Class 11 Physics · Chapter 9: Mechanical Properties of Fluids

Worksheet · 20 marks · about 40 minutes · based on NCERT

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1. A small flat disc is held at one fixed point under still water, first horizontal, then vertical, then tilted at 45°. The force of the water on one face of the disc is [1]

(a) zero when the disc is vertical

(b) greatest when the disc is horizontal, since water presses downward

(c) the same in size in every orientation, but always directed vertically downward

(d) the same in size in every orientation, and always normal to the face

2. The dimensions of the coefficient of viscosity are [1]

(a) $[ML^{-1}T^{-2}]$

(b) $[MLT^{-1}]$

(c) $[MT^{-2}]$

(d) $[ML^{-1}T^{-1}]$

3. In a steady flow, two streamlines can never cross because [1]

(a) a fluid particle at the crossing point would have two velocities at once

(b) the fluid would have to be compressed at that point

(c) the pressure at that point would become zero

(d) the flow at that point would have to be turbulent

4. At a place where a barometer reads 76 cm of mercury, the long barometer tube is tilted so that it makes an angle of 60° with the vertical. The length of the mercury column along the tube is now [1]

(a) 152 cm

(b) 76 cm

(c) 87.8 cm

(d) 38 cm

5. In an ideal hydraulic lift, which quantity has the same value at the small piston and at the large piston? [1]

(a) the force on the piston

(b) the distance moved by the piston

(c) the pressure of the liquid on the piston

(d) the speed of the piston

6. Water flows through a horizontal pipe at 4.0 m s^{-1} under a pressure of 150 kPa. Taking $\rho = 1000$ kg m^{-3} and $g = 10$ m s^{-2}, find its velocity head and its pressure head. [2]

7. State the condition, in terms of surface energies, for a liquid to stick to (wet) a solid surface, and give one example each of a liquid that wets glass and one that does not. [2]

8. A small air bubble released at the bottom of a tall jar of glycerine soon rises at a steady speed. Explain why it stops speeding up. [2]

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9. An open-tube manometer containing water is connected to a domestic gas pipeline. The water in the open arm stands 20 cm above the water in the arm joined to the pipe. (a) Find the gauge pressure of the gas ($g = 10\ m\ s^{-2}$). (b) What height difference would a mercury manometer (density $13.6 \times 10^3\ kg\ m^{-3}$) show for the same gas? (c) Which liquid is the better choice here, and why? [3]

10. Water flows steadily down a sloping pipe. At point 1, 5.0 m above the ground, the area of cross-section is 10 cm^2, the speed 2.0 $m\ s^{-1}$ and the pressure 1.50×10^5 Pa. At point 2, at ground level, the area is 5.0 cm^2. Taking $\rho = 1000\ kg\ m^{-3}$ and $g = 10\ m\ s^{-2}$, find the speed and the pressure at point 2. [3]

11. A steel ball of radius 1.0 mm is dropped into a tall jar of glycerine. Name the forces on the ball when it falls at its terminal velocity, and find that velocity. (Density of steel $7.8 \times 10^3\ kg\ m^{-3}$, of glycerine $1.26 \times 10^3\ kg\ m^{-3}$; viscosity of glycerine 0.83 Pa s; $g = 10\ m\ s^{-2}$.) [3]