



INDIAN SCHOOL DARSAIT

DEPARTMENT OF PHYSICS



Subject : Physics

Topic : Mechanical
properties of liquids

Worksheet No. 10

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Date : _____

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Class & Division : XI A/B

Roll Number : ____

- 1 What should be the minimum velocity of water in a tube of diameter 2.0 cm so that the flow is turbulent? The viscosity of water is $0.001 \text{ Nm}^{-2}\text{s}$.
- 2 The excess pressure in a soap bubble is thrice the excess pressure inside a moving soap bubble. What is the ratio between volume of the first and second bubble?
- 3 Two soap bubbles have radii 2:3. Calculate the ratio of work done in blowing these bubbles?
- 4 Find the velocity of efflux of water from a orifice near the bottom of a tank in which pressure is 500gf/sq cm above atmosphere.
- 5 The flow rate of water from a tap of diameter 1.50cm is 3 litres per min. The coefficient of viscosity of water is $10^{-3} \text{ Pa}\cdot\text{s}$. Characterize the flow.
- 6 The reading of pressure meter attached with a closed pipe is $3.5 \times 10^4 \text{ Nm}^{-2}$. On opening the valve of the pipe, the reading of the pressure meter is reduced to $3.0 \times 10^5 \text{ Nm}^{-2}$. Calculate the speed of water flowing in the pipe.
- 7 A liquid is flowing through a horizontal pipe line of varying cross section. At a certain cross section, the diameter of the pipe is $5 \times 10^{-2} \text{ m}$ and the velocity of flow of the liquid is $25 \times 10^{-2} \text{ ms}^{-1}$. Calculate the velocity of flow at another cross section where the diameter is $1 \times 10^{-2} \text{ m}$.
- 8 What is the pressure inside a small air bubble of $0.1 \times 10^{-3} \text{ m}$ radius, situated just below the free surface of water? Surface tension of water = 0.072 Nm^{-1} , 1 atm pr = $1.013 \times 10^5 \text{ Nm}^{-2}$
- 9 A capillary tube of inside radius $5 \times 10^{-4} \text{ m}$ is dipped in water of surface tension 0.075 Nm^{-1} . To what height is the water raised by the capillary action above the normal water level? Calculate the weight of water raised. Given angle of contact = 0°
- 10 Calculate the energy evolved when 8 droplets of water (surface tension = 0.072 Nm^{-1}) of radius 0.5mm each combine into one.
- 11 Find the terminal velocity of a steel ball 2mm in diameter falling through glycerin. Given specific gravity of steel and glycerin are 8 and 1.3 respectively, viscosity of glycerin is 8.3 poise.
- 12 Water flows through a horizontal pipe of non-uniform cross-section. The pressure is 0.01 m of Hg where the velocity of flow is 0.35 m/s. Find the pressure at a point where the velocity is 0.65m/s.

- 13 If excess pressure inside a soap bubble of radius 10^{-2} m is balanced by that due to column of oil 2×10^{-3} m high, calculate the surface tension of soap solution. Given specific gravity of oil = 0.8.
- 14 A wire ring of diameter 0.03 m is dipped in a liquid and pulled out gently. If a force of 0.1 N is required to break the film, then what is the surface tension of the liquid?
- 15 Mercury in a capillary tube is depressed by 1.32×10^{-2} m. Calculate the diameter of the tube if angle of contact of mercury with glass is 140° and density of mercury is 13600 kg m^{-3} . Surface tension of mercury is 0.54 N/m.
- 16 What amount of energy will be liberated if 1000 droplets of water, each of diameters of 10^{-8} m, coalesce to form a bigger drop?
- 17 If a 5×10^{-2} m long capillary tube with 0.1×10^{-3} m internal diameter open at both ends is dipped in water. State if
(i) water will rise half-way in the capillary
(ii) water will rise till the upper end of the capillary
(iii) water will overflow out of the upper end of capillary?
Explain your answer.
- 18 The density of ice is 917 kg m^{-3} . What fraction of ice lies below water? The density of sea water is 1024 kg m^{-3} . What fraction of iceberg do we see assuming that it has the same density as ordinary ice?
- 19 A house is connected to a city water main that is 100 m above the house in altitude. If the city water pressure is 4 atm, what will be the water pressure at the house?
- 20 In a test experiment on a model aeroplane in a wind tunnel, the flow speeds on the upper and lower surfaces of the wing are 70 m/s and 63 m/s respectively. What is the lift on the wing if its area is 2.5 m^2 ? (density of air = 1.3 kg m^{-3})