FLUIDS STATICS AND DYNAMICS

40 x 4 =160

1. A boat full of scrap iron is floating on water in a lake. If all the iron is dropped into water, will the level of water
a) go up b) remain the same c) rise very high d) go down

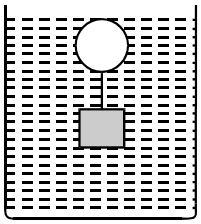
2. In order that a floating object be in a stable equilibrium, its centre of buoyancy should be
a) vertically above its centre of gravity b) vertically below its centre of gravity
c) horizontally in line with its centre of gravity d) may be anywhere.

3. A piece of ice is floating in a jar containing water. When the ice metls, then the level of water
a) rises b) falls
c) remains unchanged d) rises or falls depending upon the mass ice.

4. A piece of ice having a stone frozen in it floats in a glass vessel filled with water. How will the level of water in the vessel change when the ice melts
a) the level will rise b) the level will not change c) the level will drop d) some water will flow out

5. A body floats in a liquid contained in a beaker. The whole system is falling under gravity. The upthrust on the body due to liquid is
a) zero, b) equal to weight of liquid displaced,
c) equal to weight of the body in air, d) equal to the weight of the immersed body.

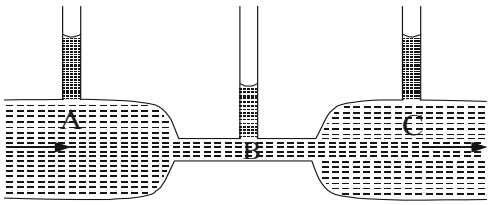
6. A balloon filled with air is weighted, so that it barely floats in water as shown in figure. When it is pushed down so that it gets submerged a short distance in water, then the balloon



a) will come up again to its former position b) will remain in the position it is left
c) will sink to the bottom d) will emerge out of liquid.

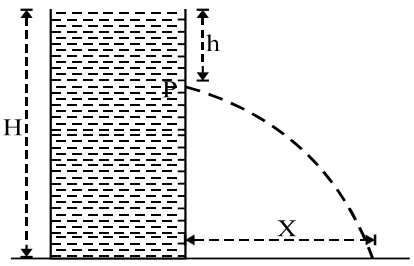
7. A jet plane flies in air because
a) the thrust of the jet compensates for the force of gravity
b) the weight of the air whose volume is equal to the volume of the plane is more than the weight of plane
c) the flow of air around the wings causes an upward force which compensates for the force of gravity
d) the gravity does not act on bodies moving with speed.

8. In the figure shown, the flow of liquid is through a horizontal pipe. Three tubes *A, B* and *C* are connected to the pipe. The radii of the tubes *A, B* and *C* at the junction are respectively 2 cm, 1 cm and 2 cm. It can be said that the



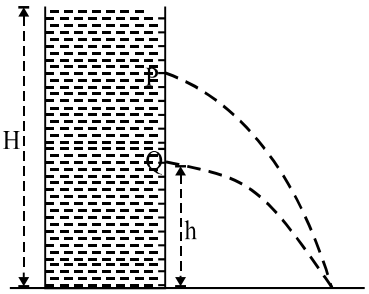
a) height of the liquid in the tube *A* is maximum. b) height of the liquid in the tubes *A* and *B* is the same
c) height of the liquid in all the three tubes is the same d) height of the liquid in the tubes *A* and *C* is the same.

9. A tank is filled with water upto a height *H*. Water is allowed to come out of a hole *P* in one of the walls at a depth *h* below the surface of water (see figure). Express the horizontal distance *x* in terms of *H* and *h*



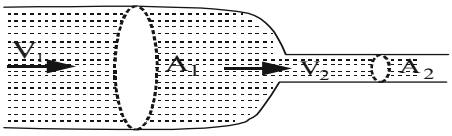
a) $x = \sqrt{h(H-h)}$ b) $x = \sqrt{[h(H-h)/2]}$
c) $x = 2\sqrt{h(H-h)}$ d) $x = 4\sqrt{h(H-h)}$

10. As shown in the figure, water squirts horizontally out of two holes in the side of the cylinder and the two streams strike the ground at the same point. If the hole *Q* is at a height *h* above the ground and the level of water stands at height *H* above the ground, then the height of *P* above ground level is



a) 2 *h* b) *H* / *h*
c) *H* - *h* d) *H* / 2

11. A liquid flows in the tube from left to right as shown in figure. A_1 and A_2 are the cross-sections of the portions of the tube as shown. Then the ratio of speeds v_1 / v_2 will be

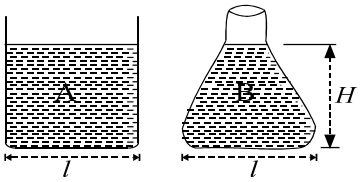


a) A_1 / A_2 b) A_2 / A_1 c) $\sqrt{A_2} / \sqrt{A_1}$ d) $\sqrt{A_1} / \sqrt{A_2}$

12. When a large bubble rises from the bottom of a lake to the surface, its radius doubles. The atmospheric pressure is equal to that of a column of water of height *H*. The depth of the lake is

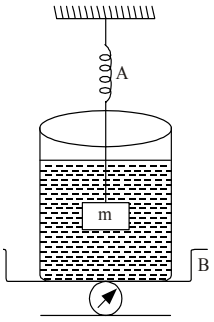
a) *H* b) 2*H* c) 7*H* d) 8*H*

13. 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 two times that in *B.* The ratio of the liquid thrust at the base of *A* to that at the base of *B* is



a) 4 : 1 b) 2 : 1
c) 1 : 1 d) 16 : 1

14. The spring balance *A* reads 2 kg with a block *m* suspended from it. A balance *B* reads 5 kg when a beaker with liquid is put on the pan of the balance. The two balances are now so arranged that the hanging mass is inside the liquid in the beaker as shown in figure. In this situation



a) the balance *A* will read more than 2 kg,
b) the balance *B* will read less than 5 kg,
c) the balance *A* will read less than 2 kg and *B* will read more than 5 kg,
d) the balance *A* and will *B* will read 2 kg and 5 kg respectively.

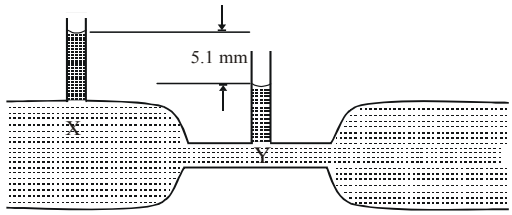
15 A vessel contains oil (density = 0.8 gm/cm^2) over mercury (density = 13.6 gm/cm^2). A homogeneous sphere floats with half of its volume immersed in mercury and the other half in oil. The density of material of the sphere in gm/cm^3 is

a) 3.3 b) 6.4 c) 7.2 d) 2.8

16 A body floats with one-third of its volume outside water and 1/4 of its volume outside another liquid. The density of other liquid is

a) 9/4 gm/cc b) 4/9 gm/cc c) 8/9 gm/cc d) 2/9 gm/cc

19. The diagram shows a venturimeter, through which water is flowing. The speed of water at *X* is 2 cm/s. The speed of water at *Y* (taking g = 1000 cms^{-2}) is



a) 23 cm^{-1} b) 32 cm^{-1} c) 101 cm^{-1} d) 1024 cm^{-1}

20. The fraction of a floating object of volume V_0 and density d_0 above the surface of a liquid of density d will be

a) $\frac{d_0}{d}$ b) $\frac{dd_0}{d+d_0}$ c) $\frac{d-d_0}{d}$ d) $\frac{d_0}{d-d_0}$

21. A cylinder is filled with a liquid of density d upto a height h. If the beaker is at rest, then the mean pressure on the wall is

a) zero b) $h\,d\,g$ c) $\frac{h}{2}d\,g$ d) $2\,h\,d\,g$

22. If in above question, the cylinder is placed in a lift which is moving upwards with an acceleration a, then the pressure on the bottom is

a) $h\,d\,g$ b) $\frac{1}{2}h\,d\,g$ c) $h\,d\,(g+a)$ d) $h\,d\,(g-a)$

23. A plate of area 0.5 m² and thickness 40 mm is immersed in water vertically. The thrust on the plate due to water (g = 10 m s^{-2}) is

a) 1000 N m^{-2} b) 500 N m^{-2} c) 200 N m^{-2} d) 1250 N m^{-2}

24. Equal volumes of two substances are mixed. Their densities are ρ_1 and ρ_2 The density of their mixture, assuming no contraction is

a) $\frac{\rho_1+\rho_2}{\rho_1\ \rho_2}$ b) $\frac{\rho_1+\rho_2}{2}$ c) $\sqrt{\rho_1\rho_2}$ d) $\frac{\rho_1\rho_2}{\rho_1+\rho_2}$

25. Equal weights of two liquids are mixed. Their densities are ρ_1 and ρ_2 . The density of their mixture, assuming no contraction is

a) $\frac{\rho_1+\rho_2}{P_1P_2}$ b) $\frac{\rho_1+\rho_2}{2}$ c) $\sqrt{\rho_1\rho_2}$ d) $\frac{2\rho_1\ \rho_2}{\rho_1+\rho_2}$

26. A beaker containing water is placed on the platform of a spring balance. The balance reads 1.5 kg. A stone of mass 1/2 kg and volume 0.001 m^3 is immersed in water without touching the wall of the beaker. The balance reads

a) 2 kg b) 1.5 kg c) 1.0 kg d) 2.5 kg

27. The gate of a canal is 5 m wide, and the water levels on either side of it are 20 m and 12 m. The resultant thrust on the gate (g = 10ms^{-2}) is

a) 64 × 10^5 N b) 64 × 10^3 N c) 64 × 10^4 N d) 64 × 10^7 N

28. Mercury is poured into communicating vessels of different cross sections. An iron piece is dropped into the broad vessel. The level of mercury

a) will go down by unequal amounts, b) will go down by equal amounts,

c) will go up by unequal amounts, d) will go up by equal amounts.

29. A body of mass *m*, lighter than water floats in water (density = ρ_o) in a cylinder of large area *S*. The change in the level of water in the vessel is

a) $m/\rho_o S$ b) $\rho_o S/m$ c) ρ_0/m d) m/ρ_0

30. A ball whose density is ρ falls into water of density $\rho_\circ$ from a height h above the water surface. If $\rho < \rho_\circ$, the depth to which the ball will sink is

a) $h\rho_0/\rho$ b) $\rho h/(\rho_0 - \rho)$ c) $\rho_0 h/(\rho_0 - \rho)$ d) $h\rho/\rho$