SURFACE TENSION & VSCOSITY

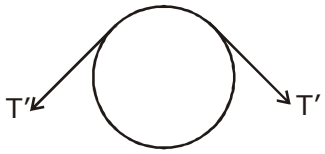
EXERCISE – I

SINGLE CORRECT

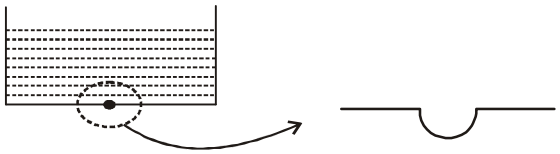
1. D

$2T' \sin d\theta = 2 Rd\theta . T \times 2$

$T' = 2RT$ due to film



2. C



$h\rho g = \frac{2T \times 2}{0.1}$

$h \times 1000 \times 10 = \frac{2 \times 75 \times 10^{-3} \times 2}{0.1 \times 10^{-3}}$

$h = \frac{300}{1000}$ - 0.3 m = 30 cm.

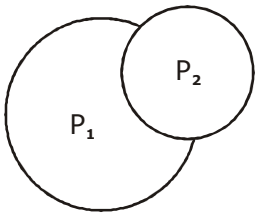
3. C

$P = \frac{2T}{r}$ r is small pressure is high

$\therefore$ air from higher pressure to lower pressure

4. B

$P_1 = P_0 + \frac{4T}{r_1}$



$P_2 > P_1$

$P_2 = P_0 + \frac{4T}{r_2}$

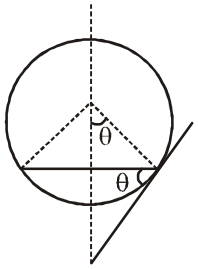
$r_2 < r_1$

$P_2 - P_1 = P_{excess} = \frac{4T}{R}$

$4T\left[\frac{1}{r_2} - \frac{1}{r_1}\right] = \frac{4T}{R}$

$R = \frac{r_2 r_1}{r_1 - r_2}$

5. B



$\cos\theta = \frac{R - h}{R}$

$\theta = \cos^{-1}\left(\frac{R - h}{R}\right)$

6. C

$P_{exi} = \frac{4T}{R}$

$4\pi R^2 d = \frac{4}{3}\pi r^3$

$(3R^2 d)^{1/3} = r$

$P_{ef} = \frac{2T}{r}$ $\quad\therefore$ Ratio $= \frac{R}{2r}$

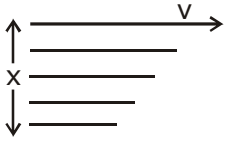
$= \left(\frac{R}{24d}\right)^{1/3}$

7. B

$\frac{2T}{R} = h\rho g$

Radius of Meniscus

8. C



$800 = \eta A.\frac{1.5}{x}$

$2400 = \eta\ A\ \frac{v}{x}$

v = 4.5 cm /sec.

9. D

$F_R = K\ .\pi r^2\ .\ v^2 = \rho\frac{4}{3}\pi r^3 g$

$v\alpha\ \sqrt{r}$

10. B

$2\frac{4}{3}\pi r^3 = \frac{4}{3}\pi R^3$

$R = 2^{1/3}.\ r$

$v \propto\ r^2$

$v\ \propto\ 4^{1/3}$

11. A

$\eta\ a^2\ \frac{v}{t}$ = mg sin 37°

$\eta\ a^2\ \frac{v}{t}\ =\ \rho a^3 g.\frac{3}{5}$

$\eta = \frac{3\rho agt}{5v}$

12. C

Terminal Velocity

13. D

$V_T = \frac{2}{9}\frac{r^2 g}{\eta}(\rho - \sigma)$

$= \frac{2}{9}\frac{(0.003)^2 \times 10}{1.260}\ (1260)$

v_T = 0.02 m /sec.

$\therefore$ Time = $\frac{0.1}{0.02}$ = 5 sec.

14. A

$a_{avg}\ \ = \frac{v_T - 0}{T}$

$a_{air} = \frac{mg - f_B}{m} = g - \frac{F_B}{m}$

$= g - \frac{v\rho_L g}{v\rho_S\ g} = g - \frac{\rho_L}{\rho_S}\ g$

$a_{air} = \frac{g(\rho_s - \rho_L)}{\rho_s} = \frac{2v_T}{T}$

$a_{air} = \frac{g(\rho_s - \rho_L)}{\rho_s}$

$= 2.\frac{2}{9}\frac{r^2}{\eta}.\frac{9}{T}\ (\rho_s - \rho_r)$

$T\ = \frac{4}{9}\frac{\rho r^2}{\eta}$

15. A

$mg = m'g + 6\ \pi\ \eta\ r\ v$

$\frac{m - m'}{r}\ \times\ v$

16. C

$a = g - \frac{v\rho_L g}{m}\ - 6\pi\ \eta\ r\ v$

straight line

17. D

18. B

$F\ \ = \eta\ A\ \frac{dv}{dx}$

$= 1\ \times\ 100\ \times\ 10^{-4}\ \times\ \frac{7 \times 10^{-2}}{1 \times 10^{-3}}$

$F\ \ = 0.7\ N$