PHYSICS PRACTICE PROBLEMS

CLASS XI

NEET

EXAM ON 5th MAY 2019

SINGLE OPTION CORRECT

This paper contains 45 **multiple choice questions**. Each question has four choices (a), (b), (c) and (d), out of which **ONLY ONE** is correct. (Mark only One Choice).

Marks : 45 × 4 = 180 **Negative Marking (–1)**

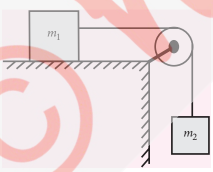
1. A body of mass $7m$ initially at rest explodes into two fragments of masses $4m$ and $3m$. If the momentum of the lighter fragment is p then the kinetic energy released in the explosion will be

(a) $\frac{7p^2}{24m}$ (b) $\frac{9p^2}{16m}$ (c) $\frac{11p^2}{24m}$ (d) $\frac{5p^2}{14m}$

2. A particle of mass m describes a circle of radius r. The centripetal acceleration of the particle is $\frac{4}{r^2}$. The momentum of the particle is

(a) $\frac{4m}{r}$ (b) $\frac{2m}{r}$ (c) $\frac{4m}{\sqrt{r}}$ (d) $\frac{2m}{\sqrt{r}}$

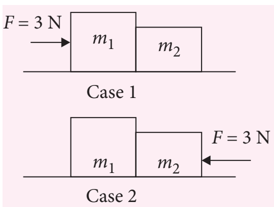
3. Figure shows a block of mass m_1 on a smooth horizontal surface pulled by a string which is attached to a block of mass m_2 hanging over a frictionless pulley which has no mass. The blocks will move with an acceleration



(a) g (b) $\left\{\frac{m_1+m_2}{m_2}\right\}g$

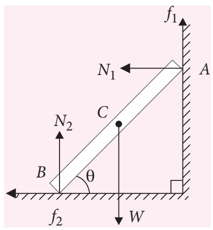
(c) $\left\{\frac{m_2}{m_1+m_2}\right\}g$ (d) $\left\{\frac{m_1}{m_1+m_2}\right\}g$

4. Two blocks m_1 and m_2 are in contact over a frictionless table; m_1 = 2.0 kg, m_2 = 1.0 kg. In the first case a horizontal force of magnitude 3 N is applied to block m_1. In the second case this force is applied to block m_2. The forces of contact between the blocks in the first and the second cases, respectively are



(a) 3 N, 3 N (b) 2 N, 2 N
(c) 1 N, 2 N (d) 2 N, 1 N

5. A uniform ladder is in equilibrium against a rough wall as shown. Points A and B respectively are the point of contact of ladder with wall and with the ground. Point C is the CM of the ladder.



1. Torque due to friction f_2 about point A is not zero.
2. Torque due to friction f_2 about point B is zero.
3. Torque due to weight is zero about A, B and C.
4. Torque due to f_1 and N_1 is not zero about A.

(a) Only 1 and 3 are correct
(b) Only 2 and 3 are correct
(c) Only 3 and 4 are not correct
(d) Only 1 and 4 are correct

6. The moment of inertia of an annular disc (a disc with concentric cavity) of mass M radius R and cavity radius r about an axis passing through its CM and normal to its plane will be

(a) $\frac{1}{2}M\left(R^2+r^2\right)$ (b) $\frac{1}{2}M\left(R^2-r^2\right)$

(c) $\frac{1}{8}M\left(2R^2+r^2\right)$ (d) $\frac{1}{4}M\left(R^2+r^2\right)$

7. A body is moved along a straight line by a machine delivering constant power. The distance moved by the body in time t is proportional to

(a) $t^{1/2}$ (b) $t^{3/4}$ (c) $t^{3/2}$ (d) t^2

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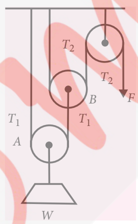
8. A body of mass 3 kg is under a force which causes displacement in it, given by $s = \frac{t^2}{3}$ in metre, with time t in seconds. What is the work done by the force between time $t = 0$ and $t = 2$ s ?
(a) 8 J (b) 5.2 J (c) 3.9 J (d) 2.6 J

9. The linear momentum p of a body varies with time as $p = 5\alpha + 7\beta t^2$ where α and β are constants. The net force acting on the body for one dimensional motion varies as
(a) t^2 (b) t^{-1} (c) t^{-2} (d) t

10. A body is acted upon by a force proportional to square of distance covered. If the distance covered is denoted by x, then work done by the force will be proportional to
(a) x (b) x^2 (c) x^3 (d) x^{-2}

11. The potential energy function along the positive x-axis is given by $U(x) = -ax + \frac{b}{x}$, a and b are constants. If it is known that the system has only one stable equilibrium configuration, the possible values of a and b are
(a) $a = -1, b = 2$ (b) $a = -5, b = 1$
(c) $a = 1, b = -2$ (d) $a = 5, b = -3$

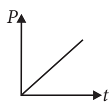
12. Neglecting the friction and weights of the pulley, which one of the following is the force F required to lift a 100 N load in the system of pulleys as shown in the figure?

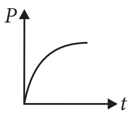


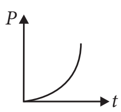
(a) 20 N (b) 25 N
(c) 30 N (d) 35 N

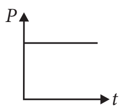
13. A body is falling freely under the action of gravity alone in vacuum. Which of the following quantities remain constant during the fall?
(a) Kinetic energy
(b) Potential energy
(c) Total mechanical energy
(d) Total linear energy

14. A motor drives a body along a straight line with a constant force. The power P developed by the motor must vary with time t as shown in figure

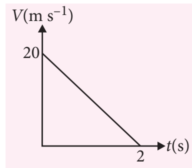
(a) 

(b) 

(c) 

(d) 

15. Velocity-time graph of a particle of mass 4 kg moving in a straight line is as shown in figure. Work done by all forces on the particle is



(a) 400 J (b) – 800 J (c) – 400 J (d) 200 J

16. An ideal spring with spring constant k is hung from the ceiling and a block of mass M is attached to its lower end. The mass is released with the spring initially unstretched. Then the maximum extension in the spring is
(a) $\frac{4Mg}{k}$ (b) $\frac{2Mg}{k}$ (c) $\frac{Mg}{k}$ (d) $\frac{Mg}{2k}$

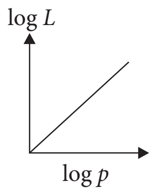
17. A block of mass 5 kg is resting on a smooth surface. At what angle a force of 20 N be acted on the body so that it will acquire a kinetic energy of 40 J after moving 4 m ?
(a) 30° (b) 45° (c) 60° (d) 120°

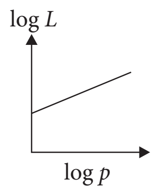
18. The moment of inertia of a body about a given axis is 1.2 kg m^2. Initially, the body is at rest. In order to produce a rotational kinetic energy of 1500 J, an angular acceleration of 25 rad s^{-2} must be applied about that axis for a duration of
(a) 4 s (b) 2 s (c) 8 s (d) 10 s

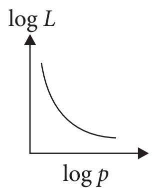
19. A particle performs uniform circular motion with an angular momentum L. If the frequency of particle's motion is halved and its kinetic energy doubled, the angular momentum becomes
(a) $2L$ (b) $4L$ (c) $L/2$ (d) $L/4$

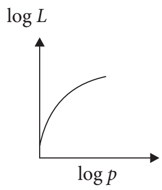
20. The moment of inertia of two spheres of equal masses about their diameters are equal. If one of them is solid and other is hollow, the ratio of their radii is
(a) $\sqrt{3} : \sqrt{5}$ (b) $3 : 5$
(c) $\sqrt{5} : \sqrt{3}$ (d) $5 : 3$

21. The curve between log L and log p is (L is angular momentum and p is linear momentum)

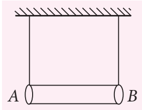
(a) 

(b) 

(c) 

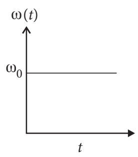
(d) 

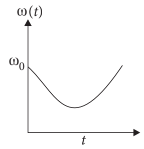
22. A uniform rod of mass m and length L is suspended by means of two light inextensible strings as shown in figure. Tension in one string immediately after the other string is cut is

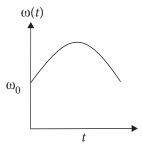


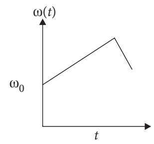
(a) $\frac{mg}{2}$ (b) mg (c) $2\,mg$ (d) $\frac{mg}{4}$

23. A circular platform is free to rotate in a horizontal plane about a vertical axis passing through its centre. A tortoise is sitting at the edge of the platform. Now the platform is given an angular velocity ω_0. When the tortoise moves along a chord of the platform with a constant velocity with respect to the platform, the angular velocity of the platform will vary with the time t as

(a) 

(b) 

(c) 

(d) 

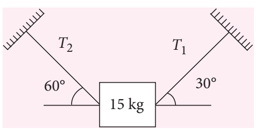
24. A wheel has angular acceleration of 3.0 rad s^{-2} and an initial angular speed of 2.00 rad s^{-1}. In a time of 2 s it has rotated through an angle (in radian) of

(a) 6 (b) 10 (c) 12 (d) 4

25. The moment of inertia of a rod about an axis through its centre and perpendicular to it is $\frac{1}{12}ML^2$ where, M is the mass and L the length of the rod. The rod is bent in the middle so that the two halves make an angle of 60°. The moment of inertia of the bent rod about the same axis would be

(a) $\frac{ML^2}{48}$ (b) $\frac{ML^2}{12}$ (c) $\frac{ML^2}{24}$ (d) $\frac{ML^2}{8\sqrt{3}}$

26. A body of mass 15 kg is suspended by the strings making angles 60° and 30° with the horizontal as shown in figure. Then (take $g = 10$ m s^{-2})



(a) $T_2 = 75$ N (b) $T_2 = 75\sqrt{3}$ N

(c) $T_1 = 25\sqrt{3}$ N (d) $T_1 = 12$ N

27. A car of mass 1000 kg negotiates a banked curve of radius 40 m on a frictionless road. If the banking angle is 45°, the speed of the car is

(a) 20 m s^{-1} (b) 30 m s^{-1}

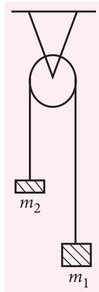
(c) 5 m s^{-1} (d) 10 m s^{-1}

28. A 5000 kg rocket is set for vertical firing. The exhaust speed is 800 m s^{-1}. To give an initial upward acceleration of 20 m s^{-2}, the amount of gas ejected per second to supply the needed thrust will be ($g = 10$ m s^{-2})

(a) 127.5 kg s^{-1} (b) 187.5 kg s^{-1}

(c) 185.5 kg s^{-1} (d) 137.5 kg s^{-1}

29. For shown atwood machine $m_1 = 8$ kg, $m_2 = 2$ kg. The string and the pulley are assumed to be smooth and massless. Take $g = 10$ m s^{-2}. The acceleration of center of mass of the system is.



(a) 3.6 m s^{-2} (b) 6 m s^{-2}

(c) 5 m s^{-2} (d) 0

30. A wide hose pipe is held horizontally by a fireman. It delivers water through a nozzle at two litre per second. On increasing the pressure, this increases to four litres per second. The fireman has now to

(a) push forward twice as hard

(b) push forward four times as hard

(c) push backward four times as hard

(d) push backward twice as hard.

31. A block of mass m is placed on a smooth wedge of inclination θ. The whole system is accelerated horizontally so that the block does not slip on the wedge. The force exerted by the wedge on the block has a magnitude

(a) $mg \tan\theta$ (b) $mg \cos\theta$

(c) $mg \sec\theta$ (d) mg

32. A system consists of 3 particles each of same mass and located at points (1, 2), (2, 4) and (3, 6). The co-ordinates of the center of mass are

(a) (1, 2) (b) (2, 4) (c) (4, 2) (d) (3, 6)

33. Out of the following bodies of same mass, which one will have maximum moment of inertia about an axis passing through its center of gravity and perpendicular to its plane ?

(a) ring of radius r

(b) disc of radius r

(c) square frame of sides $2r$
(d) square lamina of sides $2r$

34. Consider a two particle system with particles having masses m_1 and m_2. If the first particle is pushed towards the center of mass through a distance d, by what distance should the second particle be moved so as to keep the center of mass at the same position ?

(a) $\frac{m_1}{m_2}d$ (b) d
(c) $\frac{m_2}{m_1}d$ (d) $\frac{m_1}{m_1+m_2}d$

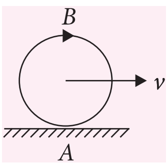
35. Two particles of mass m_1 and m_2 ($m_1 > m_2$) attract each other with a force inversely proportional to the square of the distance between them. The particles are initially held at rest and then released. Then the CM
(a) moves towards m_1 (b) moves towards m_2
(c) remains at rest
(d) moves at right to the line joining m_1 and m_2

36. Two skaters A and B of masses 50 kg and 70 kg respectively stand facing each other 6 m apart. Then they pull on a rope stretched between them. How far has each moved when they meet?
(a) both have moved 3 m
(b) A moves 2.5 m and B 2.5 m
(c) A moves 3.5 m and B 2.5 m
(d) A moves 2 m and B 4 m

37. A thin uniform circular disc of mass M and radius R is rotating in a horizontal plane about an axis passing through its center and perpendicular to its plane with an angular velocity ω. Another disc of same dimensions but of mass $\frac{1}{4}M$ is placed gently on the first disc co-axially. The angular velocity of the system is

(a) $\sqrt{2}\,\omega$ (b) $\frac{4}{5}\omega$ (c) $\frac{3}{4}\omega$ (d) $\frac{1}{3}\omega$

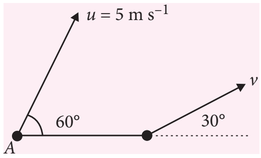
38. A wheel is rolling uniformly along a level road (see figure). The speed of translational motion of the wheel axis is v. What are the speeds of the points A and B on the wheel rim relative to the road at the instant shown in the figure?



(a) $v_A = v\,;\, v_B = 0$
(b) $v_A = 0\,;\, v_B = v$
(c) $v_A = 0\,;\, v_B = 0$
(d) $v_A = 0\,;\, v_B = 2v$

39. If a force $10\hat{i}+15\hat{j}-25\hat{k}$ acts on a system and gives an acceleration $2\hat{i}+3\hat{j}-5\hat{k}$ to the centre of mass of the system, the mass of the system is
(a) 5 units (b) $\sqrt{38}$ units
(c) $5\sqrt{38}$ units (d) None of these

40. Two particles A and B are situated at a distance $d = \sqrt{3}$ m apart. Particle A has a velocity of 5 m s^{-1} at an angle of 60° and particle B has a velocity v at an angle of 30° as shown in figure. The distance d between A and B is constant. The angular velocity of B with respect to A is



(a) $5\sqrt{3}$ rad s^{-1} (b) $\frac{5}{3}$ rad s^{-1}
(c) $\frac{10}{\sqrt{3}}$ rad s^{-1} (d) $\frac{5}{\sqrt{3}}$ rad s^{-1}

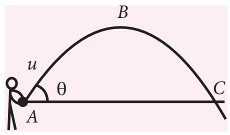
41. The ratio of the dimensions of Planck's constant and that of the moment of inertia is the dimension of
(a) Frequency (b) Velocity
(c) Angular momentum (d) Time

42. A ball is dropped to the ground from a height of 8 m. The coefficient of restitution is 0.5. To what height will the ball rebound?
(a) 2 m (b) 1.42 m (c) 4 m (d) 0.5 m

43. A mass m moving horizontally with velocity v_o strikes a pendulum of mass $2m$. If the two masses stick together after the collision, then the maximum height reached by the pendulum is

(a) $\frac{v_0^2}{18g}$ (b) $\frac{v_0^2}{2g}$ (c) $\frac{v_0^2}{6g}$ (d) $\frac{v_0^2}{12g}$

44. A ball is projected in vacuum as shown. Average power delivered by gravitational force



(a) for A to C is positive
(b) for B to C is zero.
(c) for A to B is negative.
(d) for A to B is zero.

45. 1. During any collision, velocity along common tangent doesn't change.
2. In an elastic collision with equal masses, the velocity along common normal is interchanged.
3. When a ball makes an oblique inelastic collision with a fixed target the reflection angle is less than incidence.

4. In a one dimensional elastic collision the fraction of kinetic energy transferred by a projectile to a stationary target is $\frac{4m_1 m_2}{(m_1+m_2)^2}$.

(a) Only 3 is wrong (b) 2 and 3 are wrong
(c) Only 4 is wrong (d) 3 and 4 are wrong

SOLUTIONS

1. (a) : $7m \cdot 0 = 4mv_1 + 3mv_2 = p_1 + p_2$

$\Rightarrow p_2 = -p_1 = p$ (given)

$$K = \frac{p_1^2}{2m_1} + \frac{p_2^2}{2m_2}$$
$$= \frac{p^2}{2(4m)} + \frac{p^2}{2(3m)} = \frac{p^2}{2m}\left[\frac{1}{4}+\frac{1}{3}\right] = \frac{7p^2}{24m}$$

2. (d) : $a_{cp} = \frac{v^2}{r} = \frac{4}{r^2}$

$\Rightarrow v = \frac{2}{\sqrt{r}}$ $\quad\therefore p = mv = \frac{2m}{\sqrt{r}}$

3. (c) : For $m_2 : m_2 a = mg - T$

For $m_1 : T = m_1 a$

On adding, $(m_1 + m_2)\,a = mg$ or $a = \frac{m_2 g}{m_1 + m_2}$

4. (c) : $a = \frac{F_{net}}{m_{total}} = \frac{3}{2+1} = 1 \text{ m s}^{-2}$

Case 1: for $m_1 : 3 - N = 2\,(1) \Rightarrow N = 1$ N

Case 2: for $m_2 : 3 - N = (1)\,(1) \Rightarrow N = 2$ N

5. (c) : Torque of a force about a point is zero only when the line of action of the force passes through that point.

6. (a) : Check: When $r \longrightarrow 0$, it becomes disc and when $r \longrightarrow R$, it becomes ring.

7. (c) : $P = M^1 L^2 T^{-3}$ = constant

$\Rightarrow x^2 t^{-3}$ = constant or $x^2 \propto t^3$ or $x \propto t^{3/2}$

8. (d) : $s = \frac{t^2}{3} \Rightarrow v = \frac{2t}{3}$, $v(t=0) = \frac{2}{3}(0) = 0$

$v(t=2) = \frac{2}{3}(2) = \frac{4}{3}$

$$W = \Delta K = \frac{1}{2}.3.\left(\left(\frac{4}{3}\right)^2 - 0\right) = \frac{1}{2}.3.\frac{4}{3}.\frac{4}{3} = \frac{8}{3} = 2.6 \text{ J}$$

9. (d) : $p = 5\alpha + 7\beta t^2$

$$F = \frac{dp}{dt} = 0 + 7 \times 2\beta t \Rightarrow F \propto t$$

10. (c) : $F \propto x^2$, $W = \int F\,dx \propto x^3$

11. (a) : $U = -ax + \frac{b}{x} \Rightarrow -F = \frac{dU}{dx} = -a - \frac{b}{x^2}$

or $F = a + \frac{b}{x^2}$ $\quad \frac{d^2U}{dx^2} = 0 + \frac{2b}{x^3}$

At stable equilibrium, $F = 0$, $\frac{d^2U}{dx^2} > 0$

$a + \frac{b}{x^2} = 0 \Rightarrow a = \frac{-b}{x^2}$ Also, $\frac{2b}{x^3} > 0$

12. (b) : For rope: $F = T_2$

For pulley B: $2\,T_2 = T_1$

For pulley A: $2\ \ T_1 = W = 100$

Using above eqns.

$F = \frac{100}{4} = 25$ N

13. (c)

14. (a) : $P = Fv$ = (constant) $(u + at)$

$\Rightarrow P \propto t$, so linear variation.

15. (b) : Speed becomes 0 from 20 m s^{-1}.

$\therefore W = \Delta K = \frac{1}{2}.4.\left[0 - (20)^2\right] = -800$ J

16. (b) : Let the maximum extension in the spring be x. By work energy theorem, $W = \Delta K$

$Mgx - \frac{1}{2}kx^2 = 0 - 0 \Rightarrow x = \frac{2Mg}{k}$

17. (c) $W = \Delta K$

$20 \times 4 \times \cos\theta = 40 \Rightarrow \cos\theta = \frac{1}{2}$ or $\theta = 60°$

18. (b) : $K = \frac{1}{2} I(\omega_0 + \alpha t)^2$

$1500 = \frac{1}{2} \times 1.2 \times (0 + 25t)^2 \Rightarrow t = 2$ s

19. (b) : $K = \frac{1}{2}L\omega \Rightarrow \frac{K'}{K} = \frac{L'}{L}\frac{\omega'}{\omega}$

$\Rightarrow 2 = \frac{L'}{L}\left(\frac{1}{2}\right) \Rightarrow L' = 4L$

20. (c): $\frac{2}{5}MR_S^2 = \frac{2}{3}MR_H^2 \Rightarrow \frac{R_S}{R_H} = \sqrt{\frac{5}{3}}$

21. (b): $L = pr \Rightarrow \log L = \log(pr)$

$\log L = \log p + \log r$; $y = mx + C$

So, straight line with positive intercept.

22. (a): Before cutting, $T_A + T_B = mg$

For rotational equilibrium about center

$$T_A\frac{L}{2}=T_B\frac{L}{2} \Rightarrow T_A=T_B$$

So, $2T_A = mg$ or $T_A=\frac{mg}{2}$

If string B is cut, just after cutting tension in A remains same *i.e.*, $\frac{mg}{2}$.

23. (c): Moment of inertia first decreases and then increases, thus by law of conservation of angular momentum,

$L = I\omega = \text{constant}$

ω first increases and then decreases.

24. (b): $\theta=\omega_0 t+\frac{1}{2}\alpha t^2 =2(2)+\frac{1}{2}(3)(2)^2 = 10$ radian

25. (b): $I=\frac{1}{3}\left(\frac{M}{2}\right)\left(\frac{L}{2}\right)^2+\frac{1}{3}\left(\frac{M}{2}\right)\left(\frac{L}{2}\right)^2$

$$=\frac{1}{3}\left(\frac{M}{2}\right)\left(\frac{L}{2}\right)^2\times 2=\frac{ML^2}{12}$$

26. (b): Horizontally: $T_2\cos 60° = T_1\cos 30°$

$\Rightarrow T_2=T_1\sqrt{3}$

Vertically : $T_2\sin 60° + T_1\sin 30° = 150$

Thus $T_1 = 75$ N and $T_2=75\sqrt{3}$ N

27. (a): As $\tan\theta=\frac{v^2}{gr}$

$\tan 45^\circ=\frac{v^2}{10(40)} \Rightarrow v = 20 \text{ m s}^{-1}$

28. (b): $v_{gr}\frac{dm}{dt}=m(g+a)$

$800\frac{dm}{dt}=5000(10+20) \Rightarrow \frac{dm}{dt}=187.5 \text{ kg s}^{-1}$

29. (a): $a_{cm}=\left(\frac{m_1-m_2}{m_1+m_2}\right)^2 g=\left(\frac{8-2}{8+2}\right)^2 10=3.6 \text{ m s}^{-2}$

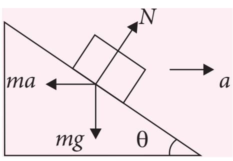
30. (b): $F=v\frac{dm}{dt}, \frac{dm}{dt}=\rho A v$

On doubling $\frac{dm}{dt}$, v also doubles, this increases force to 4 times.

31. (c): $N=m\sqrt{g^2+a^2}$ ...(i)

For no slip of block with respect to wedge

$ma\cos\theta = mg\sin\theta$



or $a = g\tan\theta$ ...(ii)

Using (ii) in (i), we get

$N=m\sqrt{g^2+g^2\tan^2\theta} \Rightarrow N = mg\sec\theta$

32. (b): $\vec{r}_{CM}=\frac{m_1\vec{r}_1+m_2\vec{r}_2+m_3\vec{r}_3}{m_1+m_2+m_3}$

$=\frac{m(1,2)+m(2,4)+m(3,6)}{m+m+m} = \frac{(6,\ 12)}{3}=(2, 4)$

33. (c): $I_{ring} = mr^2, I_{disc} = 0.5\, mr^2$

$I_{sq.frame}=4\times\left[\frac{1}{12}\frac{m}{4}(2r)^2+\frac{m}{4}(r)^2\right]=\frac{4}{3}mr^2$

$I_{sq.\ lamina}=\frac{1}{12}m\left[(2r)^2+(2r)^2\right]=\frac{2}{3}mr^2$

34. (a): $(m_1+m_2)\,\Delta x_{CM}=m_1\,\Delta x_1+m_2\,\Delta x_2$

$(m_1+m_2)\,(0)=m_1\,(-d)+m_2\,\Delta x_2$

$\Rightarrow \Delta x_2=\frac{m_1 d}{m_2}$

35. (c): Internal forces cannot change velocity of CM of a system. As CM was initially at rest, it will remain at rest.

36. (c): Two bodies under mutual internal forces always meet at their CM. From theorem of moment of masses, we can write

$50x = 70(6-x) \Rightarrow 120x = 420 \Rightarrow x = 3.5$ m

37. (b): From law of conservation of angular momentum,

$\frac{M}{2}R^2\,\omega+0=\left[\frac{M}{2}R^2+\frac{1}{2}\left(\frac{M}{4}\right)R^2\right]\omega' \Rightarrow \omega'=\frac{4}{5}\omega$

As total moment of inertia increases to $\frac{5}{4}$ times, then ω becomes $\frac{4}{5}$th.

38. (d): For pure rolling, point of contact is at rest and topmost point has double speed of that of CM.

39. (a): $|\vec{F}|=m\,|\vec{a}|$

$\left|10\hat{i}+15\hat{j}-25\hat{k}\right|=m\left|2\hat{i}+3\hat{j}-5\hat{k}\right| \Rightarrow m = 5$ units

40. (b): $v\cos 30° = 5\cos 60°$

$\Rightarrow v=\frac{5}{\sqrt{3}}\text{ m s}^{-1}$

$\omega=\frac{v}{r}=\frac{v_{AB}}{AB}=\frac{5\sin 60^0-v\sin 30^0}{\sqrt{3}}$

$$= \frac{5\frac{\sqrt{3}}{2} - \frac{5}{\sqrt{3}}\cdot\frac{1}{2}}{\sqrt{3}} = \frac{5}{3}\text{ rad s}^{-1}$$

41. (a) : Planck's constant and angular momentum have same dimensions.

$$\frac{[h]}{[I]} = \frac{[L]}{[I]} = \omega$$

42. (a) : $h_r = e^2 h_s = (0.5)^2(8) = 2\text{ m}$

43. (a) : Using law of conservation of linear momentum:

$mv_0 + 0 = (m + 2m)\,v_s$

$\Rightarrow \quad v_s = v_0/3$

$$\therefore \quad h = \frac{v_s^2}{2g} = \frac{(v_0/3)^2}{2g} = \frac{v_0^2}{18g}$$

44. (c) : During upward motion gravity does negative work and thus negative power is delivered.

45. (a) : When a ball makes an oblique inelastic collision with a fixed target, the reflection angle is more than incidence, as $\tan r = \frac{\tan i}{e}$.