# PHYSICS

**Class** **PUC 2nd Yr.**

**Topic** **Fluid Statics:**

1.  The three vessels shown in the figure have same base area. Equal volumes of a liquid are poured in them. The force on the base will be

   (A) maximum in the first (B) maximum in the second

   (C) maximum in the third (D) equal in all

2. Equal mass of three liquids are kept in three identical cylindrical vessels A, B and C. The densities are $d_A$ $d_B$ and $d_C$ respectively with $d_A < d_B < d_C$ . The force on the base will be

   (A) maximum in vessel A (B) maximum in vessel B

   (C) maximum in vessel C (D) equal in all the vessels

3. Suppose the pressure at the surface of the mercury in a barometer tube is $P_1$ and the pressure at the surface of the mercury in the cup is $P_2$

   (A) $P_1 = 0$ $P_2$ = atmospheric pressure

   (B) $P_1$ = atmospheric pressure $P_2 = 0$

   (C) $P_1 = P_2$ = atmospheric pressure

   (D) $P_1 = P_2 = 0$

4. A barometer kept in an elevator reads 76 cm when it is at rest. If the elevator goes up with increasing speed, the reading will be

   (A) zero (B) 76 cm

   (C) less than 76 cm (D) more than 76 cm

5. A barometer kept in an elevator accelerating upwards reads 76 cm. The air pressure in the elevator is

   (A) 76 cm (B) less than 76 cm

   (C) more than 76 cm (D) zero

6. To construct a barometer a tube of length 1 m is filled completely with mercury and is inverted in a mercury cup. The barometer reading on a particular day is 76 cm. Suppose a 1 m tube is filled with mercury up to 76 cm and then closed by a cork. It is inverted in a mercury cup and the cork removed. The height of the mercury column in the tube over the surface in the cup will be

   (A) zero (B) 76 cm

   (C) more than 76 cm (D) less than 76 cm

7. A 20 N metal block is suspended by a spring balance. A beaker containing some water is placed on a weighing machine which reads 40 N. The spring balance is now lowered so that the block gets immersed in the water. The spring balance now reads 16 N. The reading of the weighing machine will be

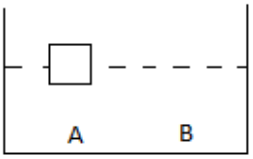
(A) 36 N (B) 60 N

(C) 44 N (D) 56 N

8. A piece of wood is floating in water kept in a bottle. The bottle is connected to an air pump. When more air is pushed into the bottle from the pump, the piece of wood will float with

(A) larger part in water (B) lesser part in water

(C) same part in water (D) it will sink

9. 

A wooden object floats in water kept in a beaker. The block is near a side of the beaker. A and B are the two points in the water at the same horizontal level. A below the block and B slightly away. The pressures there are $P_A$ and $P_B$ respectively.

(A) $P_A = P_B$ (B) $P_A$ less than $P_B$

(C) $P_A$ more than $P_B$ (D) cannot say

10. A solid floats in a liquid in a partially dipped position.

(A) the solid exerts a force equal to its weight on the liquid

(B) the liquid exerts a force of buoyancy on the solid which is equal to the weight of the solid

(C) the weight of the displaced liquid equals the weight of the solid

(D) the weight of the dipped part of the solid is equal to the weight of the displaced liquid

11. The weight of an empty balloon on the spring balance is $W_1$. The weight becomes $W_2$ when the balloon is filled with air. Let the weight of the air itself be w. Neglect the thickness of the balloon when it is filled with air. Also neglect the difference in densities of the air inside and outside the balloon

(A) $W_2 = W_1$ (B) $W_2 = W_1 + w$

(C) $W_2 < W_1 + w$ (D) $W_2 > W_1$

12. A solid is completely immersed in a liquid. The force exerted by the liquid on the solid will

(A) Increase if it is pushed deeper inside the liquid

(B) Change if its orientation is changed

(C) Decrease if it is taken partially out of the liquid

(D) Be in the vertically upward direction

13. A closed vessel is half filled with water. There is a hole near the top of the vessel and the air is pumped out from this hole.

(A) Water level will rise in the vessel

(B) The pressure at the surface of the water will decrease

(C) The force by the water on the bottom of the vessel will decrease

(D) The density of the liquid will decrease

14. A cylinder if filled with a liquid of density d up to a height h. If the cylinder is at rest, the mean pressure on the wall of the cylinder is

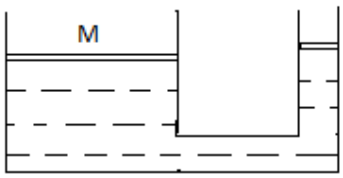
(A) Zero (B) hdg

(C) hdg/2 (D) 2hdg

15. A cylindrical vessel containing a liquid is closed by a piston of mass m. If A is the cross sectional area of the piston and $P_0$ is the atmospheric pressure, then the pressure just below the piston is

(A) $P_0$ (B) $P_0 + \frac{mg}{A}$

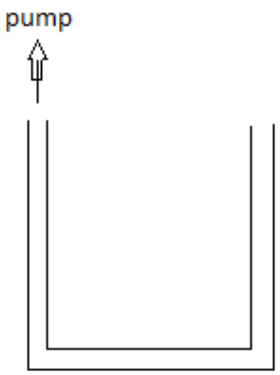
(C) $\frac{mg}{A}$ (D) none

16. 

The hydraulic press shown in the figure is used to raise the mass M through a height of 0.5 mm by performing 500 J of work on the small piston. The diameter of the large piston is 10 cm while that of the smaller one is 2 cm. The mass M is of

(A) $10^4$ kg (B) $10^3$ kg

(C) 100 kg (D) $10^5$ kg

17. 

One end of a U tube of uniform bore and area A containing mercury is connected to a suction pump. When the pump is switched on, the level of liquid of density d falls by x in one of the limbs. When the pump is switched off the restoring force in the other limb is

(A) 2xdAg (B) xgd

(C) Agd (D) xAgd

18. If the weight of a body is w in vacuum and $w_1$ and $w_2$ are its weights when immersed in liquids of specific gravities $d_1$ and $d_2$ respectively, then

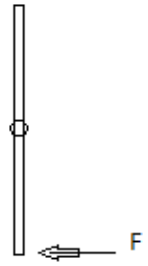
(A) $w = \frac{w_1 d_2 + w_2 d_1}{w_1 + w_2}$ (B) $w = \frac{w_2 d_1 - w_1 d_2}{d_1 - d_2}$

(C) $w = \frac{w_2 d_2 + w_1 d_1}{d_1 + d_2}$ (D) $w = \frac{w_1 d_2 + w_2 d_1}{d_1 + d_2}$

19. An alloy is prepared by mixing equal volumes of two metals. The specific gravity of the alloy is 4. When equal masses of the same two metals are mixed, the specific gravity is 3. The specific gravity of each metal is

(A) 2, 4 (B) 6, 4

(C) 6, 2 (D) 4, 8

20. 

A square gate of area 1 $m^2$ is hinged at its midpoint. A fluid of density d fills space to the left of the gate. The force F required to hold the gate stationary is

(A) dg/3 (B) dg/2

(C) dg/6 (D) none

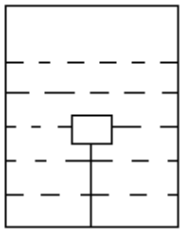
21. A dog is sitting in a boat which is floating in a pond. If the dog drinks some water from the pond, then

(A) The level of water in the pond decreases

(B) The level of water in the pond increases

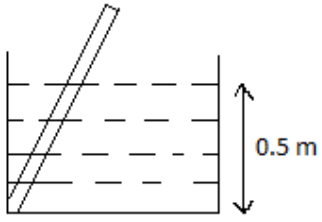
(C) The level of water in the pond first increases and then decreases

(D) The level of water in the pond remains same

22. 
A tank containing water accelerates upwards with acceleration a = 1 $m/s^2$ . A block of mass 1 kg and density 0.8 $g/cm^3$ is held stationary inside the tank with the help of a string as shown. The tension in the string is

(A) 2.2 N (B) 2.75 N

(C) 3 N (D) 2.4 N

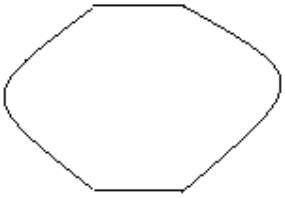
23. 

A wooden plank of length 1 m and uniform cross section is hinged at one end to the bottom of the tank. The tank is filled with water up to a height of 0.5 m. The specific gravity of the plank is 0.5. The angle Φ made by the plank with the vertical in equilibrium position is

(A) $30^0$ (B) $45^0$

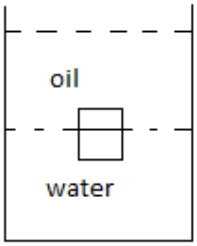
(C) $60^0$ (D) $90^0$

Numerical problems



27. A glass full of water has a bottom of area 20 $cm^2$ , height 20 cm and volume half a litre. (a) find the force exerted by the water on the bottom. (b) considering the equilibrium of the water, find the resultant force exerted by the sides of the glass on the water. Ans: 204 N, 1 N

28. If water is used to construct a barometer, what would be the height of the water column at standard atmospheric pressure ?




29. A cube of ice floats partly in water and partly in oil. Find the ratio of the volume of ice immersed in water to that in oil. Specific gravity of oil is 0.8 and that of ice is 0.9

30. A cubical metal block of edge 12 cm floats in mercury with 1/5 th of the height inside mercury. Water is poured till the surface of the block is just immersed in it. Find the height of the water column to be poured. Sp. Gravity of mercury is 13.6 ( ans: 10.4 cm )

31. A cubical box is to be constructed with iron sheets 1 mm in thickness. What can be the minimum value of the external edge so that the cube does not sink in water ? density of iron is 8000 $kg/m^3$ and density of water is 1000 $kg/m^3$ ( ans: 4.8 cm )