Sri Chaitanya IIT Academy, India

A.P, TELANGANA, KARNATAKA, TAMILNADU, MAHARASHTRA, DELHI, RANCHI

A right Choice for the Real Aspirant

ICON CENTRAL OFFICE, MADHAPUR-HYD

Sec: Sr. IPLCO **Date: 19-09-15**

Time: 9:00 AM to 12:00 Noon **RPTM-7** **Max.Marks: 360**

KEY SHEET

PHYSICS		MATHS		CHEMISTRY	
Q.NO	ANSWER	Q.NO	ANSWER	Q.NO	ANSWER
1	3	31	1	61	3
2	4	32	2	62	3
3	2	33	2	63	2
4	4	34	4	64	1
5	1	35	4	65	3
6	3	36	4	66	4
7	3	37	2	67	2
8	4	38	2	68	4
9	2	39	3	69	2
10	2	40	1	70	4
11	4	41	3	71	3
12	1	42	2	72	2
13	3	43	2	73	4
14	4	44	1	74	3
15	2	45	1	75	2
16	4	46	2	76	3
17	1	47	3	77	1
18	1	48	4	78	4
19	4	49	3	79	4
20	3	50	1	80	3
21	2	51	1	81	1
22	1	52	1	82	2
23	2	53	2	83	2
24	2	54	4	84	1
25	4	55	4	85	2
26	2	56	3	86	2
27	4	57	1	87	2
28	3	58	4	88	4
29	1	59	1	89	2
30	4	60	1	90	1

PHYSICS

1. Liquid in vessel C will be at the greatest height.

2. $P_0 + (l + h)\rho_w g = P_0 + 2h.\rho_m g$

3. Height of mercury level should remain same.

4. $P_0 + (50 + h)0.8 \times 10 = P_0 + 50 \times 1 \times 10$

   0.8h = 10 cm

   $h = \frac{10}{0.8} = \frac{100}{8} = \frac{25}{2} = 12.5\text{cm}$.

5. 10 × 1 × 10 = 12.5 × R × 10

   R = $\frac{10}{125} = \frac{100}{125} = \frac{4}{5}$ = 0.8.

6. $F = 4 \times [1500 - 1000]10 \times 20 \times 10^{-4}$

   = 40 N.

7. $0.2 \times 10 = \left(2 \times 10^{-2}\right) \times l^2 \times 100 \times 10$

   $l^2 = \frac{2}{200} = \frac{1}{100}$

   $l = \frac{1}{10}\text{m};\ l = 10\text{cm}$.

8. $\frac{\rho_b}{\rho_w} = \frac{2}{3}$

   $\frac{\rho_b}{\rho_l} = \frac{1}{4}$

   $\frac{\rho_l}{\rho_w} = \frac{8}{3}$

   $\rho_l = \frac{8}{3}\text{g/cc}$.

9. $T = \rho\rho_w v g$

   $T' = \rho\rho_w v g - \rho_w \frac{v}{2} g$

   = $\rho_w v g - \left[\rho - \frac{1}{2}\right]$

   $T' = \frac{T}{\rho}\left[\rho - \frac{1}{2}\right]$

$T' = \left[\frac{2\rho - 1}{2\rho}\right] T$.

10. Volume of material of sphere = $\frac{40}{8} = 5cc$

$(40 - 20) \times 10 = 1 \times V \times 10$

V = 20 cc [total volume]

Volume of cavity = 20 – 5 = 15 cc.

11. $0.9 \times 18 + m = 1 \times 18$

$m = 0.1 \times 18$

= 1.8 g.

12. Buoyancy force is greater than pseudo force and it will move up and the length of spring increases.

13. $P_1V_1 = P_2V_2$

$(P_0 + h\ \rho g)\ V = P_0\ (8V)$

$h\rho g = 7P_0$

$h\rho g = 7\ H\rho g$

h = 7H.

14. Work done equal difference in surface energy.

15. Surface energy equals surface tension multiplied by surface area.

16. Effective gravity is zero and water rises to fill the capillary.

17. $A_1V_1 = A_2V_2$

$L^2\sqrt{2gy} = \pi r^2\sqrt{2g4y}$

$r = \frac{L}{\sqrt{2\pi}}$.

18. $kx = \rho av^2$

$v = \sqrt{\frac{kx}{\rho a}}$.

19. $P_0 + h\rho g + \frac{h}{2}(2\rho)g = P_0 + \frac{1}{2}\rho v^2$

$2h\rho g = \frac{1\rho v^2}{2}$

$v = 2\sqrt{gh}$.

20. $P_0 + h \times 3.4 \times g = P_0 + 70 \times 13.6 \times g$

$h = \frac{70 \times 13.6}{3.4} = 280\text{cm}$.

21. $2F\sin\frac{d\theta}{2} = T\,R d\theta$

F = TR.

22. When the ball is pushed down, the water gains potential energy.
Where the ball loses potential energy. Hence, gain in potential energy of water

$= \left(V_\rho\right) rg - \left(\frac{V}{2}\rho\right)\left(\frac{3}{8}r\right)g$

(when half of the pherical ball is immersed in water, rise of c.g. of displaced water = $\frac{3r}{8}$)

$$= V\rho rg\left(1 - \frac{3}{16}\right) = \frac{4}{5}\pi r^3 \rho rg \times \frac{13}{16} = \frac{13}{12}\pi r^4 \rho g$$

Loss in PE of ball = $V\rho` rg = \frac{4}{3}\pi r^4 \rho` g$

Work done = $\frac{13}{12}\pi r^4 \rho g = \frac{4}{3}\pi r^4 \rho` g$

$$= \pi r^4 \rho g\left[\frac{13}{12} - \frac{4}{3}\frac{\rho`}{\rho}\right]$$

$$= \pi r^4 \rho g\left[\frac{13}{12} - \frac{4}{3} \times 0.5\right] = \frac{5}{12}\pi r^4 \rho g$$

23. Conceptual
24. Conceptual
25. Let V = Volume of solid sphere.
V_1 = Volume of the part of the sphere immersed in a liquid of density ρ_1
V_2 = Volume of the part of the sphere immersed in a liquid of density ρ_2
Hence, according to law of flotation,

$V\rho g = V_1\rho_1 g + V_2\rho_2 g$ .....(1)

and $V = V_1 + V_2$ .....(2)

Hence, $V_1\rho g + V_2\rho g = V_1\rho_1 g + V_2\rho_2 g$

or $V_1(\rho - \rho_1)g = V_2(\rho_2 - \rho)g$

or $\frac{V_1}{V_2} = \frac{\rho_2 - \rho}{\rho - \rho_1}$

$F_{bottom} - F_{upper\,surface} = \text{Upthrust}$

or $F_{bottom} - \pi R^2 h\rho g = V\rho g$

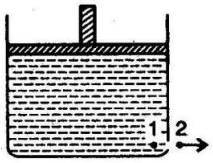
$\therefore$ $F_{bottom} = \rho g\left[\pi R^2 h + V\right]$

26. Applying Bernoullil's theorem at points 1 and 2, difference in pressure energy between 1 and 2 = difference in kinetic energy between 1 and 2

$$phg+\frac{mg}{A}=\frac{1}{2}pv^2$$

$$v=\sqrt{2gh+\frac{2mg}{\rho A}}$$

$$\sqrt{2\left(gh+\frac{mg}{\rho A}\right)}$$



27. $$F=\left[\frac{\rho\left(V_2^2-V_1^2\right)}{2}[A]\right](2)$$

28. 76 × 8 = (76 – x) (54 – x), where x is the height of the liquid in the tube.
So height of air column = 54 – x = 16

29. The height h to which the liquid rises in a capillary tube is given by

$$h=\frac{2T\cos\theta}{r\rho g}$$

Since, T, $\cos\theta$, ρ and g are constants,
Hence, hr=constant.

30. Consider an element of the liquid of width dx and area of cross section A, at a distance x from the front of the tank. Mass of the element, dm=Adxρ. Net force to the right on the element

$$=(p+dp)A-pA=Adp$$

$$\therefore Adp=(\rho A\,dx)a$$

$$\int_A^C dp=\int_A^C \rho a\,dx \text{ or } P_C-P_A=\rho al$$

Also $P_B-P_C=\rho gh$

Or $P_B-(P_A+\rho al)=\rho gh$

Or $P_B-P_A=h\rho g+l\rho a$