PHYSICS

NEET

CRASH COURSE

NEWTON'S LAWS OF MOTION

SMART ACHIEVERS

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NEWTON'S LAWS OF MOTION

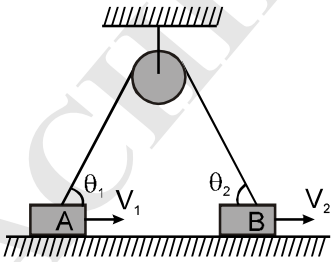
Q.1 The linear momentum P of a body varies with time and is given by the equation $P = x + yt^2$ where x and y are constants. The net force acting on the body for a one dimensional motion is proportional to-

(1) t^2 (2) a constant (3) $\frac{1}{t}$ (4) t

Q.2 A man weighs 80 kg. He stands on a weighing scale in a lift which is moving upwards with a uniform acceleration of 5 m/s^2. What would be the reading on the scale- ($g = 10\ m/s^2$)

(1) 1200 N (2) Zero (3) 400 N (4) 100 N

Q.3 In the figure shown, blocks A and B move with velocities v_1 and v_2 along horizontal direction. The ratio of $\frac{v_1}{v_2}$:



(1) $\frac{\sin\theta_2}{\sin\theta_1}$ (2) $\frac{\sin\theta_1}{\sin\theta_2}$ (3) $\frac{\cos\theta_2}{\cos\theta_1}$ (4) $\frac{\cos\theta_1}{\cos\theta_2}$

Q.4 Block B is moving towards right with constant velocity v_0. Velocity of block A with respect to block B is- (Assume all pulleys and strings are ideal)

(1) $v_0/2$ left (2) $v_0/2$ right (3) $3/2v_0$ right (4) $3/2v_0$ left

Q.5 A block of mass 0.1 kg is held against a wall by applying a horizontal force of 5N on the block. If the co-efficient of friction between the block and the wall is 0.5, the magnitude of frictional force acting on the block is ($g = 9.8 m/s^2$)

(1) 2.5 N (2) 0.98 N (3) 4.9 N (4) 0.49 N

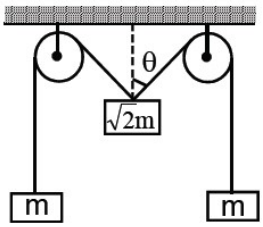
Q.6 A 40 kg slab rests on a frictionless floor. A 10 kg block rests on top of the slab. The static coefficient of friction between the block and slab is 0.60 while the kinetic coefficient is 0.40. The 10 kg block is acted upon by a horizontal force 100N. If $g = 9.8\ m/s^2$, the resulting acceleration of the slab will be-

(1) 0.98 m/s^2 (2) 1.47 m/s^2 (3) 1.52 m/s^2 (4) 6.1 m/s^2

Q.7 Ten one rupees coins are put on top of each other on a table. Each coin has a mass 'm' kg., then the force on the 7^{th} coin (counted from the bottom) due to all the coins on its top :-

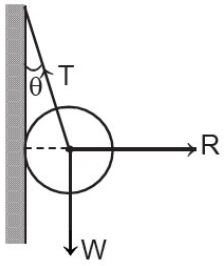
(1) 3 mg (2) 7 mg (3) 2 mg (4) 5 mg

Q.8 The pulleys and strings shown in the fig. are smooth and of negligible mass. For the system to remain in equilibrium, the angle θ should be



(1) 0° (2) 30° (3) 45° (4) 60°

Q.9 A metal sphere is hung by a string fixed to a wall. The forces acting on the sphere are shown are fig. Which of the following statement is correct :



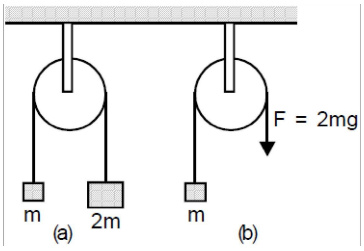
(a) $\vec{R} + \vec{T} + \vec{W} = 0$ (b) $T^2 = R^2 + W^2$ (c) T = R + W (d) R = W tan θ

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

Q.10 A body kept on a smooth inclined plane of inclination 1 in x will remain stationary relative to the inclined plane if the plane is given a horizontal acceleration equal to :-

(1) $\sqrt{x^2-1}\,g$ (2) $\frac{\sqrt{x^2-1}}{x}g$ (3) $\frac{gx}{\sqrt{x^2-1}}$ (4) $\frac{g}{\sqrt{x^2-1}}$

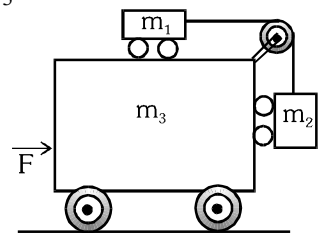
Q.11 The pulley arrangements shown in the figure are identical, the mass of the rope being negligible. In case (a) mass m is lifted by attaching a mass of 2m to the other end of the rope. In case (b) the mass m is lifted by pulling the other end of the rope with a constant downward force F = 2mg, where g is the acceleration due to gravity. The acceleration of mass m in case (a) is :-



(1) Zero (2) More than that in case (b)

(3) Less than that in case (b) (4) Equal to that in case (b)

Q.12 All surfaces assumed to be frictionless calculate the horizontal force F that must be applied so that m_1 and m_2 do not move relative to m_3 is :–



(1) $(m_1 + m_2 + m_3)\frac{m_2 g}{m_1}$ (2) $(m_1 + m_2)\frac{m_2 g}{m_1}$

(3) $(m_2 + m_3)\frac{m_1 g}{m_2}$ (4) $(m_1 + m_3)\frac{m_1 g}{m_2}$

Q.13 A car is moving along a straight horizontal road with a speed V_0. If the coefficient of friction between tyres and the road is μ. The shortest distance in which the car can be stopped is :

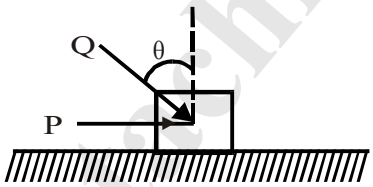
(1) $\frac{V_0^2}{2\mu g}$ (2) $\frac{V_0^2}{\mu g}$ (3) $\left(\frac{V_0}{\mu g}\right)^2$ (4) $\frac{2V_0^2}{\mu g}$

Q.14 A block of mass m is lying on an inclined plane. The coefficient of friction between the plane and the block is μ. The force (F_1) required to move the block up the inclined plane will be:-

(1) $mg\sin\theta + \mu mg\cos\theta$ (2) $mg\cos\theta - \mu mg\sin\theta$

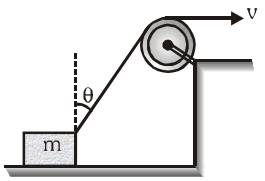
(3) $mg\sin\theta - \mu mg\cos\theta$ (4) $mg\cos\theta + \mu mg\sin\theta$

Q.15 A block of mass m lying on a rough horizontal plane is acted upon by a horizontal force P and another force Q inclined at an angle θ to the vertical. The block will remain in equilibrium if the coefficient of friction between it and the surface is :-



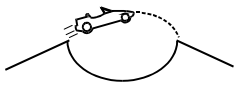
(1) $\frac{P + Q\sin\theta}{mg + Q\cos\theta}$ (2) $\frac{P\cos\theta + Q}{mg - Q\sin\theta}$ (3) $\frac{P + Q\cos\theta}{mg + Q\sin\theta}$ (4) $\frac{P\sin\theta + Q}{mg - Q\cos\theta}$

Q.16 A block is dragged on a smooth plane with the help of a rope which moves with a velocity v as shown in figure. The horizontal velocity of the block is :



(1) v (2) $\frac{v}{\sin\theta}$ (3) $v\sin\theta$ (4) $\frac{v}{\cos\theta}$

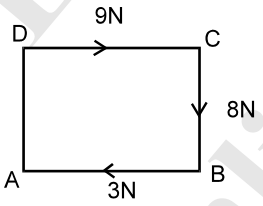
Q.17 A stunt man jumps his car over a crater as shown (neglect air resistance)



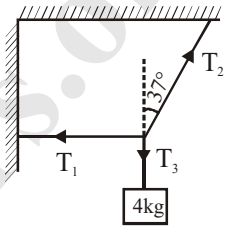
(1) during the whole flight the driver experiences weightlessness
(2) during the whole flight the driver never experiences weightlessness
(3) during the whole flight the driver experiences weightlessness only at the highest point
(4) the apparent weight increases during upward journey

Q.18 The Newton's laws of motion are valid in-
(1) inertial frames (2) non-inertial frames (3) rotating frames (4) accelerated frames

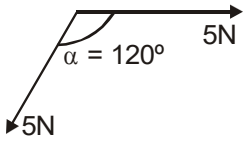
Q.19 ABCD is a rectangle forces of 9N, 8N, 3N act along the lines DC, CB and BA, respectively, in the directions indicated by the order of the letters. Then the resultant force is
(1) 8 N
(2) 5 N
(3) 20 N
(4) 10 N



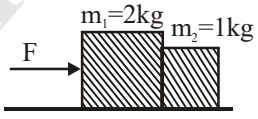
Q.20 Calculate the tensions T_1, T_2 and T_3 in the three threads shown in the following figure. (All threads are mass less) ($g = 10\ m/s^2$)
(1) 30 N, 40 N, 50 N
(2) 50 N, 30 N, 40 N
(3) 35 N, 45 N, 40 N
(4) 30 N, 50 N, 40 N



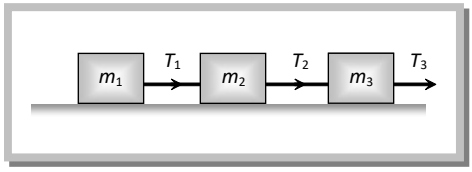
Q.21 When a force of 5 N acts on a body, the acceleration produced in the body is 5 m/s^2. If two forces of magnitude 5 N each are acting on this body as shown in the figure. The acceleration of body is
(1) Zero (2) 5 m/s^2
(3) 4 m/s^2 (4) 3 m/s^2



Q.22 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-
(1) 1 N
(2) 2 N
(3) 3 N
(4) 6 N

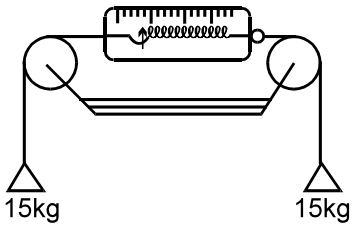


Q.23 Three blocks of masses are connected by massless strings as shown in the figure on a frictionless table. They are pulled with a force If and . The tension will be



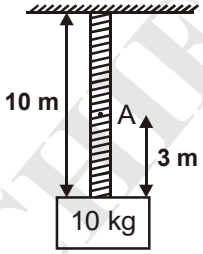
(1) 20 N (2) 40 N (3) 10 N (4) 32 N

Q.24 Two weights of 15 kg each are attached by means of two strings to the two ends of a spring balance, as shown in the diagram. The pulleys are frictionless. The reading of the balance would be-



(1) zero (2) 15 kg (3) 30 kg (4) 75 kg

Q.25 The adjoining figure shows a block of mass 10 kg connected to free end of a rope of mass 10 kg and length 10 m. The tension of the rope at point A is ($g = 10\ m/s^2$)

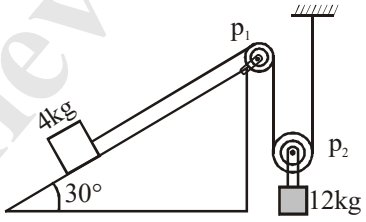


(1) 170 N (2) 30 N (3) 130 N (4) 70 N

Q.26 Calculate the acceleration of the mass 12 kg shown in the set up of fig. Also calculate the tension in the string connecting the 12 kg mass. The string are weightless and inextensible, the pulleys are weightless and frictionless-

(1) $\frac{g}{10}, \frac{56g}{5}$ N (2) $\frac{2g}{7}, \frac{60g}{7}$ N

(3) $\frac{10}{g}, \frac{5}{56g}$ N (4) $\frac{g}{14}, \frac{5}{56g}$ N



Q.27 A rope of mass 5 kg is moving vertically in vertical position with an upwards force of 100 N acting at the upper end and a downwards force of 70 N acting at the lower end. The tension at midpoint of the rope is

(1) 100 N (2) 85 N (3) 75 N (4) 105 N

Q.28 A book is lying on an inclined plane having inclination to the horizontal θ. What is the angle between the weight of the book and the reaction of the plane on the book

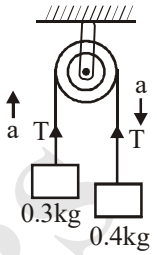
(1) 0° (2) θ° (3) 180° – θ° (4) 180°

Q.29 A block of mass *m* is at rest on a rough inclined plane of inclination θ. The force exerted on plane by the block is

(1) $mg \sin\theta$ (2) $mg \cos\theta$ (3) mg (4) Zero

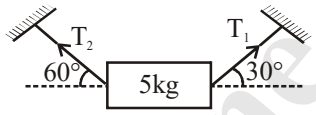
Q.30 Two bodies of mass 0.3 kg and 0.4 kg are tied to the ends of a weightless string which passes over a smooth pulley as shown in the figure. The tension in the string is-

(1) 3.06 Newton
(2) 3.36 Newton
(3) 4.05 Newton
(4) 3.0 Newton



Q.31 A body of mass 5 kg is suspended by the strings making angles 60º and 30º with the horizontal

(a) $T_1 = 25$ N (b) $T_2 = 25$ N
(c) $T_1 = 25\sqrt{3}$ N (d) $T_2 = 25\sqrt{3}$ N
(1) a, b (2) a, d
(3) c, d (4) b, c

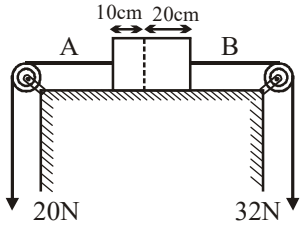


Q.32 Which of the following is incorrect about friction?

(1) If two bodies slip over each other then the force of friction is given by $f_k = \mu_k N$
(2) If two bodies do not slip over each other then maximum force of static friction that can act between the two bodies is '$f_s = \mu_s N$'.
(3) Friction force acting on a body is proportional to normal reaction between the interacting surfaces
(4) None of these

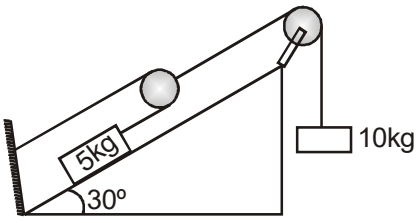
Q.33 Figure shows a uniform rod of mass 3 kg and of length 30 cm. The strings shown in figure are pulled by constant forces of 20 N and 32 N .The acceleration of the rod is-

(1) 2 m/s^2
(2) 3m/s^2
(3) 4 m/s^2
(4) 6 m/s^2

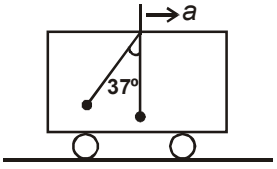


Q.34 In fig, a mass 5 kg slides without friction on an inclined plane making an angle 30º with the horizontal. Then the acceleration of this mass when it is moving upwards, the other mass is 10 kg. The pulleys are massless and frictionless. Take g = 10 m/sec^2.-

(1) .33 m/sec^2 (2) 3.3 m/sec^2
(3) 33 m/sec^2 (4) None of these

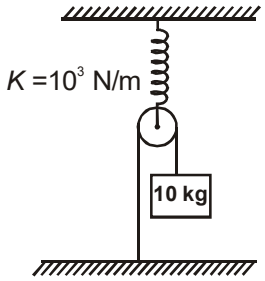


Q.35 A pendulum with a bob of mass 2 kg is hanging from the ceiling of a trolley as shown in the figure. The trolley is uniformly accelerating with an acceleration a, then ($g = 10$ m/s^2)



(1) $a = 6$ m/s^2 (2) $a = 7.5$ m/s^2 (3) $a = 4$ m/s^2 (4) $a = 2.5$ m/s^2

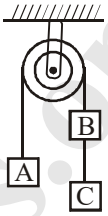
Q.36 For the arrangement shown in the figure, the extension in the spring, for which the block remains at rest is ($g = 10\ m/s^2$)



(1) 20 cm (2) 25 cm (3) 15 cm (4) 30 cm

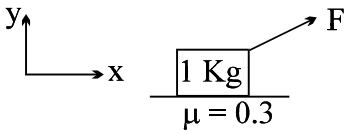
Q.37 Three equal weights A, B, C of mass 2 kg each are hanging on a string passing over a fixed frictionless pulley as shown in the fig. The tension in the string connecting weights B and C is-

(1) zero
(2) 13 Newton
(3) 3.3 Newton
(4) 19.6 Newton

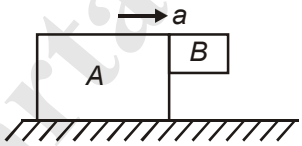


Q.38 A force $\vec{F} = \hat{i} + 4\hat{j}$ acts on block shown. The force of friction acting on the block is :

(1) $-\hat{i}$ (2) $-1.8\,\hat{i}$
(3) $-2.4\,\hat{i}$ (4) $-3\,\hat{i}$

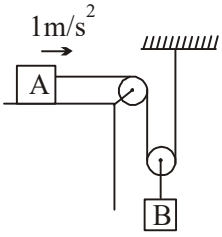


Q.39 Block *A* is placed on a smooth horizontal surface. Another block *B* is placed in contact with *A* as shown in figure. The coefficient of friction between *A* and *B* is 0.5. The minimum acceleration of block *A* so that block *B* does not fall



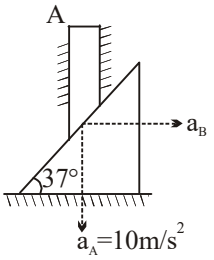
(1) $10\ m/s^2$ (2) $20\ m/s^2$ (3) $15\ m/s^2$ (4) $5\ m/s^2$

Q.40



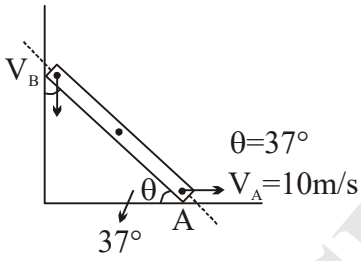
Find $\vec{a}_B = ?$

(1) $2\ m/s^2\downarrow$ (2) $\frac{1}{2}\ m/s^2\uparrow$ (3) $\frac{1}{2}\ m/s^2\downarrow$ (4) $1\ m/s^2\downarrow$

Q.41 

Find $\vec{a}_B = ?$

(1) $\frac{40}{3}$ m/s^2 (2) 20 m/s^2 (3) 15 m/s^2 (4) $\frac{20}{3}$ m/s^2

Q.42 Find V_B=? 

(1) $V_A \tan\theta$ (2) $V_A \sec^2\theta$ (3) V_A cosec θ (4) $V_A \cot\theta$

Direction for following questions :

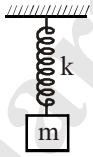
A. Both Assertion and Reason are true, and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. Assertion is true but Reason is false.

D. Assertion and Reason both are false.

Q.43 A block is suspended from spring and block is in equilibrium.
Assertion : Force acting at two ends of spring will be action reaction pair.
Reason : Action and reaction force are of same type and act in opposite directions.



(1) A (2) B (3) C (4) D

Q.44 **Assertion :** A rocket moves forward by pushing the surrounding air backwards.
Reason : Every action has an equal & opposite reaction.
(1) A (2) B (3) C (4) D

Q.45 **Assertion :** On a rainy day, it is diffcult to drive a car or bus at high speed.
Reason : The value of coefficient of friction is lowered due to wetting of the surface.
(1) A (2) B (3) C (4) D

Q.46 **Assertion :** A body can be rest even when it is under the action of any number of external force.

Reason : Vector sum of all the external forces on a body may be zero.

(1) A (2) B (3) C (4) D

Q.47 **Assertion :** When a person walks on a rough surface the frictional force exerted by the surface on the person is opposite to the direction of tendency of motion of his leg.

Reason : A body moves with constant velocity it means body moves along straight lines & there is no acceleration present.

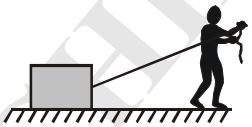
(1) A (2) B (3) C (4) D

Q.48 **Assertion :** Pulling a lawn roller is easier than pushing it.

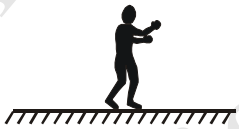
Reason : Pushing increases the apparent weight and hence the force of friction.

(1) A (2) B (3) C (4) D

Q.49 **Assertion :** A man and a block rest on smooth horizontal surface. The man holds a rope which is connected to block. The man cannot move on the horizontal surface.



Reason : A man standing at rest on smooth horizontal surface can start walking due to absence of friction(The man is only in contact with floor as shown).



(1) A (2) B (3) C (4) D

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ANSWER KEY

Q.1	4	Q.2	1	Q.3	3	Q.4	2	Q.5	2
Q.6	1	Q.7	1	Q.8	3	Q.9	3	Q.10	4
Q.11	3	Q.12	1	Q.13	1	Q.14	1	Q.15	1
Q.16	2	Q.17	1	Q.18	1	Q.19	4	Q.20	4
Q.21	2	Q.22	1	Q.23	4	Q.24	2	Q.25	3
Q.26	2	Q.27	2	Q.28	3	Q.29	3	Q.30	2
Q.31	2	Q.32	3	Q.33	3	Q.34	2	Q.35	2
Q.36	1	Q.37	2	Q.38	1	Q.39	2	Q.40	3
Q.41	1	Q.42	4	Q.43	4	Q.44	4	Q.45	1
Q.46	1	Q.47	2	Q.49	1	Q.49	4		