Physicsaholics

DPP – 2

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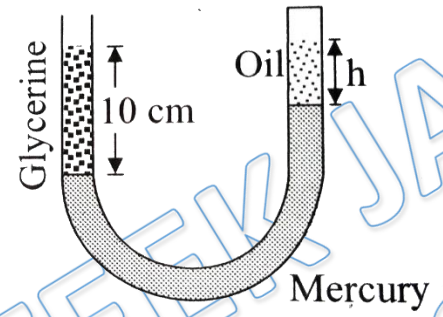
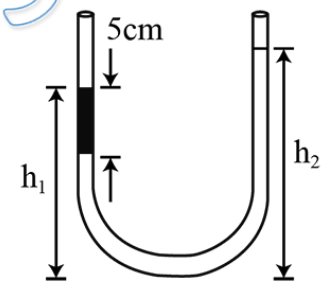
Q 1. A vertical U tube of uniform inner cross-section containing mercury in both its arms. A glycerin (density 1300 kgm^{-3}) column of length 10 cm is introduced into one of the arms. Oil of density (800 kgm^{-3}) is poured in the other arm until the upper surface of the oil and the glycerin are in the same horizontal surface. Find the length of oil column (Density of mercury = 13.6×10^3 kgm^{-3})



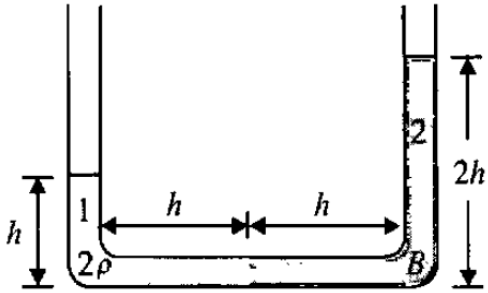
(a) 10.4 cm (b) 8.2 cm
(c) 7.2 cm (d) 9.6 cm

Q 2. An open-ended U-tube of a uniform cross-sectional area contains water (density 1.0 gm/cm^3) standing initially 20 cm from the bottom in each arm. An immiscible liquid of density 4.0 gm/cm^3 is added to one arm until a layer of 5 cm high forms, as shown in the figure above. What is the ratio $\frac{h_2}{h_1}$ of the heights of the liquid in the two arms?



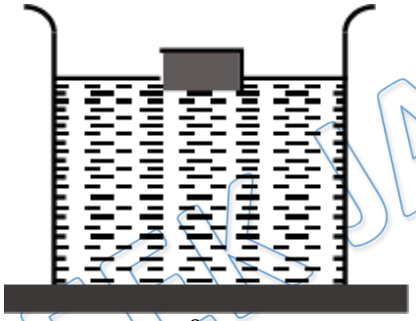
(a) $\frac{3}{1}$ (b) $\frac{5}{2}$
(c) $\frac{2}{1}$ (d) $\frac{3}{2}$

Q 3. A vertical U-tube has two liquid 1 and 2. The height of liquids columns in both the limbs are h and 2h, as shown in the figure. If the density of the liquid 1 is 2ρ. Find the density of liquid 2.



(a) ρ (b) 2ρ
(c) 3ρ (d) 4ρ

Q 4. A uniform cube of mass M is floating on the surface of a liquid with three fourth of its volume immersed in the liquid (density=ρ). The length of the side of the cube is equal to

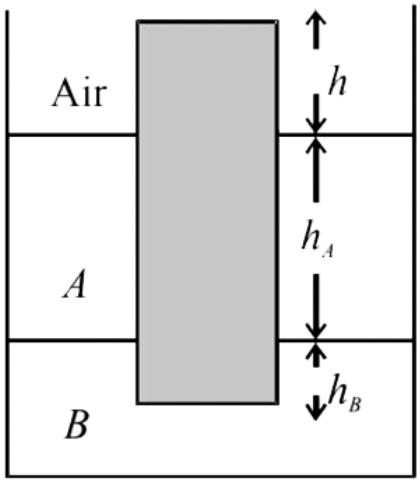


(a) $\left(\frac{4M}{3\rho}\right)^{\frac{2}{3}}$ (b) $\left(\frac{M}{3\rho}\right)^{\frac{2}{3}}$
(c) $\left(\frac{M}{4\rho}\right)^{\frac{2}{3}}$ (d) none of these

Q 5. A cube of side 20 cm is floating on a liquid with 5 cm of the cube outside the liquid. If the density of liquid is 0.8gm/cc then the mass of the cube is
(a) 4.2 kg (b) 4.8 kg
(c) 5 kg (d) 5.2 kg

Q 6. A cube of side 4cm is just completely immersed liquid A. When it is put in liquid B, it floats with 2 cm outside the liquid. Calculate the ratio for densities of two liquids.
(a) $\frac{1}{2}$ (b) $\frac{1}{4}$
(c) $\frac{1}{3}$ (d) $\frac{1}{2.5}$

Q 7. A uniform solid cylinder of density 0.8g/cm^3 floats in equilibrium in a combination of two non-mixing liquids A and B with its axis vertical. The densities of the liquids A and B are 0.7g/cm^3 and 1.2g/cm^3, respectively. The height of liquid A is h_A = 1.2cm. The length of the part of the cylinder immersed in liquid B is h_B = 0.8cm. Find h, the length of the part of the cylinder in air.

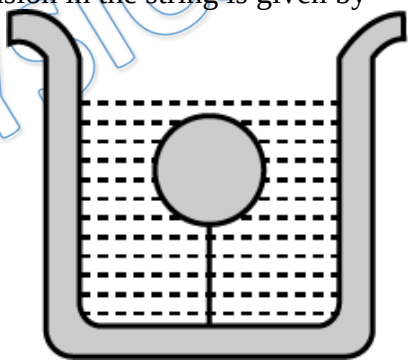


(a) 2.5 cm (b) 0.25 cm
(c) 1.25 cm (d) 2.25 cm

Q 8. A wooden plank immerses up to 50% in water. Then _____ % of it is immersed in a liquid of density 0.5 g/cm^3
(a) 90 % (b) 50 %
(c) 75 % (d) 100 %

Q 9. A log of wood of mass 120 Kg floats in water. The weight that can be put on the raft to make it just sink, should be (density of wood = 600 Kg/m^3)
(a) 80 kg (b) 50 kg
(c) 60 kg (d) 30 kg

Q 10. A solid sphere of density η (> 1) times lighter than water (density =1 unit) 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) $(\eta-1)mg$

Q 11. In a hydraulic machine, a force of 2N is applied on the piston of area of cross section 10 cm^2. What force is obtain on its piston of area of cross section 100 cm^2
(a) 2 N (b) 4 N
(c) 10 N (d) 20 N

Q 12. A hydraulic lift is used to lift a car of mass 3000 kg. The cross-sectional area of the lift on which the car is supported is 5×10^{-2} m. What is the pressure on the smaller piston, if both the pistons are at the same horizontal level? Take g=10 m/s^2.
(a) $3 \times 10^3\ N/m^2$ (b) $2 \times 10^4\ N/m^2$
(c) $5 \times 10^7\ N/m^2$ (d) $6 \times 10^5\ N/m^2$

Q 13. To lift an automobile of 2000kg a hydraulic pump with a larger piston 900 cm^2 in area is employed. Calculate the force that must be applied to pump a small piston of area 10 cm^2 to accomplish this task.
(a) 312.6 N (b) 72.4 N
(c) 222.2 N (d) 441.4 N

Q 14. Calculate the work done in raising a stone of mass 6 kg of specific gravity 2, immersed in water from a depth of 4m to 1m below the surface of water (g = 10 m/s^2).
(a) 150 J (b) 60 J
(c) 90 J (d) 180 J

Q 15. The buoyant force on a body in a liquid depends on
(a) total depth of the liquid
(b) density of the liquid
(c) density of body
(d) none of these

Q 16. The reading of a spring balance when a block suspended from it is air 60 newton. This reading changed to 40 newton when the block is fully submerged in water . The specific gravity of the block must be therefore:
(a) 3 (b) 2
(c) 6 (d) $\frac{3}{2}$

Q 17. A block of steel of size 5cm×5cm×5cm is weighed in water. If the relative density of steel is 7. Its apparent weight is :
(a) $6 \times 5 \times 5 \times 5$ gm-wt (b) $4 \times 4 \times 4 \times 7$ gm-wt
(c) $5 \times 5 \times 5 \times 7$ gm-wt (d) $4 \times 4 \times 4 \times 6$ gm-wt

Q 18. If a body floats with $\left(\frac{p}{q}\right)^{th}$ of its volume above the surface of the water, then the relative density of the body is :
(a) $\frac{q+p}{q}$ (b) $1-\frac{p}{q}$
(c) $\frac{p-q}{q}$ (d) $\frac{p}{q}$

Q 19. An object weighs 10N in air. When immersed fully in water, it weighs only 8N. The weight of the liquid displaced by the object will be:
(a) 2 N (b) 8 N
(c) 10 N (d) 12 N

Q 20. A sphere of solid material of relative density 9 has a concentric spherical cavity and just floats in water. If the radius of the sphere be R, then the radius of the cavity (r) will be related to R as:

(a) $r^3 = \frac{8}{9}R^3$ (b) $r^3 = \frac{2}{3}R^3$

(c) $r^3 = \frac{\sqrt{8}}{3}R^3$ (d) $r^3 = \sqrt{\frac{2}{3}}R^3$

Answer Key

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Q.1 d	**Q.2 c**	**Q.3 a**	**Q.4 d**	**Q.5 b**
Q.6 a	**Q.7 b**	**Q.8 d**	**Q.9 a**	**Q.10 d**
Q.11 d	**Q.12 d**	**Q.13 c**	**Q.14 c**	**Q.15 b**
Q.16 a	**Q.17 a**	**Q.18 b**	**Q.19 a**	**Q.20 a**