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Daily Practice Problems

JEE PHYSICS

Topic: Newton's Law of Motion and Fraction

Q.1 The incorrect statement about Newton's second law of motion is-

(A) it provides a measure of inertia

(B) it provides a measure of force

(C) it relates force and acceleration

(D) it relates momentum and force

Q.2 Newton's third law is equivalent to the-

(A) law of conservation of linear momentum

(B) law of conservation of angular momentum

(C) law of conservation of energy

(D) law of conservation of energy and mass

Q.3 We can derive Newton's-

(A) second and third laws from the first law

(B) first and second laws from the third law

(C) third and first laws from the second law

(D) All the three laws are independent of each others

Q.4 The ratio of the weight of a man in a stationary lift and in a lift accelerating downwards with a uniform acceleration 'a' is 3:2. The acceleration of the lift is -

(A) g/3 (B) g/2 (C) g (D) 2g

Q.5 A lift is moving up with an acceleration of 3.675 m/sec^2. The weight of a man-

(A) increases by 37.5%

(B) decreases by 37.5%

(C) increases by 137.5%

(D) remains the same

Q.6 If the tension in the cable supporting an elevator is equal to the weight of the elevator, the elevator may be -

(a) going up with increasing speed

(b) going down with increasing speed

(c) going up with uniform speed

(d) going down with uniform speed

(A) a, d (B) a, b, c (C) c, d (D) a, b

Q.7 A particle moves in the xy plane under the action of a force F such that the value of its linear momentum (P) at any time t is, $P_x = 2 \cos t$, $P_y = 2 \sin t$. The angle θ between P and F at that time t will be -

(A) 0º (B) 30º (C) 90º (D) 180º

Q.8 The linear momentum P of a body moving in one dimension varies with time according to the equation $P = at^3 + bt$ where a and b are positive constants. The net force acting on the body is

(A) proportional to t^2

(B) a constant

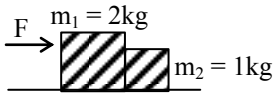
(C) proportional to t

(D) inversely proportional to t

Q.9 A player catches a ball of 200 g moving with a speed of 20 m/s. If the time taken to complete the catch is 0.5 sec, the force exerted on the players hand is -

(A) 8 N (B) 4 N (C) 2 N (D) 0 N

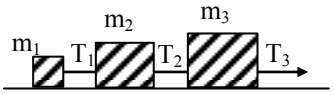
Q.10 Blocks are in contact on a frictionless table. A horizontal force F = 3N is applied to one block as shown. The force exerted by the smaller block m_2 on block m_1 is-



(A) 1 N (B) 2 N

(C) 3 N (D) 6 N

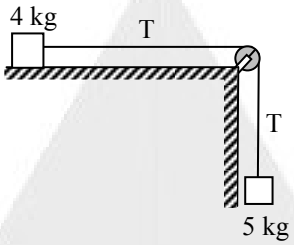
Q.11 Three block are connected as shown, on a horizontal frictionless table and pulled to the right with a force T_3 = 60 N. If m_1 = 10 kg, m_2 = 20 kg and m_3 = 30 kg, the tension T_2 is-



(A) 10 N **(B) 20 N**

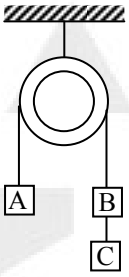
(C) 30 N **(D) 60 N**

Q.12 Two bodies of 5 kg and 4 kg are tied to a string as shown in the figure. If the table and pulley both are smooth, acceleration of 5 kg body will be equal to-



(A) g **(B) g/9** **(C) 4g/9** **(D) 5g/9**

Q.13 Three equal weights A, B, C of mass 2 kg each are hanging on a string passing over a fixed frictionless pulley as shown in the fig. The tension in the string connecting weights B and C is-



(A) zero **(B) 13 Newton**

(C) 3.3 Newton **(D) 19.6 Newton**

Q.14 Mark the correct statements about the friction between two bodies -

(a) static friction is always greater than the kinetic friction

(b) coefficient of static friction is always greater than the coefficient of kinetic friction

(c) limiting friction is always greater than the kinetic friction

(d) limiting friction is never less than static friction

(A) b, c, d **(B) a, b, c**

(C) a, c, d **(D) a, b, d**

Q.15 **A block of mass 2kg rests on a rough inclined plane making an angle of 30º with the horizontal. The coefficient of static friction between the block and the plane is 0.7. The frictional force on the block is-**

(A) 0.7 × 9.8 Newton

(B) 9.8 Newton

(C) 0.7 × 9.8 $\sqrt{3}$ Newton

(D) 9.8 × $\sqrt{3}$ Newton

Q.16 **A body of mass M is kept on a rough horizontal surface (friction coefficient = μ). A person is trying to pull the body by applying a horizontal force but the body is not moving. The force by the surface on A is F, where -**

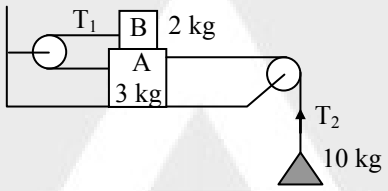
(A) F = Mg

(B) F = μMg

(C) Mg ≤ F ≤ Mg $\sqrt{1+\mu^2}$

(D) Mg ≥ F ≥ Mg $\sqrt{1-\mu^2}$

Q.17 **In the figure, the block A and B are of masses 3 kg and 2 kg. The coefficient of friction between the two blocks A and B is 0.3. The surface of the table is smooth. Then -**



(a) The acceleration of masses is 5.75 ms^{-2}

(b) The tensions are T_1 and T_2 in the strings are 90.36 N and 17.55 N

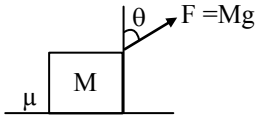
(c) Acceleration of masses is 8.15 ms^{-2}

(d) Tension T_1 and T_2 in the strings are 17.38 N and 40.50 N

(A) a, c **(B) c, d**

(C) b, d **(D) a, d**

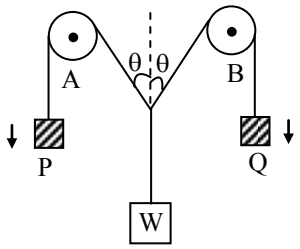
Q.18 **A block of mass M rests on a rough horizontal surface as shown. Coefficient of friction between the block and the surface is μ. A force F = Mg acting at angle θ with the vertical side of the block pulls it in which of the following cases the block can be pulled along the surface ?**



(A) tan θ ≥ μ **(B) tan (θ/2) ≥ μ**

(C) cot θ ≥ μ **(D) cot (θ/2) ≥ μ**

Q.19 **A weight W is tied to two strings passing over the frictionless pulleys A and B as shown in the figure. If weights P and Q move downwards with speed v, the weight W at any instant rises with the speed-**



(A) v cos θ **(B) 2v cos θ**

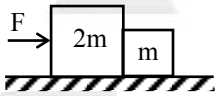
(C) v/cos θ **(D) 2v/cos θ**

Q.20 **A mass is suspended from the roof of a car by a string. While the car has a constant acceleration a, the string makes an angle of 60º with the verticle . If g = 10 m/s^2, the value of a is-**

(A) 10(3)$^{1/2}$ m/s^2 **(B) 10/(3)$^{1/2}$ m/s^2**

(C) 5 m/s^2 **(D) 5(3)$^{1/2}$ m/s^2**

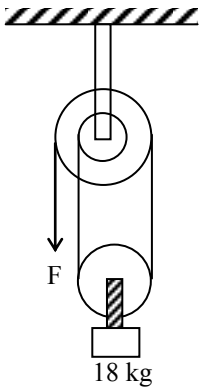
Q.21 **Two blocks are in contact on a frictionless table one has a mass m and the other 2m. A force F is applied on 2m as shown is Figure. Now the same force F is applied on m. In the two cases respectively the ratio of force of contact between the two blocks will be-**



(A) 1 : 1 **(B) 1 : 2**

(C) 1 : 3 **(D) 1 : 4**

Q.22 **In the figure at the free end a force F is applied to keep the suspended mass of 18 kg at rest. The value of F is-**

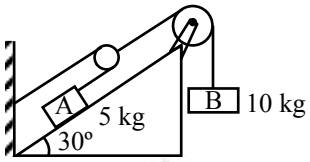


(A) 180 N **(B) 90 N**

(C) 60 N **(D) 30 N**

Q.23 **In fig, a mass 5 kg slides without friction on an inclined plane making an angle 30º with the horizontal. Then the acceleration of this mass when it is moving upwards, the other mass is 10 kg. The pulleys are massless and frictionless. Take g = 10 m/sec².-**

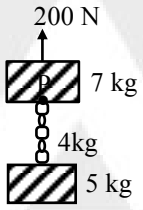
(Given : m_A = 5 kg, m_B = 10 kg)



(A) .33 m/sec² **(B) 3.3 m/sec²**

(C) 33 m/sec² **(D) None of these**

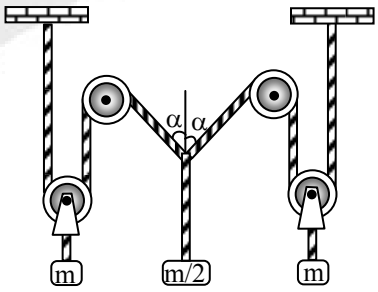
Q.24 **Two blocks of 7 kg and 5 kg are connected by a heavy rope of mass 4 kg. An upward force of 200N is applied as shown in the diagram. The tension at the top of heavy rope at point P is: (g = 10 m/s²)**



(A) 2.27 N **(B) 112.5 N**

(C) 87.5 N **(D) 360 N**

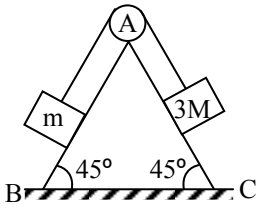
Q.25 **In the given figure, pulleys and strings are massless. For equilibrium of the system, the value of α is -**



(A) 60° **(B) 30°**

(C) 90° **(D) 120°**

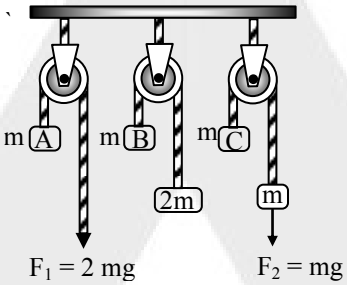
Q.26 **In the given figure the wedge is fixed, pulley is frictionless and string is light. Surface AB is frictionless whereas AC is rough. If the block of mass 3m slides down with constant velocity, then the coefficient of friction between surface AC and the block is -**



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

(C) $\frac{1}{2}$ **(D)** $\frac{4}{3}$

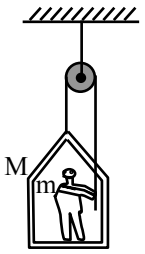
Q.27 **In the figure, the blocks A, B and C each of mass m have accelerations a_1, a_2 and a_3 respectively. F_1 and F_2 are external forces of magnitude 2 mg and mg respectively. Then -**



(A) $a_1 = a_2 = a_3$ **(B)** $a_1 > a_3 > a_2$

(C) $a_1 = a_2$, $a_2 > a_3$ **(D)** $a_1 > a_2$, $a_2 = a_3$

Q.28 **A man of mass m stands on a frame of mass M. He pulls on a light rope, which passes over a pulley. The other end of the rope is attached to the frame. For the system to be in equilibrium, what force must the man exert on the rope ?**



(A) $\frac{(M+m)g}{2}$ **(B) (M + m)g**

(C) (M – m)g **(D) (M + 2m)g**

Q.29 **A block slides down an inclined surface of inclination 30º with the horizontal. Starting from rest it covers 8m in the first two seconds. Find the coefficient of kinetic friction between the two.**

(A) 0.11 (B) 0.5 (C) 0.8 (D) 0.2

Q.30 **A body of mass 2 kg is lying on a rough inclined plane of inclination 30º. Find the magnitude of the force parallel to the incline needed to make the block move (a) up the incline (b) down the incline. Coefficient of static friction = 0.2**

(A) 13 N, 5 N **(B) 13 N, 13 N**

(C) 13 N, 0 N **(D) 5 N, 13 N**

ANSWER KEY

Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Ans.	A	A	C	A	A	C	C	A	A	A
Que.	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Ans.	C	D	B	A	B	C	D	D	C	A
Que.	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Ans.	B	B	B	B	A	B	B	A	A	C