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: 22-08-15**

Time: 9:00 AM to 12:00 Noon **RPTM-4** **Max.Marks: 360**

KEY SHEET

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

PHYSICS

1. Internal forces Can't change the momentum of the system

2. $(2m)V + 0 = (2m)\dfrac{V}{3} + mV^1$

$\Rightarrow V^1 = \dfrac{4V}{3}$

$\therefore e = \dfrac{\dfrac{4V}{3} - \dfrac{V}{3}}{V - 0} = 1$

3. Conceptual

4 $\dfrac{\Delta k}{k_i} = \dfrac{\dfrac{1}{2}.\left(\dfrac{2}{3}m\right).V^2}{\dfrac{1}{2}(2m)V^2} = \dfrac{1}{3}$

5. Collision occurs between the time interval t=1s and t=3sec

They maintain common speed at t=2sec

$m_R \times 0.8 + m_S \times 0 = m_R \times 0.2 + m_S \times 1$

$\Rightarrow m_S = (0.6)mR$

$\therefore m_R > m_S$

6. $\left(k_{system}\right)_i = \dfrac{1}{2}\times 5\times 2^2 + \dfrac{1}{2}10\times\left(\sqrt{3}\right)^2 = 25J.$

$\left(k_{system}\right)_f = \dfrac{1}{2}15\left[\left(\dfrac{10}{15}\right)^2 + \left(\dfrac{10\sqrt{3}}{15}\right)^2\right] = \dfrac{40}{3}J$

$\therefore$ Heat liberated $= 25 - \dfrac{40}{3} = \dfrac{35}{3}J$

7. $\vec{F}\Delta t = m(\overrightarrow{V_F} - \overrightarrow{V_i})$

$2\vec{F} = 10\left(3\hat{j} - 4\hat{i}\right)$

$\Rightarrow \vec{F} = 15\hat{J} - 20\hat{i}$

$|F| = \sqrt{225+400} = 25N$

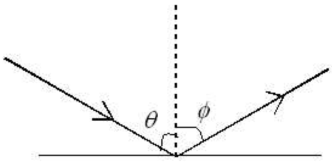
8. During collision KE loss is maximum

Let $Ki = \dfrac{1}{2}mv^2 = 3 \Rightarrow mv^2 = 6J$

Loss in $KE = \dfrac{1}{2}\dfrac{m.2m}{3m}.V^2 = \dfrac{mv^2}{3} = 2J$

Then loss in KE converted to elastic P.E.

9.



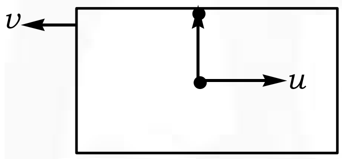
$\tan\phi \geq \tan\theta \Rightarrow \phi \geq \theta$

10. $\therefore \vec{a}\ cm = \dfrac{\overrightarrow{Mg} - \vec{R}}{M}$

11. $e = \dfrac{\dfrac{\pi R^2}{4}}{\left(\dfrac{\pi R.R}{2}\right)} = \dfrac{2}{4} = \dfrac{1}{2}$

e = 0.5

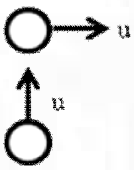
12.



Just after collision $T = \dfrac{m(2v)^2}{v}$

13. Conceptual

14 $\mathrm{KE} = \frac{1}{2}\mathrm{m}\left(\mathrm{V}_2^2 - \mathrm{V}_1^2\right) = \frac{1}{2}\mathrm{m}\left(\vec{\mathrm{V}}_2 - \vec{\mathrm{V}}_1\right).\left(\vec{\mathrm{V}}_2 + \vec{\mathrm{V}}_1\right) = \frac{1}{2}\vec{\mathrm{I}}.\left(\vec{\mathrm{V}}_1 + \vec{\mathrm{V}}_2\right)$



15.

16. $\mathrm{T} = 2\sqrt{\dfrac{2\mathrm{h}}{\mathrm{g}}}$ independent of horizontal impulse from the wall.

17. By law of conservation of momentum, Just after

$\cancel{m}v_0 = 3\cancel{m}v'$

$v' = \dfrac{v_0}{3}$

By Energy conservation

$$\frac{1}{2}(3m)v'^2 = 3mgR(1-\cos\theta)+\frac{1}{2}mv''^2$$

Solving

$$v''^2 = 100$$
$$V'' = 10m/s$$

$$a_{\tan} : a_{con} = g\sin\theta = \frac{v''^2}{R} = \frac{10\sqrt{3}}{2} : 100$$

$$\sqrt{3} : 20$$

18. By law of conservation of momentum,

$$v'' = -\left[v_1'\hat{i} + v_1'\hat{j} + v'\hat{k}\right]$$

$$(v'')^2 = 3\left[v'^2\right].$$

$$E_0 = \frac{1}{2}mv'^2$$

Total E = $3\left[\frac{1}{2}mv'^2\right]+\frac{1}{2}mv''^2$

$$= 3\left[E_0\right] + 3E_0$$

$$= 6E_0$$

19. By law of conservation of momentum,

$$\cancel{m}u = 2\cancel{m}v\cos 30° + \cancel{m}v_1$$

coefficient of restitution

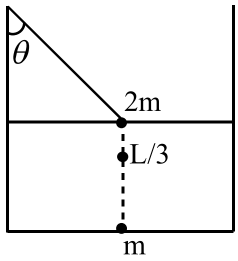
$$e = \frac{v - v_1\cos 30°}{v\cos 30°}$$

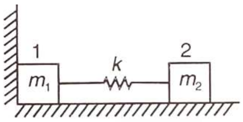
Solving we get

$$\frac{u\sqrt{3}}{5}(1+e)$$

20. Conceptual

21. For equilibrium the center of mass should lie below point of suspension.



22. 

According to C.O.E we get

$$\frac{1}{2}kx^2 = \frac{1}{2}m_2 v_2^2$$

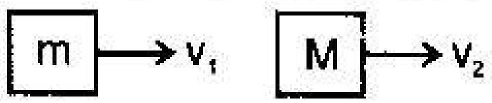
$$v_2 = \sqrt{\frac{k}{m}}x$$

$$C_{CM} = \frac{m_1 \times 0 + m_2 \times \sqrt{\frac{k}{m}}x}{m_1 + m_2}$$

23. (3) Let v_1, v_2 and v_3 be velocities of blocks 1, 2, and after suffering collision each.

$mv = mv_1 + Mv_2$ and $v_1 - v_2 = -v$

solving we get $v_1 = \frac{m-M}{m+M} < 0 \because m < M$



$$\therefore |v_1| = \frac{M-m}{m+M}v$$

and $v_2 = \frac{2mv}{m+M}$

Similarly $v_3 = \frac{2mv}{m+M} \times v_2 = \frac{4Mmv}{(m+M)^2}$ ..... (2)

$$\therefore \frac{M-m}{M+m}v = \frac{4Mmv}{(m+M)^2}$$

or $M^2 - m^2 = 4Mm$

$\frac{M}{m} = 2+\sqrt{5}$ Ans

24. During 1st collision perpendicular component of v, $v_\perp$ becomes e times, when IInd component $v_{||}$ remains unchanged and similarly for second collision. The end result is that both $v_{||}$ and $v_\perp$ becomes e times their initial value and hence v" = - ev (the(-) sign indicates the reversal of direction).

25. $F = \left(\frac{dm}{dt}\right)V = 5N$

$a = \frac{5}{2} m/s^2$

26. The motion of the centre of mass is shown in the figure

$s = ut + \frac{1}{2}gt^2$

t=4s.

27. Extra force $F = v\frac{dm}{dt} = 0.6\times 5 = 3N$

28. $\vec{V}_P = -V_2 \sin\left(\frac{V_2}{R}t\right)\hat{i} + V_2\cos\left(\frac{V_2}{R}t\right)\hat{j}$s

$\vec{V}_Q = V_1\hat{j}$

Relative linear momentum = $m\left(\vec{V}_P - \vec{V}_Q\right)$

29. Final velocity of $B > 2m/s$ (same as A)

$(KE)_B > \frac{1}{2}m(2)^2$

$(p)_B > m(2)$ we see that KE is numerically greater than momentum

30. Displacement of C.M along x – axis should be zero

$Y_{CM} = 0$

$\Rightarrow y_2 = -5cm$