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NEET MECHANICAL PROPERTIES OF FLUIDS — SURFACE TENSION AND SURFACE ENERGY — PYQS

Max. Marks: 24 **Questions:** 6

Section A (MCQ) — 6 questions

Q.1 A balloon is made of a material of surface tension S and its inflation outlet (from where gas is filled in it) has small area A. It is filled with a gas of density ρ and takes a spherical shape of radius R. When the gas is allowed to flow freely out of it, its radius r changes from R to 0 (zero) in time T. If the speed v(r) of gas coming out of the balloon depends on r as r^a and T $S^\alpha A^\beta \rho^\gamma R^\delta$ then [NEET (UG) 2025]

(1) $a=-\frac{1}{2},\ \alpha=-\frac{1}{2},\ \beta=-1,\ \gamma=\frac{1}{2},\ \delta=\frac{7}{2}$

(2) $a=\frac{1}{2},\ \alpha=\frac{1}{2},\ \beta=-\frac{1}{2},\ \gamma=\frac{1}{2},\ \delta=\frac{7}{2}$

(3) $a=\frac{1}{2},\ \alpha=\frac{1}{2},\ \beta=-1,\ \gamma=+1,\ \delta=\frac{3}{2}$

(4) $a=-\frac{1}{2},\ \alpha=-\frac{1}{2},\ \beta=-1,\ \gamma=-\frac{1}{2},\ \delta=\frac{5}{2}$

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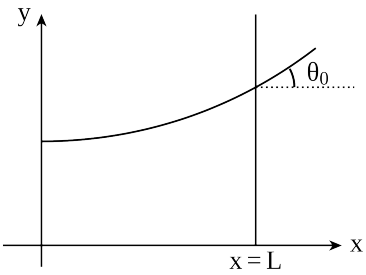
Q.2 Consider a water tank shown in the figure. It has one wall at x = L and can be taken to be very wide in the z direction. When filled with a liquid of surface tension S and density ρ, the liquid surface makes angle θ_0 ($\theta_0 \ll 1$) with the x-axis at x = L. If y(x) is the height of the surface then the equation for y(x) is:



(take $\theta(x)=\sin\theta(x)=\tan\theta(x)=\frac{dy}{dx}$, g is the acceleration due to gravity) [NEET (UG) 2025]

(1) $\frac{d^2y}{dx^2}=\sqrt{\frac{\rho g}{S}}$ (2) $\frac{dy}{dx}=\sqrt{\frac{\rho g}{S}}x$

(3) $\frac{d^2y}{dx^2}=\frac{\rho g}{S}x$ (4) $\frac{d^2y}{dx^2}=\frac{\rho g}{S}y$

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Q.3 A thin flat circular disc of radius 4.5 cm is placed gently over the surface of water. If surface tension of water is 0.07 N m^{-1}, then the excess force required to take it away from the surface is [NEET (UG) 2024]

(1) 19.8 mN (2) 198 N

(3) 1.98 mN (4) 99 N

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Q.4 The amount of energy required to form a soap bubble of radius 2 cm from a soap solution is nearly: (surface tension of soap solution = 0.03 N m^{-1}) [NEET (UG) 2023]

(1) 5.06×10^{-4} J (2) 3.01×10^{-4} J

(3) 50.1×10^{-4} J (4) 30.16×10^{-4} J

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Q.5 A rectangular film of liquid is extended from (4 cm × 2 cm) to (5 cm × 4 cm). If the work done is 3×10^{-4} J, the value of the surface tension of the liquid is [NEET 2016 (Phase 2)]

(1) 0.250 N m^{-1} (2) 0.125 N m^{-1}

(3) 0.2 N m^{-1} (4) 8.0 N m^{-1}

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Q.6 A certain number of spherical drops of a liquid of radius r coalesce to form a single drop of radius R and volume V. If T is the surface tension of the liquid, then [AIPMT 2014]

(1) energy = $4VT\left(\frac{1}{r}-\frac{1}{R}\right)$ is released.

(2) energy = $3VT\left(\frac{1}{r}+\frac{1}{R}\right)$ is absorbed.

(3) energy = $3VT\left(\frac{1}{r}-\frac{1}{R}\right)$ is released.

(4) energy is neither released nor absorbed.

Scan or tap for the full solution

ANSWER KEY

Ques.	1	2	3	4	5	6					
Ans.	**1**	**4**	**1**	**2**	**2**	**3**					