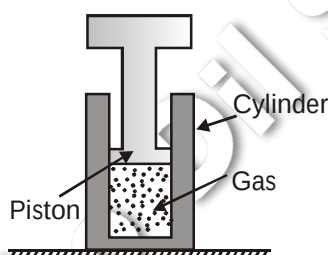


EXERCISE

Multiple choice questions

- A man of mass 60 kg stands on a weighing machine of area 225 m^2 . The pressure exerted by him is (take $g = 10 \text{ ms}^{-2}$)
 (1) 26666.7 Nm^{-2} (2) 266.67 Nm^{-2}
 (3) 26.667 Nm^{-2} (4) 2.67 Nm^{-2}
- A door of dimensions $2 \text{ m} \times 1.2 \text{ m} \times 0.06 \text{ m}$ is acted upon by a certain force due to the air inside the room, whose pressure is 10^5 Pa . The magnitude of the force is
 (1) $2.4 \times 10^5 \text{ N}$ (2) 2.4 dyne (3) 2.4 kN (4) 24 N
- The combustion chamber of a bike has an area of cross-section 16 cm^2 . A pressure of 400 Pa acts on it. Find force exerted on bike.
 (1) 64 N (2) 6.4 N (3) 0.64 N (4) 0.064 N
- The given apparatus shows a heavy piston supported by gas trapped in a cylinder. The cross-sectional area of the piston is $4.0 \times 10^{-4} \text{ m}^2$. The pressure of the gas inside the cylinder is $1.5 \times 10^5 \text{ Pa}$ and atmospheric pressure is $1.0 \times 10^5 \text{ Pa}$. Find the mass of the piston (Take $g = 10 \text{ m s}^{-2}$).

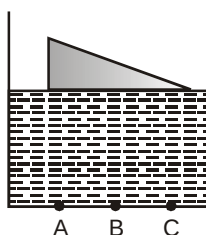


- (1) 1 kg (2) 2 kg (3) 3 kg (4) 4 kg
- The given figure shows two shoulder bags, one with a thin strap, and the other with a wide strap.

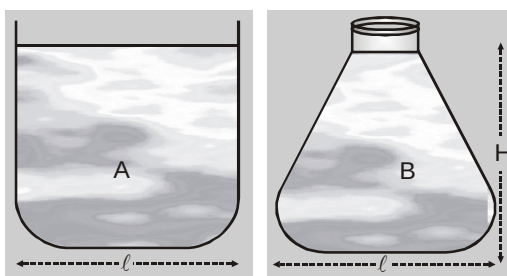


- If both bags are equally heavy, the sling bag with the wide strap will be more comfortable to carry because
- (1) the thin strap has a greater mass per unit length
 - (2) the thin strap causes greater force to be exerted
 - (3) the wide strap allows friction to be spread over a bigger area, thus reducing the force between the shoulder and the strap
 - (4) the wide strap enables the weight of the bag to be spread over a bigger area, thus reducing the pressure on the shoulder
- Hydraulic brakes work on the principle of
 (1) Pascal's law (2) Archimedes' principle (3) Newton's law (4) Bernoulli's theorem
 - To lift an automobile of 1600 kg, a hydraulic pump with a larger piston 800 cm^2 in area is employed. If the area of the smaller piston is 10 cm^2 , the force that must be applied on it is
 (1) 20 N (2) 20 kgf (3) 200 kgf (4) 2000 N

8. An object of uniform density is allowed to float in water kept in a beaker. The object has triangular cross-section as shown in the figure. If the water pressure measured at the three points A, B and C below the object are P_A , P_B and P_C respectively, then

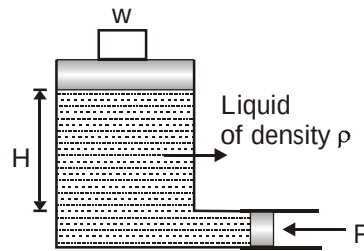


- (1) $P_A > P_B > P_C$ (2) $P_A < P_B < P_C$ (3) $P_A = P_B = P_C$ (4) $P_A = P_C < P_B$
9. In a stationary homogeneous liquid
- (1) pressure is the same at all points at the same level
 - (2) pressure is the same at all points
 - (3) pressure depends on the direction
 - (4) pressure is independent of any atmospheric pressure on the upper surface of the liquid
10. **Assertion** : It is difficult to stop bleeding from a cut in the body at high altitudes.
Reason : The atmospheric pressure at high altitude is lesser than the blood pressure.
- (1) Both assertion and reason are correct and reason is the correct explanation of assertion.
 - (2) Both assertion and reason are true but reason is not the correct explanation of assertion.
 - (3) Assertion is true but reason is false.
 - (4) Assertion is false but reason is true.
11. Density of ice is σ and that of water is ρ . What will be the decrease in volume when a mass M of ice melts?
- (1) $\frac{M}{\sigma - \rho}$ (2) $\frac{\sigma - \rho}{M}$ (3) $M \left[\frac{1}{\sigma} - \frac{1}{\rho} \right]$ (4) $\frac{1}{M} \left[\frac{1}{\rho} - \frac{1}{\sigma} \right]$
12. The relative density of a solid with respect to a liquid is $4/5$ and relative density of the liquid with respect to water is $10/9$. The buoyant force exerted by a liquid on a solid immersed in it is equal to the weight of the liquid displaced by the solid. Specific gravity of solid with respect to water is
- (1) $18/25$ (2) $8/9$ (3) 0.56 (4) 1.8
13. A tank 2 m high is half filled with water and then filled to the top with oil of density 0.80 g/cc . What is the pressure at the bottom of the tank due to these liquids only ? (Take $g = 10 \text{ ms}^{-2}$)
- (1) $1.8 \times 10^3 \text{ Nm}^{-2}$ (2) $0.9 \times 10^3 \text{ Nm}^{-2}$ (3) $1.8 \times 10^4 \text{ Nm}^{-2}$ (4) $0.9 \times 10^4 \text{ Nm}^{-2}$
14. Two vessels A and B have the same base area and contain water to the same height, but the mass of water in A is four times that in B. The ratio of the liquid thrust at the base of A to that at the base of B is



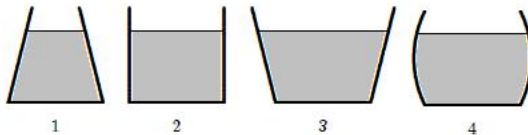
- (1) $4 : 1$ (2) $2 : 1$ (3) $1 : 1$ (4) $16 : 1$

15. A heavy load W is supported on a platform of area S by applying a force F on a small piston of area $\frac{S}{10}$. The value of F for equilibrium is

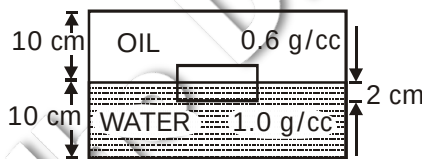


- (1) $\frac{W}{10}$ (2) $\frac{W + \rho g H S}{10}$ (3) $\frac{W - \rho g H S}{10}$ (4) $10 W$

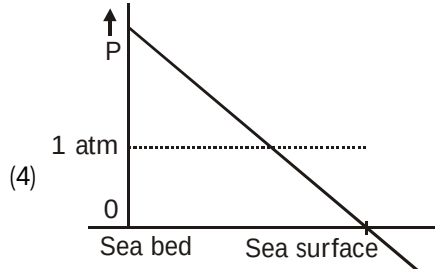
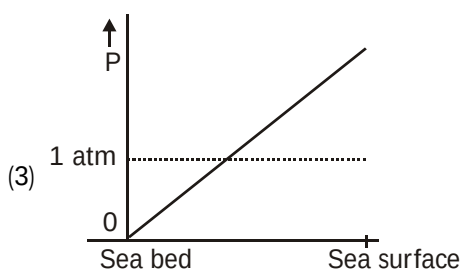
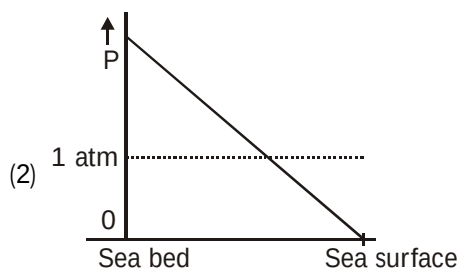
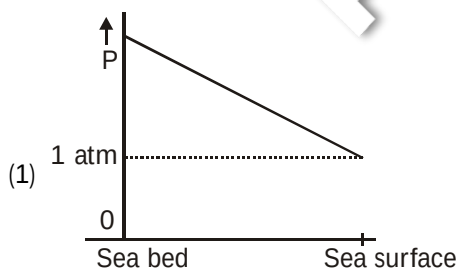
16. The vessels shown below all contain water to the same height. Rank them according to the pressure exerted by the water on the vessel bottoms, least to greatest.



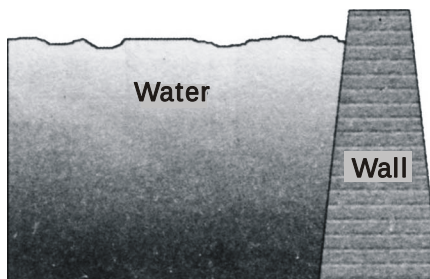
- (1) 3, 4, 2, 1 (2) 4, 3, 2, 1 (3) 2, 3, 4, 1 (4) All pressures are the same
17. A cubical block of side 10 cm floats at the interface of an oil and water. The pressure above that of atmosphere at the lower face of the block is



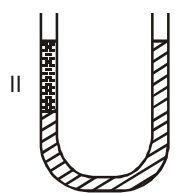
- (1) 200 N/m^2 (2) 680 N/m^2 (3) 400 N/m^2 (4) 800 N/m^2
18. A body submerged in the sea was brought up slowly from the sea bed to the sea surface. Variation of pressure on the body with decrease in the depth of sea is shown in the figures below. Which of these is correct ?



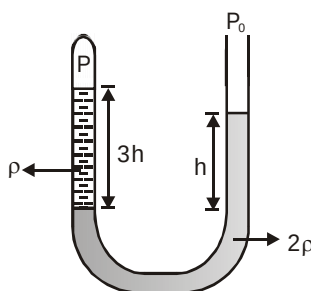
19. The given figure shows the cross-section of a dam and its reservoir. The widening of the wall towards the bottom is because of :



- (1) increase in pressure with depth of water
(2) decrease in pressure with depth of water
(3) decrease in density of water
(4) increase in density of water
20. A dam has a height H and a width b . Assuming that the water level reaches the top, find the net force exerted on the dam for $H = 60$ m and $b = 200$ m.
(1) 3×10^8 N (2) 4.2×10^9 N (3) 2.3×10^{10} N (4) 3.6×10^9 N
21. At a depth of 1000 m in an ocean, what is the gauge pressure ? (The density of sea water is 1.03×10^3 kg m $^{-3}$; $g = 10$ m s $^{-2}$)
(1) 1.03×10^5 Pa (2) 2.06×10^5 Pa (3) 1.03×10^7 Pa (4) 2.06×10^7 Pa
22. To obtain the absolute pressure from the gauge pressure
(1) subtract atmospheric pressure (2) add atmospheric pressure
(3) subtract 273 (4) add 273
23. A U-tube of uniform cross-section shown in figure is partially filled with liquid I. Another liquid II which does not mix with I is poured into one side. The liquid levels of the two sides is found the same, while the level of liquid I has risen by 2 cm. If the specific gravity of liquid I is 1.1, the specific gravity of liquid II must be

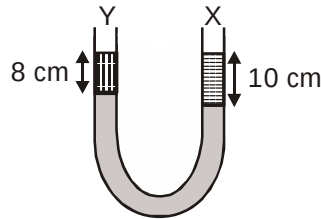


- (1) 1.2 (2) 1.1 (3) 1.3 (4) 1.0
24. In the figure shown

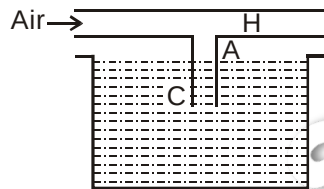


- (1) $P < P_0$ (2) $P > P_0$ (3) $P = P_0$ (4) $P = 0$

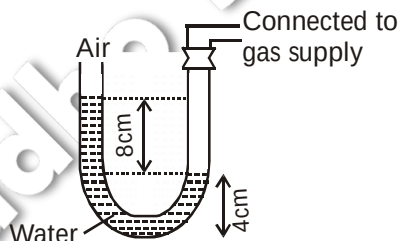
25. A liquid X of density 3.36 g/cm^3 is poured in a U-tube, which contains Hg ($\rho_{\text{Hg}} = 13.6 \text{ g/cm}^3$). Another liquid Y is poured in left arm with height 8 cm. Upper levels of X and Y are same. What is density of Y ?



- (1) 0.8 g/cc (2) 1.2 g/cc (3) 1.4 g/cc (4) 1.6 g/cc
26. Mercury is a convenient liquid to use in a barometer because
- (1) it is a metal (2) it has a high boiling point
- (3) it expands little with temperature (4) it has a high density
27. A capillary tube C dipped in a liquid that wets it as shown in figure. If we blow air through the horizontal tube H, then what will happen to the liquid column in the capillary tube ?



- (1) Level will fall below A. (2) Level will rise above A.
- (3) Level will remain at A. (4) It is difficult to predict.
28. A manometer is connected to a gas supply. Pressure can be measured in cm of water. The pressure of the gas is



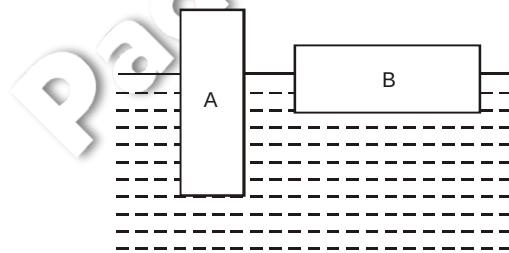
- (1) 8 cm of water more than atmospheric pressure
- (2) 12 cm of water more than atmospheric pressure
- (3) 8 cm of water less than atmospheric pressure
- (4) 12 cm of water less than atmospheric pressure
29. A solid of mass 1.6 kg and density $2.4 \times 10^3 \text{ kgm}^{-3}$ is completely immersed in water. The loss of weight is
- (1) 0.66 N (2) 0.66 kg wt (3) 6.6 kg wt (4) 66 N
30. A body floats in a liquid contained in beaker. The whole system as shown in figure falls freely under gravity. The upthrust on the body is



- (1) zero
- (2) equal to the weight of the liquid displaced
- (3) equal to the body weight in air
- (4) equal to the weight of the immersed portion of the body

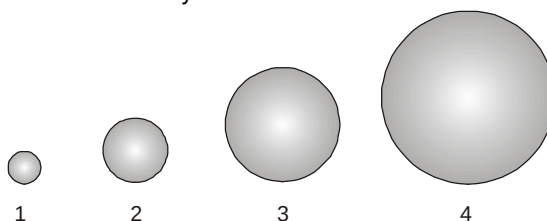
31. A small block of wood of relative density 0.5 is submerged in water. When the block is released, it starts moving upwards. The acceleration of the block is ($g = 10 \text{ ms}^{-2}$)
 (1) 5 ms^{-2} (2) 10 ms^{-2} (3) 7.5 ms^{-2} (4) 15 ms^{-2}
32. A sealed packet of mass 500 g has density 1.43 g cm^{-3} . When placed in alcohol (density 0.8 g cm^{-3}) the upthrust on the packet will be
 (1) 250 gf (2) 280 gf (3) 350 gf (4) 300 gf
33. 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 body is
 (1) M (2) $M\left(1 - \frac{d}{d_2}\right)$ (3) $M\left(1 - \frac{d}{d_1}\right)$ (4) $\frac{M(1 - d/d_2)}{(1 - d/d_1)}$
34. A coil of wire of cross section 0.75 mm^2 weighs 125 g in air and 115 g in water. The length of the coil in cm is
 (1) $\frac{10^2}{0.75} \text{ cm}$ (2) $\frac{10^5}{0.75} \text{ cm}$ (3) $\frac{10^5}{75} \text{ cm}$ (4) $\frac{10^3}{75} \text{ cm}$
35. An object of mass 4 kg and density $2 \times 10^3 \text{ kg m}^{-3}$ is completely immersed in water, its apparent weight will be
 (1) 2 kg wt (2) 20 kg wt (3) 1 kg wt (4) 10 kg wt
36. A solid has a mass 39 kg. It loses $\frac{1}{3}$ rd of its weight when immersed in water. Its volume will be
 (1) $1.3 \times 10^{-3} \text{ m}^3$ (2) $13 \times 10^{-3} \text{ m}^3$ (3) $13 \times 10^{-2} \text{ m}^3$ (4) 13 m^3
37. A piece of pure gold ($\rho = 19.3 \text{ g cm}^{-3}$) is suspected to be hollow from inside. It weighs 77.2 g in air and 71.2 g in water. The volume of the hollow portion in gold will be
 (1) 1 cm^3 (2) 2 cm^3 (3) 3 cm^3 (4) 4 cm^3
38. When a body is weighed in a liquid, the loss in its weight is not equal to
 (1) Weight of liquid displaced by the body.
 (2) Weight of water displaced by the body.
 (3) The difference in weights of the body in air and liquid.
 (4) The upthrust of liquid on the body.
39. A solid has a volume of 8 cm^3 . When weighed on a spring scale calibrated in grams, the scale indicates 20 g. What does the scale indicate if the object is weighed while immersed in a liquid of density 2 g cm^{-3} ?
 (1) 16 g (2) 10 g (3) 12 g (4) 4 g
40. An iron cube of mass 5 kg and sides 10 cm is inside water. What will be its apparent weight ?
 (1) 39.2 N (2) 58.8 N (3) 49 N (4) 24.5 N
41. 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})
 (1) 80 kg (2) 50 kg (3) 60 kg (4) 30 kg
42. Two solids A and B float in water. It is observed that A floats with $\frac{1}{2}$ of its body immersed in water and B floats with $\frac{1}{4}$ of its volume above the water level. The ratio of the density of A to that of B is
 (1) 4:3 (2) 2:3 (3) 3:4 (4) 1:2

43. When a sphere is floating in water, its $\frac{1}{3}$ rd part is outside the water, and when sphere is floating in unknown liquid, its $\frac{3}{4}$ th part is outside the liquid, then density of liquid is
- (1) $\frac{4}{9}$ gm/cc (2) $\frac{9}{4}$ gm/cc (3) $\frac{8}{3}$ gm/cc (4) $\frac{3}{8}$ gm/cc
44. A piece of wood of R.D. 0.25 floats in a pail containing oil of R.D. 0.81. The fraction of volume of the wood above the surface of the oil is
- (1) 0.31 (2) 0.69 (3) 0.21 (4) 0.79
45. A solid floats in water with $\frac{3}{4}$ th of its volume below the surface of water. The density of the solid will be
- (1) 75 kgm^{-3} (2) 750 kgm^{-3} (3) $75 \times 10^2 \text{ kgm}^{-3}$ (4) $75 \times 10^3 \text{ kgm}^{-3}$
46. The density of ice is 0.918 g cm^{-3} and that of water is 1.03 g cm^{-3} . An iceberg floats with a portion of 224 cm^3 outside the surface of water. The total volume of the iceberg is
- (1) 1030 cm^3 (2) 1545 cm^3 (3) 2060 cm^3 (4) 2575 cm^3
47. A man of weight 40 kg floats on water in a lake. His apparent weight is
- (1) 40 kg (2) 35 kg (3) zero (4) 20 kg
48. A wooden cube just floats inside water when a 200 g mass is placed on it. When the mass is removed the cube is 2 cm above water level. The side of cube is
- (1) 5 cm (2) 10 cm (3) 15 cm (4) 20 cm
49. A boat having a length of 3 metre and breadth 2 metre is floating on a lake. The boat sinks by 1 cm when a man gets on it. The mass of the man is
- (1) 60 kg (2) 62 kg (3) 72 kg (4) 128 kg
50. Two identical blocks of ice float in water as shown. Then

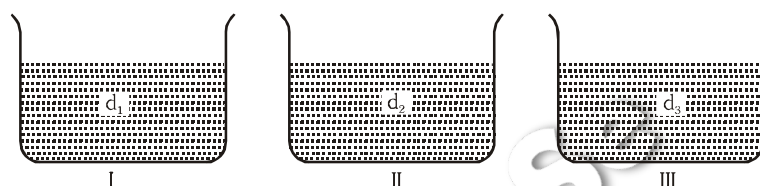


- (1) block A displaces a greater volume of water since the pressure acts on a smaller bottom area
 (2) block B displaces a greater volume of water since the pressure is less on its bottom
 (3) the two blocks displace equal volumes of water since they have the same weight
 (4) block A displaces a greater volume of water since its submerged end is lower in the water
51. A vessel contains oil (density $\rho_o = 0.8 \text{ g cm}^{-3}$) over mercury (density $\rho_{Hg} = 13.6 \text{ gcm}^{-3}$). A homogeneous sphere floats with half its volume immersed in mercury and the other half in oil. The density of material of sphere in g cm^{-3} is
- (1) $(\rho_o + \rho_{Hg})\frac{1}{2}$ (2) $\rho_o + \rho_{Hg}$ (3) $\rho_{Hg} - \rho_o$ (4) $\frac{\rho_o \rho_{Hg}}{\rho_{Hg} + \rho_o}$
52. A glass stopper suspended from the hook of a spring balance and immersed in water reads 100 gf. When a cork of volume 20 cm^3 is tied to the glass stopper and then the combination is immersed in water, the reading of spring balance will be
- (1) more than 100 gf (2) equal to 100 gf (3) less than 100 gf (4) none of the above

53. Sonam has 4 solid metallic balls, all of equal weight. The sizes of the 4 balls are as shown below. If ball 2 sinks in water, which of the other balls will definitely sink in water ?



- (1) Only ball 1
 (2) Only ball 3
 (3) Both ball 1 and ball 4
 (4) All the other balls - 1, 3 and 4
54. A large iron body of mass 2 kg and volume $2.5 \times 10^{-3} \text{ m}^3$ is dipped in water. Will it float or sink ?
 (1) Float
 (2) Sink
 (3) Float & then sink
 (4) Cannot be determined
55. An object of density d is immersed in three different liquids of densities d_1 , d_2 and d_3 such that $d_3 < d_1 < d < d_2$



- (1) It will sink in liquid III and float in liquid I
 (2) It will sink in liquid III and float in liquid II
 (3) It will sink in liquid I and float in liquid III
 (4) It will sink in liquid II and float in liquid I
56. A block weighs 15 N in air. It weighs 12 N when immersed in water and 13 N when immersed in another liquid. The relative density of the block and liquid will be
 (1) $\frac{3}{2}$; 5
 (2) $\frac{2}{3}$; $\frac{1}{5}$
 (3) 5; $\frac{2}{3}$
 (4) $\frac{1}{5}$; $\frac{3}{2}$
57. A piece of steel has a weight W in air, W_1 when completely immersed in water and W_2 when completely immersed in an unknown liquid. The relative density (specific gravity) of liquid is
 (1) $\frac{W - W_1}{W - W_2}$
 (2) $\frac{W - W_2}{W - W_1}$
 (3) $\frac{W_1 - W_2}{W - W_1}$
 (4) $\frac{W_1 - W_2}{W - W_2}$
58. A solid weighs 32 gf in air and 28.8 gf in water. The R.D. of the solid is
 (1) 8.9
 (2) 10
 (3) 29.12
 (4) 20
59. An ice cube holding a solid steel ball floats in a cup of water. After all the ice melts, the level in the cup will
 (1) rise
 (2) fall
 (3) remain unchanged
 (4) cannot be confirmed without knowing density of steel ball
60. An ice cube with an embedded cork floats in a cup of water. If all ice melts, there will be
 (1) drop in level
 (2) rise in level
 (3) no change in level
 (4) can drop or rise based on temperature

ANSWERS

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	4	1	3	2	4	1	2	3	1	1	3	2	3	3	2	4	4	1	1	4
Que.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	3	2	2	1	1	4	2	1	2	1	2	2	4	3	1	2	2	2	4	1
Que.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	1	2	3	2	2	3	3	2	1	3	1	3	1	1	2	3	2	2	2	3