the figure. The density of liquid A is 3 ρ / 2 and liquid B is 3 ρ. The density of cylinder is

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	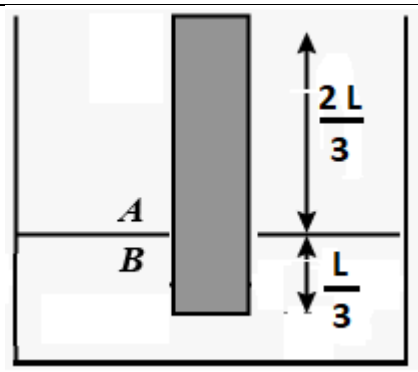 (a) 7 ρ / 5 (b) 13 ρ / 5 (c) 5 ρ / 2 (d) 2 ρ
7	Water is flowing continuously from a tap having an internal diameter 8 x 10^{-3} m. The water velocity as it leaves the tap is 2 m / s.The diameter of the water stream at a distance 3 m below the tap is close to (a) 2 x 10^{-3} m (b) 1 x 10^{-3} m (c) 4 x 10^{-3} m (d) 8 x 10^{-3} m
8	At what speed, the velocity head of water is equal to pressure head of 40 cm of Hg? (a) 10.3 m/s (b) 2.8 m/s (c) 5.6 m/s (d) 8.4 m/s
9	A non-viscous liquid of constant density 500 kg/m^3 flows in a variable cross-sectional tube. The area of cross-section of the tube at two points P and Q at heights of 3 m and 6 m are 2 x 10^{-3} m^3 and 4 x 10^{-3} m^3 respectively. The work done per unit volume by the forces of gravity as the fluid flows from point P to Q, is: (a) 29.4 J / m^3 (b) – 1.47 x 10^4 J / m^3 (c) – 2.94 x 10^4 J / m^3 (d) None of these
10	Consider a cylindrical tank of radius 1m 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 x 10^5 N is applied on the top surface of water using a piston. The speed of efflux from the hole will be: (P_A = 1.01 X 10^5 Pa, ρ_w = 1000 kg/m^3, 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