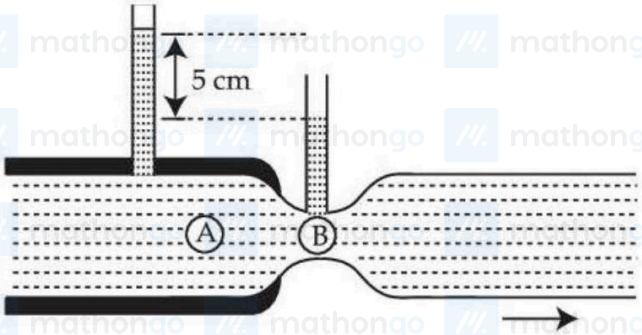
Q1. 21 January Shift 1

Water flows through a horizontal tube as shown in the figure. The difference in height between the water columns in vertical tubes is 5 cm and the area of cross-sections at A and B are 6 cm^2 and 3 cm^2 respectively. The rate of flow



will be ____ cm^3/s. (take $g = 10\ m/s^2$)

(1) $\frac{200}{\sqrt{3}}$ (2) $200\sqrt{6}$ (3) $100\sqrt{3}$ (4) $200\sqrt{3}$

Q2. 21 January Shift 2

A spherical body of radius r and density σ falls freely through a viscous liquid having density ρ and viscosity η and attains a terminal velocity v_0. Estimated maximum error in the quantity η is : (Ignore errors associated with σ, ρ and g, gravitational acceleration)

(1) $\frac{2\Delta r}{r} + \frac{\Delta v_0}{v_0}$ (2) $2\frac{\Delta r}{r} - \frac{\Delta v_0}{v_0}$ (3) $2\left[\frac{\Delta r}{r} - \frac{\Delta v_0}{v_0}\right]$ (4) $2\left[\frac{\Delta r}{r} + \frac{\Delta v_0}{v_0}\right]$

Q3. 21 January Shift 2

Surface tension of two liquids (having same densities), T_1 and T_2, are measured using capillary rise method utilizing two tubes with inner radii of r_1 and r_2 where $r_1 > r_2$. The measured liquid heights in these tubes are h_1 and h_2 respectively. [Ignore the weight of the liquid about the lowest point of miniscus]. The heights h_1 and h_2 and surfaces tensions T_1 and T_2 satisfy the relation:

(1) $h_1 > h_2$ and $T_1 = T_2$ (2) $h_1 = h_2$ and $T_1 = T_2$

(3) $h_1 > h_2$ and $T_1 < T_2$ (4) $h_1 < h_2$ and $T_1 = T_2$

Q4. 21 January Shift 2

The terminal velocity of a metallic ball of radius 6 mm in a viscous fluid is 20 cm/s. The terminal velocity of another ball of same material and having radius 3 mm in the same fluid will be ____ cm/s.

Q5. 22 January Shift 1

Given below are two statements:

Statement I: Pressure of a fluid is exerted only on a solid surface in contact as the fluid-pressure does not exist everywhere in a still fluid.

Statement II: Excess potential energy of the molecules on the surface of a liquid, when compared to interior, results in surface tension.

In the light of the above statements, choose the correct answer from the options given below

(1) Statement I is false but Statement II is true
(2) Statement I is true but Statement II is false
(3) Both Statement I and Statement II are false
(4) Both Statement I and Statement II are true

Q6. 22 January Shift 2

When a part of a straight capillary tube is placed vertically in a liquid, the liquid raises upto certain height h. If the inner radius of the capillary tube, density of the liquid and surface tension of the liquid decrease by 1% each, then the height of the liquid in the tube will change by $\%$.

(1) $+1$ (2) -3 (3) $+3$ (4) -1

Q7. 23 January Shift 2

A small metallic sphere of diameter 2 mm and density $10.5\ \mathrm{g/cm^3}$ is dropped in glycerine having viscosity 10 Poise and density $1.5\ \mathrm{g/cm^3}$ respectively. The terminal velocity attained by the sphere is ____ $\mathrm{cm/s}$.

($\pi = \frac{22}{7}$ and $g = 10\ \mathrm{m/s^2}$)

(1) 3.0 (2) 1.0 (3) 2.0 (4) 1.5

Q8. 23 January Shift 2

An air bubble of volume $2.9\ \mathrm{cm^3}$ rises from the bottom of a swimming pool of 5 m deep. At the bottom of the pool water temperature is $17^\circ\mathrm{C}$. The volume of the bubble when it reaches the surface, where the water temperature is $27^\circ\mathrm{C}$, is ____ $\mathrm{cm^3}$.

($\mathrm{g} = 10\ \mathrm{m/s^2}$, density of water $= 10^3\ \mathrm{kg/m^3}$, and 1 atm pressure is $10^5\ \mathrm{Pa}$)

(1) 4.5 (2) 2.0 (3) 4.2 (4) 3.0

Q9. 24 January Shift 1

Sixty four rain drops of radius 1 mm each falling down with a terminal velocity of 10 $\mathrm{cm/s}$ coalesce to form a bigger drop. The terminal velocity of bigger drop is ____ $\mathrm{cm/s}$.

Q10. 24 January Shift 2

A cubical block of density $\rho_b = 600\ \mathrm{kg/m^3}$ floats in a liquid of density $\rho_e = 900\mathrm{kg/m^3}$. If the height of block is $H = 8.0$ cm then height of the submerged part is ____ cm.

(1) 6.3 (2) 4.3 (3) 5.3 (4) 7.3

Q11. 24 January Shift 2

A soap bubble of surface tension $0.04\ \mathrm{N/m}$ is blown to a diameter of 7 cm. If $(15000 - x)\mu\mathrm{J}$ of work is done in blowing it further to make its diameter 14 cm, then the value of x is ____. $(\pi = 22/7)$

ANSWER KEYS

1. (4)	**2.** (1)	**3.** (4)	**4.** 5	**5.** (1)	**6.** (1)	**7.** (3)	**8.** (1)
9. 160	**10.** (3)	**11.** 11304					