

## Chapter # 15 (Fluids)

1- A column of fluid, is open to the atmosphere at the top, and is 9.5 m high. If the density of the fluid is  $1680 \text{ kg/m}^3$ , what is the total pressure at the bottom of this column? [ $2.58 \times 10^5 \text{ Pa}$ ]

2- The velocity of the flow of water in a pipe is 4.5 m/s. If the pipe has a diameter of 8.4 cm, what is the mass of water coming out of the pipe per second? [24.9 kg/s]

3- A pipe carrying water from the ground floor to the fourth floor of a building which is 13 m high. At the fourth floor the pipe has a cross-sectional area of  $4.1 \times 10^{-4} \text{ m}^2$ , a pressure of  $1.66 \times 10^5 \text{ Pa}$  and the velocity of water flow is 8.4 m/s. At the ground floor, the cross-sectional area of the pipe is  $9.3 \times 10^{-4} \text{ m}^2$ , What is the pressure in the pipe at the ground floor? [ $3.22 \times 10^5 \text{ Pa}$ ]

4- Water flowing at 4 m/s in a non uniform circular pipe at point A. If the diameter of the pipe at point B is 1/2 its value at A, what is the velocity of water at point B? [16 m/s]

5- A very small hole is made 1.0 m below the top of a large tank full of water. If the tank is open, what is the initial velocity of water coming out of the hole? [4.4 m/s]

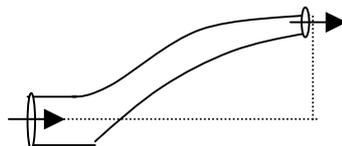
6- Find the minimum area of a flat ice slab 1 m thick if it is to support a 2000 kg car above sea water. (density of ice is  $920 \text{ kg/m}^3$ , density of sea water is  $1020 \text{ kg/m}^3$ ) [ $20 \text{ m}^2$ ]

7- Consider an ice cube of 10 cm side and average density of  $917 \text{ kg/m}^3$ . What is the magnitude of the minimum force that one has to exert on its top surface to hold it completely submerged under water ? (the density of water  $10^3 \text{ kg/m}^3$ ) [ $0.813 \text{ N}$ ]

8- A swimming pool of dimensions 30.0 m by 10.0 m has a flat horizontal bottom. When the pool is filled to a depth of 2.0 m with fresh water, what is the total force on the bottom surface of this swimming pool ? (assume the density of water to be  $103 \text{ kg/m}^3$  and  $P_a = 1.01 \times 10^5 \text{ N/m}^2$ ) [ $3.6 \times 10^7 \text{ N}$ ]

9- A block of wood floats in water with 0.67 of its volume submerged. The density of water is  $1000 \text{ kg/m}^3$ . When the same block floats in oil, 0.90 of its volume is submerged. Find the density of the oil. [ $744 \text{ kg/m}^3$ ]

10- Water enters the first floor of a house through a pipe 2.0 cm in diameter and at an absolute pressure of  $4 \times 10^5 \text{ Pa}$ . The pipe leads to a second floor room , 5 m above, where the diameter is 1.0 cm. The flow velocity in the inlet pipe is 4 m/s. What is the flow velocity and pressure in the second room? [16 m/s ,  $2.31 \times 10^5 \text{ Pa}$ ]



11- A solid sphere has a weight of 10 N. When it is suspended from a spring scale and submerged in water, the scale reads 6.0 N. What is the radius of the solid sphere? (density of water is  $1000 \text{ kg/m}^3$ ). [4.6 cm]

12- Water flows at a rate of 8.00 liter/min from a small hole at the bottom of a tank which is 0.900 m deep. Find the area of the hole. [ $3.17 \times 10^{-5} \text{ m}^2$ ]

