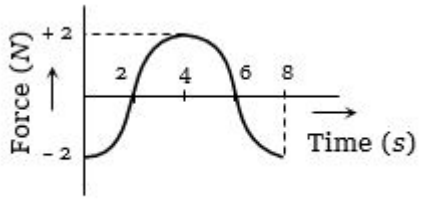
# Jupiter Academy

**Subjects : Physics** **PRACTICE PAPER 03**

**Total Marks : 180**

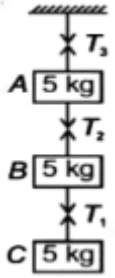
## Physics - Section A ( MCQ )

**1.** The force-time $(F - t)$ curve of a particle executing linear motion is as shown in the figure. The momentum acquired by the particle in time interval from zero to $8$ second will be ..... $N - s$



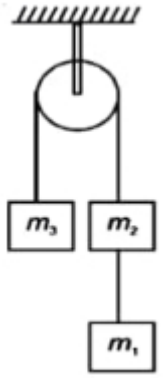

**A)** $-2$ **B)** $+4$ **C)** $6$ **D)** $0$

**2.** The value of $\frac{T_3}{T_1}$ is .....



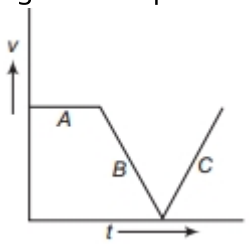

**A)** $1$ **B)** $2$ **C)** $3$ **D)** $\frac{3}{2}$

**3.** Three blocks of masses $m_1 = 4\ kg, m_2 = 2\ kg, m_3 = 4\ kg$ are connected with ideal strings passing over a smooth. massless pulley as shown in figure. The acceleration of blocks will be ..... $m/s^2$ $(g = 10\, m/s^2)$



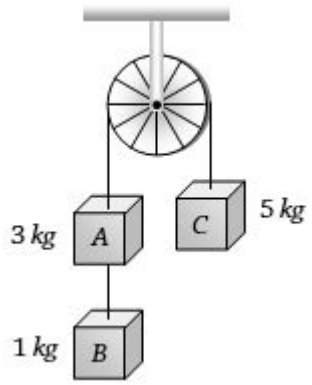

**A)** $2$ **B)** $4$ **C)** $3$ **D)** $5$

**4.** The velocity-time graph of a body is shown in figure. It implies that at point $B$




**A)** the force is zero
**B)** there is a force towards motion
**C)** there is a force which opposes motion
**D)** there is only gravitational force

**5.** Three weight $A, B$ and $C$ are connected by string as shown in the figure. The system moves over a frictionless pulley. The tension in the string connecting $A$ and $B$ is (where $g$ is acceleration due to gravity)




**A)** $g$ **B)** $\frac{g}{9}$ **C)** $\frac{8g}{9}$ **D)** $\frac{10g}{9}$

**6.** An object of mass $3\ m$ splits into three equal fragments. Two fragments have velocities $v\hat{j}$ and $v\hat{i}$. The velocity of the third fragment is

**A)** $v(\hat{j} - \hat{i})$ **B)** $v(\hat{i} - \hat{j})$
**C)** $-v(\hat{i} + \hat{j})$ **D)** $\frac{v(\hat{i}+\hat{j})}{\sqrt{2}}$

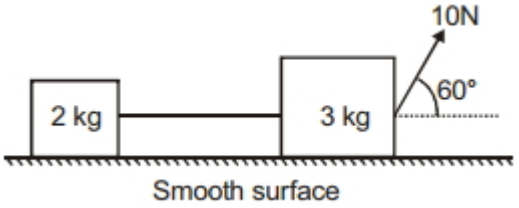
**7.** A projectile is fired with velocity $u$ at an angle $\theta$ with horizontal. At the highest point of its trajectory it splits up into three segments of masses $m, m$ and $2\ m$. First part falls vertically downward with zero initial velocity and second part returns via same path to the point of projection. The velocity of third part of mass $2\, m$ just after explosion will be

**A)** $u\cos\theta$ **B)** $\frac{3}{2}u\cos\theta$
**C)** $2u\cos\theta$ **D)** $\frac{5}{2}u\cos\theta$

**8.** A man weighing $80\ kg$ is standing in a trolley weighing $320\ kg$. The trolley is resting on frictionless horizontal rails. If the man starts walking on the trolley with a speed of $1\ m/s$, then after $4\ sec$ his displacement relative to the ground will be ..... $m$

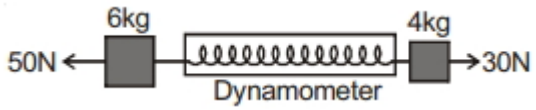
**A)** $5$ **B)** $4.8$ **C)** $3.2$ **D)** $3.0$

**9.** Figure shows two blocks connected by a light inextensible string as shown in figure. A force of $10\ N$ is applied on the bigger block at $60^\circ$ with horizontal, then the tension in the string connecting the two masses is ..... $N$




**A)** $5$ **B)** $2$ **C)** $1$ **D)** $3$

**10.** A dynamometer $D$ is attached to two blocks of masses $6\ kg$ and $4\ kg$ as shown in the figure. The reading of the dynamometer is ..... $N$




**A)** $18$ **B)** $28$ **C)** $38$ **D)** $48$

**11.** A rocket of mass $5700\ kg$ ejects mass at a constant rate of $15\ kg/s$ with constant speed of $12\ km/s$. The acceleration of the rocket 1 minute after the blast is ..... $m/s^2$ $(g = 10\, m/s^2)$

**A)** $34.9$ **B)** $27.5$ **C)** $3.50$ **D)** $13.5$

**12.** When an object is in equilibrium state, then

**A)** It must be at rest
**B)** No force is acting on it
**C)** Its net acceleration must be zero
**D)** All of these

**13.** What force should be applied on the wedge so that block over it does not move? (All surfaces are smooth)

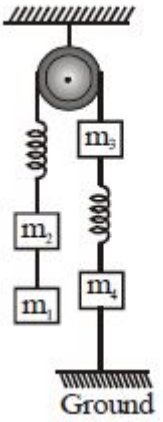
**A)** $F = (M+m)g\cot\theta$ **B)** $F = (M+m)g\tan\theta$
**C)** $F = (M+m)g\sin\theta$ **D)** $F = (M+m)g\cos\theta$

**14.** If final momentum is equal to initial momentum of the system then

**A)** No net force on the system
**B)** Always net force on the system
**C)** May be net force on the system
**D)** Both $(a)$ and $(b)$

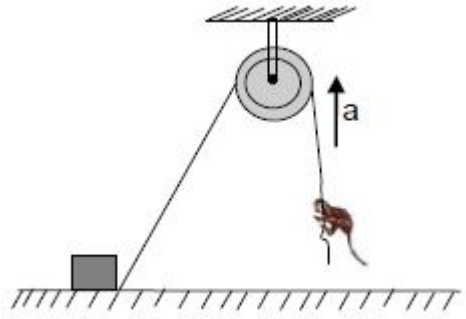
**15.** For the system shown in figure, $m_1 > m_2 > m_3 > m_4$ . Initially, the system is at rest in equilibrium condition. If the string joining $m_4$ and ground is cut, then just after the string is cut :

Statement $I$ $m_1$ ,$m_2$ ,$m_3$ remain stationary.
Statement $II$ The value of acceleration of all the $4$ blocks can be determined.
Statement $III$ Only $m_4$ remains stationary.
Statement $IV$ Only $m_4$ accelerates.
Statement $V$ All the four blocks remain stationary.
Now, choose the correct option.




**A)** All the statements are correct
**B)** Only $I$ , $II$ and $IV$ are correct
**C)** Only $II$ and $V$ are correct
**D)** Only $II$ and $IV$ are correct.

**16.** A light string fixed at one end to a clamp on ground passes over a fixed pulley and hangs at the other side. It makes an angle of $30^o$ with the ground. A monkey of mass $5\ kg$ climbs up the rope. The clamp can tolerate a vertical force of $40\ N$ only. The maximum acceleration in upward direction with which the monkey can climb safely is ..... $m/s^2$ (neglect friction and take $g = 10\ m/s^2$ )




**A)** $2$ **B)** $4$ **C)** $6$ **D)** $8$

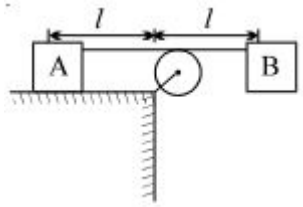
**17.** $A$ flexible chain of weight $W$ hangs between two fixed points $A$ & $B$ which are at he same horizontal level. The inclination of the chain with the horizontal at both the points of support is $\theta$. What is the tension of the chain at the mid point?

**A)** $\frac{W}{2}.cosec\theta$ **B)** $\frac{W}{2}.tan\theta$
**C)** $\frac{W}{2}cot\theta$ **D)** none

**18.** Natural length of a spring is $60\,cm$, and its spring constant is $4000\ N/m$. A mass of $20\ kg$ is hung from it. The extension produced in the spring is,.....$cm$ (Take $g = 9.8\ m/s^2$)

**A)** $4.9$ **B)** $0.49$ **C)** $9.4$ **D)** $0.94$

**19.** Two blocks $A$ and $B$ each of same mass are attached by a thin inextensible string through an ideal pulley. Initially block $B$ is held in position as shown in fig. Now the block $B$ is released. Block $A$ willl slide to right and hit the pulley in time $t_A$. Block $B$ will swing and hit the surface in time $t_B$.Assume the surface as frictionless. [Hint: Tension $T$ in the string acting on both blocks is same in magnitude. Acceleration needed for horizontal motion is from $T$.




**A)** $t_A = t_B$ **B)** $t_A < t_B$
**C)** $t_A > t_B$ **D)** data are not sufficient to get relationship between $t_A$ and $t_B$.

**20.** A body of mass $2\ kg$ moving on a horizontal surface with an initial velocity of $4\ m/sec$ comes to rest after $2\ sec$. If one wants to keep this body moving on the same surface with a velocity of $4\ m/sec$, the force required is ..... $N$

**A)** $8$ **B)** $4$ **C)** $0$ **D)** $2$

**21.** With what minimum acceleration can a fireman slides down a rope while breaking strength of the rope is $\frac{2}{3}$ of his weight

**A)** $\frac{2}{3}g$ **B)** $g$ **C)** $\frac{1}{3}g$ **D)** Zero

**22.** The weight of man in a lift moving upward is $608\ N$ while the weight of the same man in the lift moving downwards with the same acceleration is $368\,N$. His normal weight is ..... $N$

**A)** $480$ **B)** $488$ **C)** $588$ **D)** $240$

**23.** A balloon of mass $M$ is descending at a constant acceleration $\alpha$. When a mass $m$ is released from the balloon it starts rising with the same acceleration $\alpha$. Assuming that its volume does not change, what is the value of $m$ ?

**A)** $\left[\frac{\alpha}{\alpha+g}\right] M$
**B)** $\left[\frac{2\alpha}{\alpha+g}\right] M$
**C)** $\left[\frac{\alpha+g}{\alpha}\right] M$
**D)** $\left[\frac{\alpha+g}{2\alpha}\right] M$

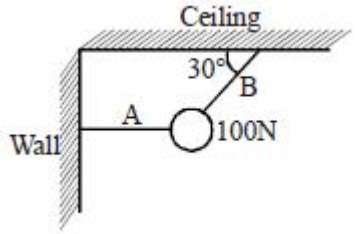
**24.** A balloon of mass $m$ is descending down with an acceleration $\frac{g}{2}$. How much mass should be removed from it so that it starts moving up with same acceleration?

**A)** $\frac{2\,m}{3}$ **B)** $\frac{m}{3}$
**C)** $3\,m$ **D)** $\frac{4}{3}\,m$

**25.** A cricket ball of mass $500\ g$ collides with a bat with speed $15\ m/s$ and returns with the same speed within $0.01\ second$ . The force acted on bat is ..... $N$

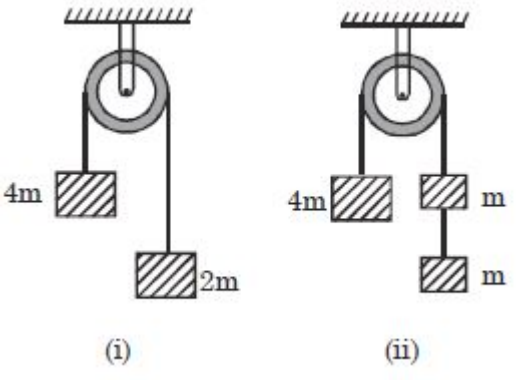
**A)** $750$ **B)** $1500$ **C)** $500$ **D)** $1000$

**26.** A $100\ Newton$ weight is suspended in a corner of a room by two cords $A$ and $B$ as shown in the figure below. The tension in the horizontal cord $A$ is ..... $N$



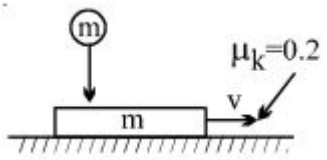

**A)** $50$ **B)** $100$ **C)** $200$ **D)** $173.2$

**27.** In the arrangement shown in figure, pulley is smooth and massles and all the strings are light let $F_1$ be the force exerted on the pulley in case $(i)$ and $F_2$ the force in case $(ii)$. Then



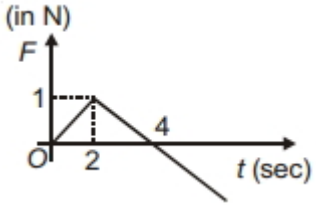

**A)** $F_1 > F_2$ **B)** $F_1 < F_2$
**C)** $F_1 = F_2$ **D)** $F_1 = 2F_2$

**28.** $A$ ball of mass $m$ falls vertically from a height $h$ and collides with $a$ block of equal mass $m$ moving horizontally with $a$ velocity $v$ on $a$ surface. The coefficient of kinetic friction between the block and the surface is $0.2$, while the coefficient of restitution $e$ between the ball and the block is $0.5$. There is no friction acting between the ball and the block. The velocity of the block decreases by




**A)** $0$ **B)** $0.1\sqrt{2gh}$
**C)** $0.3\sqrt{2gh}$ **D)** can't be said

**29.** Force acting on a body varies with time as shown below. If initial momentum of the body is $\vec{p}$, then the time taken by the body to retain its momentum $\vec{p}$ again is ..... $s$




**A)** $8$ **B)** $(4+2\sqrt{2})$
**C)** $6$ **D)** Can never obtain

**30.** A constant force acting on a body of mass of $5\,kg$ changes its speed from $5\,ms^{-1}$ to $10\,ms^{-1}$ in $10\,s$ without changing the direction of motion. The force acting on the body is ..... $N$

**A)** $1.5$ **B)** $2$ **C)** $2.5$ **D)** $5$

**31.** When an object is at rest

**A)** Force is required to keep it in rest state
**B)** No force is acting on it
**C)** A large number of forces may be acting on it which balance each other
**D)** It is in vacuum

**32.** An initially stationary device lying on a frictionless floor explodes into two pieces and slides across the floor one piece is moving in positive $x$ direction then other peice is moving in

**A)** Positive $y$ direction
**B)** Negative $y$ direction
**C)** Negative $x$ direction
**D)** At angle from $x$ direction

**33.** A ping-pong ball of mass $m$ is floating in air by a jet of water emerging out of a nozzle. If the water strikes the ping-pong ball with a speed $v$ and just after collision water falls dead, the rate of flow (in $kg/s$) of water in the nozzle is equal to

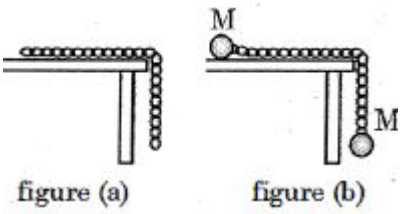
**A)** $\frac{2mg}{v}$ **B)** $\frac{mv}{g}$
**C)** $\frac{mg}{v}$ **D)** none of these

**34.** Displacement of a particle of mass $2\,kg$ moving in a straight line varies with time as $s=(2t^3+2)\,m$. Impulse of the force acting on the particle over a time interval between $t=0$ and $t=1\,s$ is ..... $N-s$

**A)** $10$ **B)** $12$ **C)** $8$ **D)** $6$

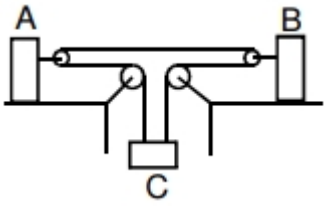
**35.** A chain lying on an absolutely smooth table, half of it hanging over the edge of the table as shown in figure $(a)$. The time it takes to slip off the table is affected if two equal weights be attached, one to each end as shown in figure $(b)$ .

$t_a$ : time taken to slip in situation '$a$'
$t_b$ : time taken to slip in situation '$b$'




**A)** $t_a > t_b$ **B)** $t_a < t_b$
**C)** $t_a = t_b$ **D)** cannot be determined

**36.** If acceleration of $A$ is $2\ m/s^2$ to left and acceleration of $B$ is $1\ m/s^2$ to left, then acceleration of $C$ is -




**A)** $1\,m/s^2$ upwards
**B)** $1\,m/s^2$ downwards
**C)** $2\,m/s^2$ downwards
**D)** $2\,m/s^2$ upwards

**37.** A rope of length $L$ is pulled by a constant force $F$. What is the tension in the rope at a distance $x$ from the end where the force is applied

**A)** $\frac{FL}{x}$ **B)** $\frac{F(L-x)}{L}$
**C)** $\frac{FL}{L-x}$ **D)** $\frac{Fx}{L-x}$

**38.** An aircraft is moving with a velocity of $300\,ms^{-1}$. If all the forces acting on it are balanced, then

A) It still moves with the same velocity
B) It will be just floating at the same point in space
C) It will fall down instantaneously
D) It will lose its velocity gradually

**39.** A ball of mass $150\ g$ starts moving with an acceleration of $20 m/s^2$. When hit by a force, which acts on it for $0.1\ sec$. The impulsive force is ..... $N-s$

A) $0.5$ B) $0.1$ C) $0.3$ D) $1.2$

**40.** A body of mass $m$ collides against a wall with a velocity $v$ and rebounds with the same speed. Its change of momentum is

A) $2mv$ B) $mv$ C) $-mv$ D) Zero

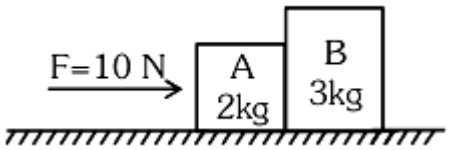
**41.** A rider on horse back falls when horse starts running all of a sudden because

A) Rider is taken back
B) Rider is suddenly afraid of falling
C) Inertia of rest keeps the upper part of body at rest whereas lower part of the body moves forward with the horse
D) None of the above

**42.** A man of weight $75\ kg$ is standing in an elevator which is moving with an acceleration of $5\ m/s^2$ in upward direction the apparent weight of the man will be ..... $N \quad (g = 10\ m/s^2)$

A) $1425$ B) $1375$ C) $1250$ D) $1125$

**43.** A horizontal force $10\ \mathrm{N}$ is applied to a block $A$ as shown in figure. The mass of blocks $A$ and $B$ are $2\ \mathrm{kg}$ and $3\ \mathrm{kg}$ respectively. The blocks slide over a frictionless surface. The force exerted by block $A$ on block $B$ is :




A) $4\ \mathrm{N}$ B) $6\ \mathrm{N}$ C) $10\ \mathrm{N}$ D) Zero

**44.** A person standing on the floor of an elevator drops a coin. The coin reaches the floor in time $t_1$ if the elevator is at rest and in time $t_2$ if the elevator is moving uniformly. Then

A) $\mathrm{t_1 < t_2}$ or $\mathrm{t_1 > t_2}$ depending upon whether the lift is going up or down
B) $\mathrm{t_1 < t_2}$
C) $\mathrm{t_1 > t_2}$
D) $\mathrm{t_1 = t_2}$

**45.** A person is standing in an elevator. In which situation he finds his weight less than actual when

A) The elevator moves upward with constant acceleration
B) The elevator moves downward with constant acceleration.
C) The elevator moves upward with uniform velocity
D) The elevator moves downward with uniform velocity