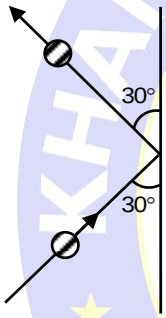
Chapter 04

Newton's Laws of Motion

NEET-FLASHBACK

Q.1 A 0.5 kg ball moving with a speed of 12 m/s strikes a hard wall at an angle of 30° with the wall. It is reflected with the same speed and at the same angle. If the ball is in contact with the wall for 0.25 seconds, the average force acting on the wall is: **[AIPMT 2006]**

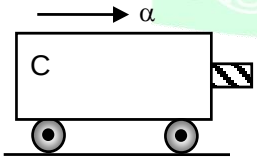


(1) 48 N (2) 24 N (3) 12 N (4) 96 N

Q.2 A body, under the action of a force $\vec{F} = 6\hat{i} - 8\hat{j} + 10\hat{k}$, acquires an acceleration of 1 ms^{-2}. The mass of this body must be **[AIPMT-2009]**

(1) $10\sqrt{2}$ kg (2) $2\sqrt{10}$ kg
(3) 10 kg (4) 20 kg

Q.3 A block of mass m is in contact with the cart C as shown in the figure. **[AIPMT 2010]**



The coefficient of static friction between the block and the cart is μ. The acceleration α of the cart that will prevent the block from falling satisfies

(1) $\alpha < \frac{g}{\mu}$ (2) $\alpha > \frac{mg}{\mu}$
(3) $\alpha > \frac{g}{\mu m}$ (4) $\alpha \geq \frac{g}{\mu}$

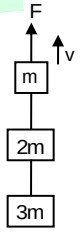
Q.4 A person of mass 60 kg is inside a lift of mass 940 kg and presses the button on control panel. The lift starts moving upwards with an acceleration 1.0 m/s^2. If g = 10 ms^{-2}, the tension in the supporting cable is: **[AIPMT-2011]**

(1) 8600 N (2) 9680 N
(3) 11000 N (4) 1200 N

Q.5 A body of mass M hits normally a rigid wall with velocity V and bounces back with the same speed. The impulse experienced by the body is : **[AIPMT 2011]**

(1) MV (2) 1.5 MV (3) 2 MV (4) Zero

Q.6 Three blocks with masses m, 2m and 3m are connected by strings as shown in the figure. After an upward force F is applied on block m, the masses move upward at constant speed v. What is the net force on the block of mass 2m? (g is the acceleration due to gravity) **[AIPMT2013]**

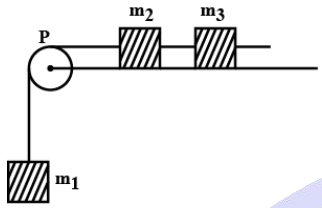


(1) 2mg (2) 3mg (3) 6mg (4) zero

Q.7 A system consists of three masses m_1, m_2 and m_3 connected by a string passing over a pulley

P. The mass m_1 hangs freely m_2 and m_3 are on a rough horizontal table (the coefficient of friction = μ). The pulley is frictionless and is of negligible mass. The downward acceleration of mass m_1 is: (Assume $m_1 = m_2 = m_3 = m$)

[AIPMT 2014]

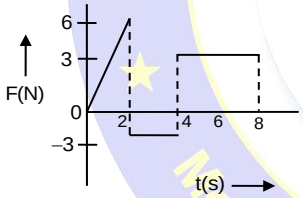


(1) $\frac{g(1-2\mu)}{9}$ (2) $\frac{2g\mu}{3}$

(3) $\frac{g(1-2\mu)}{3}$ (4) $\frac{g(1-2\mu)}{2}$

Q.8 The force 'F' acting on a particle of mass 'm' is indicated by the force-time graph shown below. The change in momentum of the particle over the time interval from zero to 8 s is :

[AIPMT 2014]



(1) 24 Ns (2) 20 Ns (3) 12 Ns (4) 6 Ns

Q.9 A balloon with mass 'm' is descending down with an acceleration 'a' (where a < g). How much mass should be removed from it so that it starts moving up with acceleration 'a' ? (Assume that it's volume does not change) **[AIPMT 2014]**

(1) $\frac{2ma}{g+a}$ (2) $\frac{2ma}{g-a}$

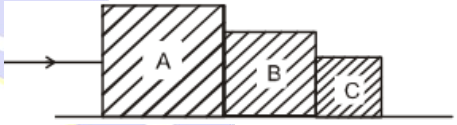
(3) $\frac{ma}{g+a}$ (4) $\frac{ma}{g-a}$

Q.10 A block A of mass m_1 rests of a horizontal table. A light string connected to it passes over a frictionless pulley at the edge of table and from its other end another block B of mass m_2 is suspended. The coefficient of kinetic friction between the block and the table is μ_k. When the block A is sliding on the table, the tension in the string is: **[AIPMT 2015]**

(1) $\frac{(m_2-\mu_k m_1)g}{(m_1+m_2)}$ (2) $\frac{m_1m_2(1+\mu_k)g}{(m_1+m_2)}$

(3) $\frac{m_1m_2(1-\mu_k)g}{(m_1+m_2)}$ (4) $\frac{(m_2+\mu_k m_1)g}{(m_1+m_2)}$

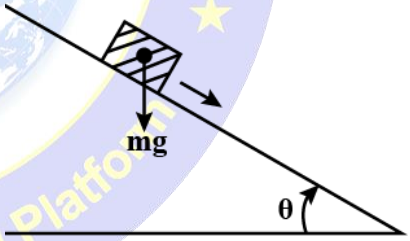
Q.11 Three blocks A, B and C of masses 4 kg, 2kg and 1 kg respectively, are in contact on a frictionless surface, as shown. If a force of 14 N is applied on the 4 kg block, then the contact force between A and B is : **[AIPMT 2015]**



(1) 6 N (2) 8 N

(3) 18 N (4) 2 Ns

Q.12 A plank with a box on it at one end is gradually raised about the other end. As the angle of inclination with the horizontal reaches 30°, the box starts to slip and slides 4.0 m down the plank in 4.0s. The coefficients of static and kinetic friction between the box and the plank will be, respectively: **[AIPMT 2015]**

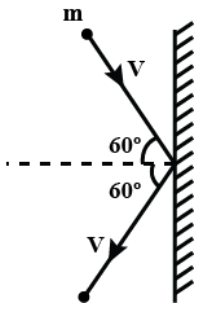


(1) 0.4 and 0.3 (2) 0.6 and 0.6

(3) 0.6 and 0.5 (4) 0.5 and 0.6

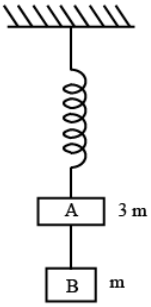
Q.13 A rigid ball of mass m strikes a rigid wall at 60° and gets reflected without loss of speed as shown in the figure below. The value of impulse imparted by the wall on the ball will be :

[NEET 2016]



(1) $\frac{mV}{2}$ (2) $\frac{mV}{3}$ (3) mV (4) 2mV

Q.14 Two blocks A and B of masses 3m and m respectively are connected by a massless and inextensible string. The whole system is suspended by a massless spring as shown in figure. The magnitudes of acceleration of A and B immediately after the string is cut, are respectively: **[NEET 2017]**



(1) $\frac{g}{3}$, g (2) g, g (3) $\frac{g}{3}$, $\frac{g}{3}$ (4) g, $\frac{g}{3}$

Q.15 Which of the following statement is incorrect ? **[NEET 2018]**

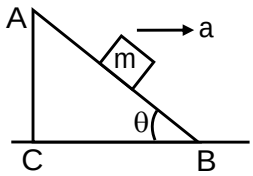
(1) Rolling friction is smaller than Sliding friction

(2) Limiting value of Static friction is directly proportional to Normal reactions

(3) Frictional force opposes the relative motion

(4) Coefficient of Sliding friction has dimensions of length

Q.16 A block of mass m is placed on a smooth inclined wedge ABC of inclination θ as shown in the figure. The wedge is given an acceleration 'a' towards the right. The relation between 'a' and θ for the block to remain stationary on the wedge is : **[NEET 2018]**



(1) $a = \frac{g}{\text{cosec}\theta}$ (2) $a = \frac{g}{\sin\theta}$

(3) $a = g\cos\theta$ (4) $a = g\tan\theta$

Q.17 A truck is stationary and has a bob suspended by a light string, in a frame attached to the truck. The truck, suddenly moves to the right with an acceleration of a. The pendulum will tilt: **[NEET 2019 (Odisha)]**

(1) to the left and angle of inclination of the pendulum with the vertical is $\sin^{-1}\left(\frac{g}{a}\right)$

(2) to the left and angle of inclination of the pendulum, with the vertical is $\tan^{-1}\left(\frac{a}{g}\right)$

(3) to the left and angle of inclination of the pendulum, with the vertical is $\sin^{-1}\left(\frac{a}{g}\right)$

(4) to the left and angle of inclination of the pendulum, with the vertical is $\tan^{-1}\left(\frac{g}{a}\right)$

Q.18 A body of mass m is kept on a rough horizontal surface (coefficient of friction = μ) A horizontal force is applied on the body, but it does not move. The resultant of normal reaction and the frictional force acting on the object is given by F, where F is: **[NEET (UG) 2019 (Odisha)]**

(1) $|\vec{F}| = mg + \mu mg$ (2) $|\vec{F}| = \mu mg$

(3) $|\vec{F}| \le mg\sqrt{1+\mu^2}$ (4) $|\vec{F}| = mg$

Q.19 A block of mass 10 kg is in contact against the inner wall of a hollow cylindrical drum of radius 1 m. The coefficient of friction between the block and the inner wall of the cylinder is 0.1. The minimum angular velocity needed for the cylinder to keep the block stationary when the cylinder is vertical and rotating about its axis, will be: ($g = 10\ m/s^2$) **[NEET 2019]**

(1) 10 rad/s (2) 10π rad/s

(3) $\sqrt{10}$ rad/s (4) $\frac{10}{2\pi}$ rad/s

Q.20 Two particles A and B are moving in uniform circular motion in concentric circles of radii r_A and r_B with speed v_A and v_B respectively. Their time period of rotation is the same. The ratio of angular speed of A to that of B will be :

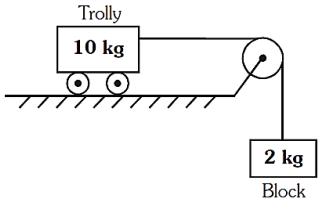
[NEET 2019]

(1) $r_B : r_A$ (2) 1 : 1

(3) $r_A : r_B$ (4) $v_A : v_B$

Q.21 Calculate the acceleration of the block and trolly system shown in the figure. The coefficient of kinetic friction between the trolly and the surface is 0.05. (g = 10 m/s^2, mass of the string is negligible and no other friction exists).

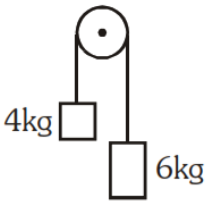
[NEET-Recovid-2020]



(1) 1.25 m/s^2 (2) 1.50 m/s^2

(3) 1.66 m/s^2 (4) 1.00 m/s^2

Q.22 Two bodies of mass 4kg and 6kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is: **[NEET-2020]**



(1) g/10 (2) g (3) g/2 (4) g/5

Q.23 The angular speed of the wheel of a vehicle is increased from 360 rpm to 1200 rpm in 14 second. Its angular acceleration is

[NEET UG 2020]

(1) 2π rad/s^2 (2) 28π rad/s^2

(3) 120π rad/s^2 (4) 1 rad/s^2

Q.24 A particle moving in a circle of radius R with a uniform speed takes a time T to complete one revolution. If this particle were projected with the same speed at an angle 'θ' to the horizontal, the maximum height attained by it equals 4R. The angel of projection, θ is then given by:

[NEET (UG) 2021]

(1) $\theta = \cos^{-1}\left(\frac{gT^2}{\pi^2 R}\right)^{1/2}$ (2) $\theta = \cos^{-1}\left(\frac{\pi^2 R}{gT^2}\right)^{1/2}$

(3) $\theta = \sin^{-1}\left(\frac{\pi^2 R}{gT^2}\right)^{1/2}$ (4) $\theta = \sin^{-1}\left(\frac{2gT^2}{\pi^2 R}\right)^{1/2}$

Q.25 The angular speed of a fly wheel moving with uniform angular acceleration changes from 1200 rpm to 3120 rpm in 16 seconds. The angular acceleration in rad/s^2 is – **[NEET 2022]**

(1) 2π (2) 4π (4) 12π (4) 104π

Q.26 A football player is moving southward and suddenly turns eastward with the same speed to avoid an opponent. The force that acts on the player while turning is **[NEET 2023]**

(1) Along northward (2) Along north-east

(3) Along south-west (4) Along eastward

Q.27 The angular acceleration of a body, moving along the circumference of a circle, is

[NEET 2023]

(1) Along the radius towards the centre

(2) Along the tangent to its position

(3) Along the axis of rotation

(4) Along the radius, away from centre

Q.28 Calculate the maximum acceleration of a moving car so that a body lying on the floor of the car remains stationary. The coefficient of static friction between the body and the floor is 0.15 (g = 10 m s^{-2}). **[NEET 2023]**

(1) 150 m s^{-2} (2) 1.5 m s^{-2}

(3) 50 m s^{-2} (4) 1.2 m s^{-2}

ANSWER KEY

NEET-FLASHBACK

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	2	1	4	3	3	4	3	3	1	2	1	3	3	1	4
Que.	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**		
Ans.	4	2	3	1	2	1	4	1	4	2	2	3	2		