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	JEE–ADVANCE	Date: 23-08-15
Time: 3 Hours	2011-P1-Model	Max Marks: 240

PAPER-I
KEY & SOLUTIONS

CHEMISTRY

1	B	2	D	3	A	4	D	5	C	6	A
7	C	8	ABCD	9	AD	10	ABC	11	AB	12	B
13	C	14	D	15	A	16	D	17	2	18	7
19	2	20	2	21	5	22	7	23	5		

PHYSICS

24	D	25	C	26	C	27	C	28	A	29	D
30	A	31	ABD	32	CD	33	BC	34	ABCD	35	C
36	B	37	B	38	B	39	A	40	2	41	2
42	4	43	4	44	8	45	3	46	3		

MATHS

47	C	48	A	49	A	50	B	51	A	52	C
53	D	54	ABCD	55	AB	56	ABC	57	ABCD	58	B
59	A	60	C	61	D	62	A	63	6	64	2
65	2	66	7	67	5	68	8	69	9		

PHYSICS

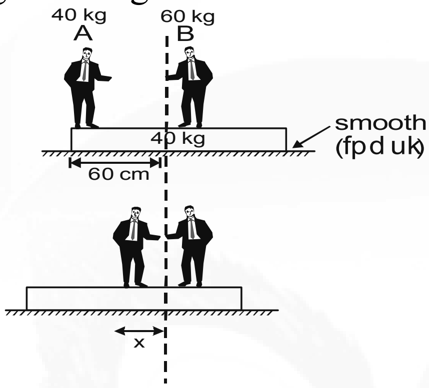
24. **(D)** By conservation of linear momentum along the string,

$$mu = (m + m + 3m)\,v \text{ or } v = \frac{4}{5}$$

and impulse on the block A = 3m (v – 0) $= \frac{3mu}{5}$

25.

Sol. **(C)** Taking the origin at the centre of the plank.



$m_1\Delta x_1 + m_2\Delta x_2 + m_3\Delta x_3 = 0$ $\quad (\Delta x_{CM} = 0)$

(Assuming the centres of the two men are exactly at the axis shown.)

$60(0)+40(60)+40(-x)=0$, x is the displacement of the block.

$\Rightarrow x = 60\ cm$

26.

Sol. **(C)** Neglecting gravity,

$$v = \left(\frac{m_0}{m_t}\right)u\lambda n \ ;$$

u = ejection velocity w.r.t. balloon .

$m_0 =$ initial mass

$$= \left(\frac{m_0}{m_0/2}\right)2\ell n = 2\ell n 2$$

27.

Sol. **(C)** Let the tube displaced by x towards left, then ;

$$mx = m(R-x) \Rightarrow x = \frac{R}{2}$$

31.

Sol. **(A), (B), (D)**

Self explanatory

32.

Sol. **(C), (D)**

Since, $F_{ext} = 0$

Hence, momentum will remain conserved equal to mv.

$mv = (m + M)\, v'$

or $v' = \frac{mv}{m+M}$

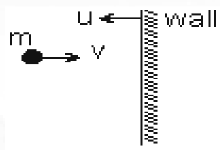
and final kinetic energy is $\frac{1}{2}(m + M)\, v'^2$

$$= \frac{1}{2}(m + M)\left(\frac{mv}{m+M}\right)^2 = \frac{m^2v^2}{2(m+M)}$$

33.

Sol. (B), (C)

in an elastic collision



$v_{sep} = v_{app}$

or $v' - u = v + u$

or $v' = v + 2u$

change in momentum of ball is $|p_f - p_i|$

$= |m(-v') - mv|$

$= m(v' + v)$

$= 2m(u + v)$

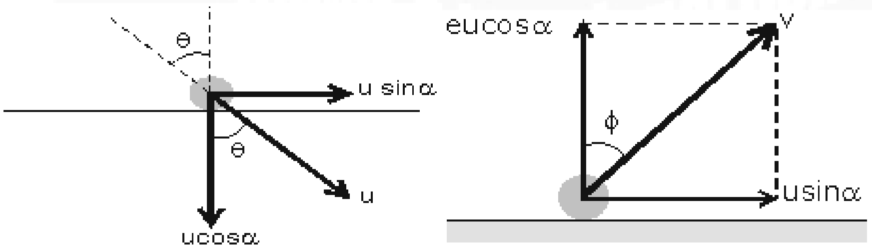
average force $= \frac{\Delta p}{\Delta t} = \frac{2m(u+v)}{\Delta t}$

change in $KE = K_f - K_i = \frac{1}{2}mv'^2 - \frac{1}{2}mv^2$

$= 2mu(u + v)$

34.

Sol. (A), (B), (C) & (D)



Impulse (J) = ΔP $= mv \sin\phi - m(-u \sin\theta)$

$= m(v \sin\phi + u \sin\theta)$

$= m(V_{sep} + V_{app})$

$= m\ (eV_{app} + V_{app})\ [e = \frac{V_{sep}}{V_{app}}]$

$= m\ V_{app}\ (e + 1)$

$J = m\ u \sin\theta\ (1 + e)$

In horizontal direction, momentum is conserved :

$u \cos\theta = v \cos\phi$ or $v = \frac{u\cos\theta}{\cos\phi}$

or ; $e = \frac{V_{sep}}{V_{app}} = \frac{v\sin\phi}{u\sin\theta} = \frac{\tan\phi}{\tan\theta}$

or $\tan\phi = e\tan\theta$

in vertical direction, $e = \frac{v\sin\phi}{u\sin\theta}$

or ; $v\sin\phi = eu\sin\theta$,

$v = \sqrt{(eu\sin\theta)^2 + (u\cos\theta)^2}$

$= u\sqrt{e^2\sin^2\theta + \cos^2\theta}$

$v = u\sqrt{1-(1-e^2)\sin^2\theta}$

final kinetic energy $= \frac{1}{2}mv^2$

initial kinetic energy $= \frac{1}{2}mu^2$

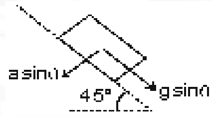
$ratio = \frac{v^2}{u^2} = e^2\sin^2\theta + \cos^2\theta$

38.

Ans C

Sol. The acceleration a of wedge is $a = \frac{g\sin\theta\cos\theta}{1+\sin^2\theta} = \frac{g}{3}$

$\therefore$ The components of acceleration of block along and normal to incline are



Hence vertical component of acceleration of block is $a_y = a\sin^2\theta + g\sin\theta\cos\theta = \frac{2g}{3}$

SECTION-IV (Total Marks : 28)

(Integer Answer Type)

40.

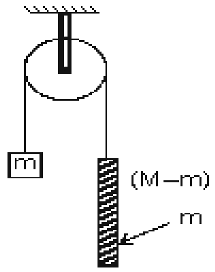
Ans 2

[Ans : $\alpha = (u/v_0)\ln(m_0/m)$]

45.

Ans 3.

Sol. In the from of reference fixed to the palley axis. the location of c.m. of the given system is described by the radius vector



$$\Delta\vec{r}_{CG} = \frac{M\Delta\vec{r}_{MG} + (M-m)\Delta\vec{r}_{(M-m)G} + m\Delta\vec{r}_{mG}}{M+(M-m)+m}$$

Note that /;ku nsa

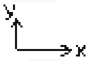
$\Delta\vec{r}_M = -\Delta\vec{r}_{(M-m)}$ and vkSj $\Delta\vec{r}_{M\,(M-m)} + \Delta\vec{r}_{(M-m)} = \Delta\vec{r}_M$

$= \Delta\vec{r}_{CG} = \frac{m[\vec{r}_{mG} - \vec{r}_{(M-m)G}}{2M}$

$= \frac{m\,\Delta\vec{r}_{m(M-m)}}{2M} = \frac{m\,\vec{\ell}'}{2M}$

46.

Ans 3.

Soln. 

V = $\sqrt{2gl}$

In x dir

2m × $\frac{v}{\sqrt{2}}$ = 3 mV

v = $\frac{3}{\sqrt{2}}$V

= $\frac{3}{\sqrt{2}} \times \sqrt{2gl}$

v = $3\sqrt{gl}$ **Ans.**