LAW OF MOTION AND FRICTION

1. Inertia means :-

(1) Resistance to uniform motion

(2) Resistance to rest

(3) Resistance to deform

(4) Resistance to change in its motion

2. Which of the following is a non contact force:-

(1) Gravitational force (2) Tension

(3) Friction (4) Air drag

3. If a constant external force starts acting on a moving particle, which of the following is essentially true?

(1) the line of motion of the particle will keep changing

(2) the speed of the particle will keep changing

(3) the particle will never stop

(4) none is essentially true

4. A bullet of mass 0.08 kg moving with a speed of 80m/s enters a heavy wooden block and is stopped after a distance of 40cm. What will be average resistive force exerted on bullet by block.

(1) 800 N (2) 400 N (3) 640 N (4) 720 N

5. Choose the **INCORRECT** statement (with respect to the 2nd law of motion)

(1) Any internal force in the system are not included in net force while writing equation.

(2) Acceleration here and now is determined by the force here and now, not by any history of the motion of the particle.

(3) In the second law, F = 0 implies a = 0. The second law is obviously consistent with the first law.

(4) If a force is not parallel to the velocity of the body, but makes some angle with it, it changes only component of velocity along the direction perpendicular to direction of force.

6. A bullet of mass 5 gram is accelerated in a rifle barrel with an approximately constant force of 2500 N. The mass of the rifle is 5 kg. What is the force pushing the rifle back ?

(1) 2.5 N (2) 2500 N

(3) 250000 N (4) 0 N

7. A particle of mass 2kg moves in free space such that its position vector varies with time as $\vec{r} = \left[(3+4t^2)\hat{i} + (2t)\hat{j} + (3-6t)\hat{k}\right]$m where t is in second. Net force acting on the particle is

(1) zero

(2) parallel to x-axis

(3) parallel to y-axis

(4) time dependent

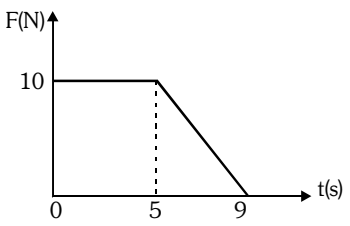
8. A machine gun fires 10 bullets per second in horizontal direction. Mass of each bullet is 80 g and muzzle velocity is 500 m/s. If the average horizontal force the shooter must apply to keep the machine gun stationary is F × 10^2 N, find numerical value of F.

(1) 4 (2) 5 (3) 8 (4) 12

9. A cricket ball of mass 160 g is moving horizontally directly towards a batsman. Its speed just before it hits the bat is 30 m/s. It leaves the bat at 40 m/s at 90° to its original direction. Find the magnitude of the impulse (in N-s) imparted to the ball.

(1) 4.8 (2) 8 (3) 6.4 (4) 10

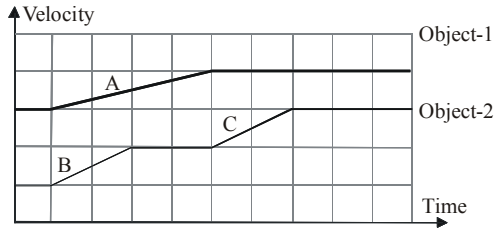
10. A body of mass 4 kg is acted on by a force which varies as shown in the graph below. The momentum acquired is :-



(1) 280 N–s (2) 140 N–s

(3) 70 N–s (4) 210 N–s

11. The graph shows the velocities of two objects as function of time. Mass of object-1 is twice of that of object-2. Net forces F_A, F_B, and F_C are acting on the objects during intervals A, B, and C, respectively. Which one of the following choices is the correct relationship between the magnitudes of the net forces?



(1) $F_B = F_C > F_A$ (2) $F_C = F_B = F_A$

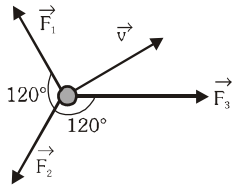
(3) $F_A > F_B = F_C$ (4) $F_A > F_B > F_C$

12. A ball of mass 200 gm, moving with a speed of 40 m/s, is deflected exactly with the same speed but at 90° with its incident direction after striking with a bat. if the striking time is 2s, the average force acts on the ball is :

(1) 4.0 N (2) $\frac{4}{\sqrt{2}}$ N

(3) $4\sqrt{2}$ N (4) zero

13. A particle is moving in free space with some velocity as shown. It is applied by force $\vec{F}_1$, $\vec{F}_2$ & $\vec{F}_3$ of magnitudes 10 N, 10 N and 15 N respectively



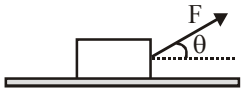
(1) its velocity changes only in magnitude

(2) its velocity changes only in direction

(3) its velocity changes in both magnitude and direction

(4) its velocity remains constant

14. A block is being pulled by a force F on a long frictionless level floor. Magnitude of the force is gradually increased from zero until the block lifts off the floor. Immediately after the block leaves the floor, its acceleration is



(1) gcosθ

(2) gcotθ

(3) gsinθ

(4) More information is required to decide.

15. A force 'F_0' start acting on a stationary particle of mass 'm' then velocity of particle after covering a distance 'd' is :-

(1) $\sqrt{\frac{m}{2F_0 d}}$ (2) $\frac{2F_0 d}{m}$

(3) $\sqrt{\frac{2F_0 d}{m}}$ (4) Zero

16. Among the given cases, in which cases net force on the object will be zero ?

(a) An ice cube of 50g mass floating on water

(b) A body moving with uniform velocity in space

(c) A satellite revolving around the earth

(d) A book at rest on a table

(1) In a, b and c

(2) only in a

(3) In a, b and d

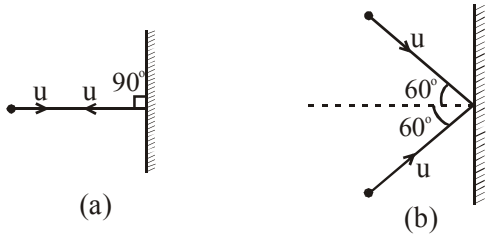
(4) in all cases

17. Motion of a particle of mass 5kg is described by the relation $x = (5t + 10t^2)$ m force on the particle is :-

(1) 20 N (2) 40 N

(3) 80 N (4) 100N

18. Two identical billiard balls strikes a rigid vertical wall with the same speed but at different angles and get reflected without any change in speed as shown in the figure (a) & (b). The ratio impulses imparted to the balls by the wall is :-



(a) (b)

(1) 1 : 2 (2) $\sqrt{3}$: 2

(3) 2 : $\sqrt{3}$ (4) 2 : 1

19. A batsman hits back a ball straight in the direction of the bowler without changing its initial speed of 25 ms^{-1}. If the mass of ball is 0.4 kg, then assuming linear motion of the ball, determine the impulse imparted to the ball :-

(1) 20 N-s (2) 40 N-s

(3) 50 N-s (4) 60 N-s

20. Which of the following statement is correct :-

(1) If force is along velocity, then it can change the direction of motion.

(2) If force is perpendicular to velocity, then it can change the magnitude of velocity,

(3) If force is in the opposite direction of velocity, then it can not change the direction of motion.

(4) If force is perpendicular to velocity then it can change direction of velocity.

21. Mass of a particle is 0.50 kg. It is moving initially with the speed by 80 m/s towards east. At t = 0, when particle is at x = 0, a force of 20N directed towards west is being applied on it for 4 sec. Its position after 5 sec is :-

(1) 80 m (2) 0 (3) –40m (4) –80m

22. A student unable to answer a question on Newton's laws of motion attempts to pull himself up by tugging on his hair. He will not succeed.

(1) as the force exerted is small

(2) the frictional force while gripping, is small

(3) Newton's law of inertia is not applicable to live beings

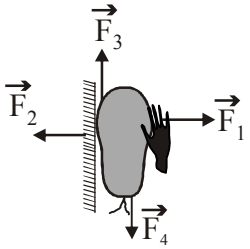
(4) as the force applied is internal to the system

23. In the figure shown, a balloon is pressed against a wall. It is in equilibrium and maximum compresed state.

$\vec{F}_1$ = force of balloon on hand of man ;

$\vec{F}_2$ = force of balloon on wall ;

$\vec{F}_3$ = friction force ; $\vec{F}_4$ = weight of balloon. Choose the correct statement (s).



(A) $\vec{F}_1$ and $\vec{F}_2$ are action reaction pairs.

(B) $\vec{F}_3$ and $\vec{F}_4$ are action reaction pairs.

(C) $\vec{F}_2$ and $\vec{F}_3$ are action reaction pairs.

(D) $\vec{F}_4$ and gravitational force exerted by balloon on earth are action reaction pairs.

(1) Only A & D

(2) Only A, B & D

(3) Only D

(4) Only C & D

24. In a tonga, horse pulls a wagon. Which is the correct analysis of the situation?

(1) The tonga moves forward because the horse pulls forward slightly harder on the wagon than the wagon pulls backward on the horse.

(2) Because action always equals reaction, the horse cannot pull the wagon. The wagon pull backward just as hard as the horse pulls forward, there is no motion.

(3) The horse's force on the wagon is as strong as the force of the wagon on the horse.

(4) The horse can pull the wagon forward only if it weighs more than the wagon.

25. A block of weight 9.8 N is placed on a table. The table surface exerts an upward force of 10N on the block. Taking g = 9.8 m/s^2 , which of the following statement are correct ?

(a) The block exerts a force of 10 N on the table

(b) The block exerts a force of 19.8 N on the table

(c) The block exerts a force of 9.8 N on the table

(d) The block has an upward acceleration

(1) only a

(2) a and d

(3) b and d

(4) c and d

26. A ball of mass m is thrown vertically upward. Instead of neglecting air resistance, assume that the force of air resistance has a magnitude proportional to the ball's velocity, but pointing in the opposite direction. The acceleration of the ball at the highest point is

(1) 0

(2) Less than g

(3) g

(4) Greater than g

27. A body is placed over a smooth inclined plane of angle $\pi-\theta$. The angle between normal reaction and the weight of the body is

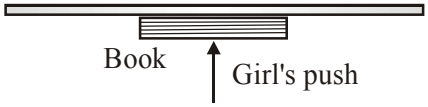
(1) $\pi-\theta$

(2) θ

(3) less than θ

(4) greater than θ

28. A girl pushes her physics book up against the horizontal ceiling of her room as shown in the figure.



The book weighs 20 N and she pushes upwards with a force of 25 N. The choices below list the magnitudes of the contact force F_{CB} between the ceiling and the book, and F_{BH} between the book and her hand. Select the correct pair.

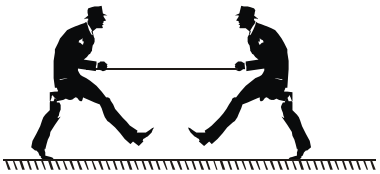
(1) F_{CB} = 20 N and F_{BH} = 25 N

(2) F_{CB} = 25 N and F_{BH} = 45 N

(3) F_{CB} = 5 N and F_{BH} = 25 N

(4) F_{CB} = 5 N and F_{BH} = 45 N

29. In a tug–of–war contest, two men pull on a horizontal rope from opposite sides. The winner will be the man who



(1) exerts greater force on the rope

(2) exerts greater force on the ground

(3) exerts a force on the rope which is greater than the tension in the rope

(4) makes a smaller angle with the vertical

30. Three forces are acting on a body to make resultant force zero. Which set can do it without the angle between any of the forces being 0° or 180°?

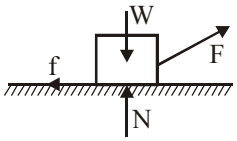
(1) 3N, 3N, 7N

(2) 10N, 8N, 2N

(3) 3N, 3N, 6N

(4) 6N, 10N, 8N

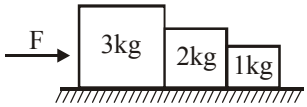
31. A person pulls a block by applying a force F and the block remains at rest. The arrows in the diagram correctly show the directions, but not necessarily the magnitudes, of the various forces on the block. Which of the following relations among the force magnitudes F, W, N, and f must be true? Here f is friction and W is the weight (the force of gravity), and N is the normal reaction.



(1) F = f and N = W (2) F = f and N > W

(3) F > f and N < W (4) F > f and N = W

32. Consider the following statement about the blocks shown in the diagram that are being pushed by a constant force on a frictionless table.

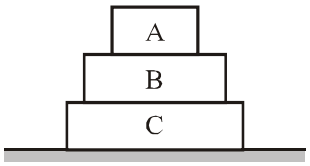


(i) All blocks move with the same acceleration.
(ii) The net force on each block is the same.
Which of these statement are/is correct

(1) (i) only (2) (ii) only

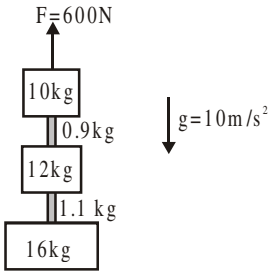
(3) both (i) and (ii) (4) neither (i) nor (ii)

33. Consider three blocks A, B and C. Block A is placed on block B, which is placed on block C and block C is placed on the ground. Normal reaction between blocks B and C is three times of that between blocks A and B. Normal reaction between block C and ground is two times of that of between blocks B and C. Possible values of the masses of blocks A, B and C respectively are



(1) 5kg, 15 kg and 10 kg
(2) 5 kg, 10 kg and 15 kg
(3) 5 kg, 15 kg and 30 kg
(4) 5 kg, 30 kg and 60 kg

34. Three blocks shown in figure are connected by two heavy uniform ropes. An upward force of 600 N is applied as shown in figure. What is the acceleration of the system?



(1) 15 m/s^2

(2) 5 m/s^2

(3) 10 m/s^2

(4) None of these

35. The force exerted by the floor of an elevator on the foot of a person standing there is less than the weight of the person if the elevator is

(A) going up and slowing down

(B) going up and speeding up

(C) going down and slowing down

(D) going down and speeding up

(1) Only A (2) Only C

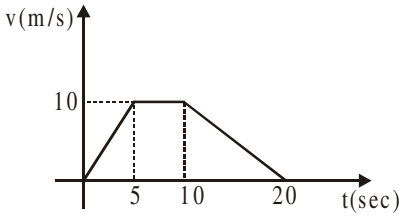
(3) A & D (4) B & C

36. A uniform rope of mass 1.0 kg is connected with a box of mass 2.0 kg, which is placed on a smooth horizontal surface. The free end of the rope is pulled horizontally by a force 6 N. Find the tension at the midpoint of the rope.

(1) 4 N (2) 1 N

(3) 5 N (4) 2 N

37. Velocity of a lift moving upwards varies with time as shown in figure. If a mass of 60 kg is placed on a weighing machine in the lift, then Reading of weighing machine at t = 3 s and at t = 15 s are



(1) 60 kg-wt and 54 kg-wt

(2) 72 kg-wt and 54 kg-wt

(3) 48 kg-wt and 48 kg-wt

(4) 75 kg-wt and 48 kg-wt

38. A block is kept at rest in a lift which is initial at rest. If lift starts moving downward with an acceleration of $15 m/s^2$, then acceleration of block will be :- ($g = 10 m/s^2$)

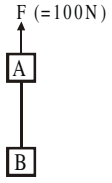
(1) $15 m/s^2$

(2) $5 m/s^2$

(3) $25 m/s^2$

(4) None of these

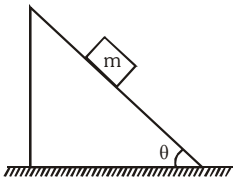
39. Consider the shown arrangement where the blocks A and B connected by means of a uniform string is being moved vertically up by the force F. Each block weighs 2 kg while the mass of string is 1000 gm. The tension at bottom of the string equals



(1) 20 N (2) 40 N

(3) 60 N (4) 270 N

40. If block is sliding down on a rough fixed inclined plane with constant velocity as shown in the figure then net force acting on the wedge due to block is:-



(1) $\frac{mg}{\cos\theta}$ (2) mg

(3) $mg\cos\theta$ (4) None of these

41. A rope of length L and mass M is hanging from a rigid support.The tension in the rope at a distance x from the rigid support is :-

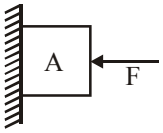
(1) Mg (2) $\left(\frac{L-x}{L}\right)Mg$

(3) $\left(\frac{L}{L-x}\right)Mg$ (4) $\frac{x}{L}Mg$

42. A chain consisting of 5 links of mass 0.1 kg each is lifted vertically upwards with a constant acceleration 5 m/s^2 as shown in figure. The force of interaction between the top link and the link immediately below it will be : ($g = 10 m/s^2$)

(1) 6 N (2) 4 N (3) 3 N (4) 2 N

43. A block A of mass m is kept at rest against a rough vertical wall by applying a horizontal force F. Minimum value of F to keep the block in equilibrium is F_m, then find the acceleration of block when $F = \frac{F_m}{5}$.



(1) $4 m/s^2$ (2) $8 m/s^2$ (3) $10 m/s^2$ (4) $1 m/s^2$

44. Force F = 100 N is applied on a combination of mass M and m in two situations as shown in figure (i) & (ii). If contact force between M & m in two cases is N_1 & N_2 respectively then calculate $\frac{N_2}{N_1}$. (Given : M = 10 kg, m = 2kg). Friction is absent everywhere.

figure (i) figure (ii)

(1) 2 (2) 5 (3) 4 (4) 6

45. **91.** A block is placed on horizontal floor. Block is in equilibrium under the action of three forces F_1 = 10N, F_2 = 2N and friction force. If F_2 is removed then net force on block will be :-

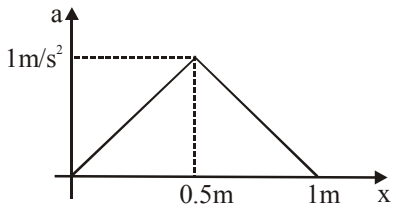
(1) 2N left

(2) 2N right

(3) 0 N

(4) Cannot be determined

46. A body initially at rest, starts moving along x-axis in such a way so that its acceleration vs displacement plot is as shown in figure. The maximum velocity of particle is :-



(1) 1 m/s (2) 6 m/s

(3) 2 m/s (4) none

47. A mass 1 kg is suspended by a thread. It is

(i) lifted up with an acceleration 4.9 m/s²

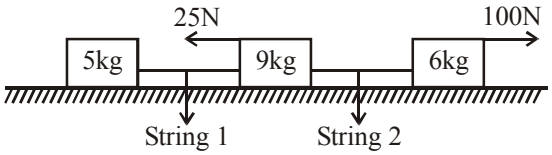
(ii) lowered with an acceleration 4.9 m/s².

The ratio of the tensions is :-

(1) 3 : 1 (2) 1 : 3

(3) 1 : 2 (4) 2 : 1

48. In the given figure tension at the mid-point of string-2. If mass of string-1 is 6 kg and mass of string-2 is 4 kg.



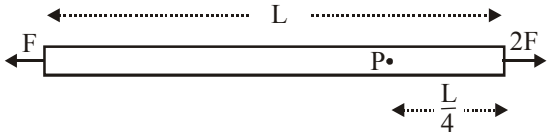
(1) 70 N

(2) 60 N

(3) 80 N

(4) 50 N

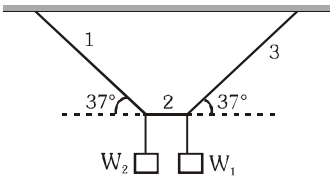
49. A uniform rod of mass M and length L lies flat on a frictionless horizontal surface. Two forces F and 2F are applied along the length of the rod as shown. The tension in the rod at point P is



(1) F (2) 3F

(3) $\frac{5F}{4}$ (4) $\frac{7F}{4}$

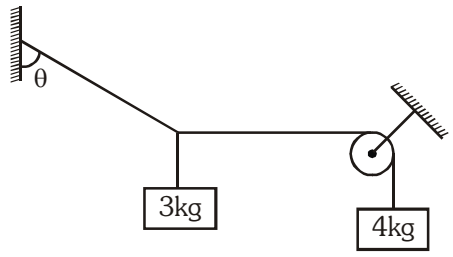
50. In the given figure, system is in equilibrium. If W_1 = 300 N, then W_2 is approximately equal to:-



(1) 500 N (2) 400 N

(3) 670 N (4) 300 N

51. In shown system, each of the block is at rest. The value of θ is



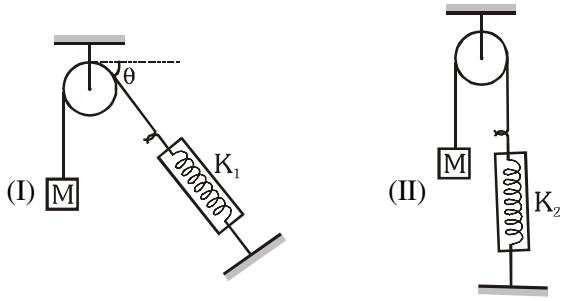
(1) $\tan^{-1}(1)$

(2) $\tan^{-1}\left(\frac{3}{4}\right)$

(3) $\tan^{-1}\left(\frac{4}{3}\right)$

(4) $\tan^{-1}\left(\frac{3}{5}\right)$

52. Two situations are shown in the diagram.



Tension in spring in case I is represented as $T_{S\,I}$ and tension in spring in case II is $T_{S\,II}$ and $K_1 \neq K_2$

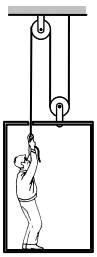
(1) $T_{SI} \sin\theta = T_{S\,II}$

(2) $T_{S\,I} = T_{S\,II}$

(3) Extension in spring in case I less than extension in spring in case II.

(4) Extension in spring in case I is equal to extension in spring in case II.

53. A man standing in a lift according to the arrangement shown in figure is trying to move the lift upwards by pulling the rope down. Is it always possible to do this? (contact of man from floor does not break)



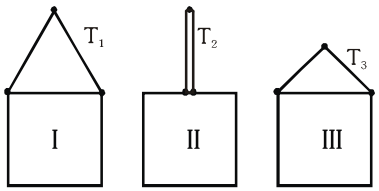
(1) Yes, provided that the man is capable of pulling the rope hard enough.

(2) Yes, only if mass of the man is greater than or equal to that of the lift.

(3) Yes, only if mass of the man is greater than or equal to half of that of the lift.

(4) Yes, only if mass of the man is greater than or equal to one third of that of the lift.

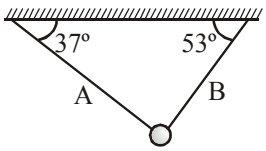
54. A picture can be hung on a wall with string in three different ways, as shown. The magnitude of the tension force of the string is:



(1) $T_1 > T_2 > T_3$ (2) $T_3 > T_1 > T_2$

(3) $T_2 > T_1 > T_3$ (4) $T_3 > T_2 > T_1$

55. A small ball of weight 10 N is suspended by two strings A and B as shown in the figure. Values of tensions in the strings A and B are :-



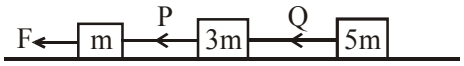
(1) 80 N and 60 N respectively.

(2) 60 N and 80 N respectively

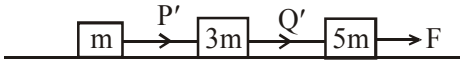
(3) 6 N and 8 N respectively

(4) 8 N and 6 N respectively.

56. Three blocks of mass m, 3m and 5m are connected by massless strings and pulled by a force F on a frictionless surface as shown in the figure below. The tension P in the first string is 16N .



If the point of application of F is changed as given below.



The value of P' and Q' will be :-

(1) 16N, 10N

(2) 10N, 16N

(3) 2N, 8N

(4) 10N, 6N

57. A man squatting on the ground gets straight up and stand. The force of reaction of ground on the man during the process is :-

(1) constant and equal to mg in magnitude

(2) constant and greater than mg in magnitude

(3) variable but always greater than mg

(4) at first greater than mg and later becomes equal to mg

58. Mass of a monkey is 50 kg. It climbs up a rope having breaking strength 800 N. In which of the following cases, the rope will break :- ($g = 10\ m/s^2$)

(1) climbs down with an acceleration of $6ms^{-2}$

(2) climbs up with an acceleration of $5ms^{-2}$

(3) climbs up with an acceleration of $6.5\ ms^{-2}$

(4) All of the above

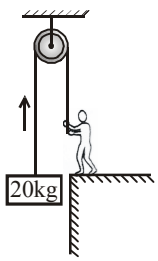
59. Mass of a block is 20kg. A man of mass 60kg raises it with constant velocity as shown in the figure. Force exerted by man on the floor will be :-

(1) 400 N

(2) 600 N

(3) 200 N

(4) None of the above

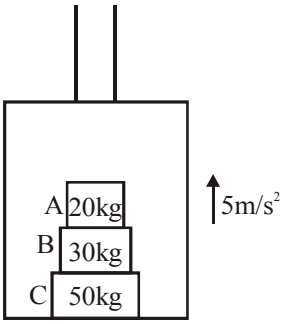


60. A shell of mass 0.01 kg is fired by a gun of 50 kg. If the muzzle speed of shell is $60ms^{-1}$, then the recoil speed of gun is :-

(1) 1.2 m/s (2) 1.6 m/s

(3) 1.2 cm/s (4) 1.6 cm/s

61. In shown situation elevator is moving upward with acceleration of 5 m/s^2.



Column I	**Column II**
(1) Net force acting on B	(P) 150 N
(2) Normal reaction between A and B	(Q) 300 N
(3) Normal reaction between B and C	(R) 450 N
(4) Normal reaction between C and elevator	(S) 750 N
	(T) 1500 N

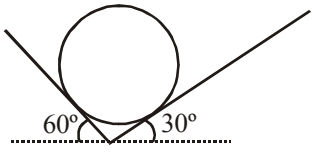
(1) (1)-P (2)-Q (3)-S (4)-T

(2) (1)-Q (2)-Q (3)-R (4)-T

(3) (1)-P (2)-R (3)-S (4)-S

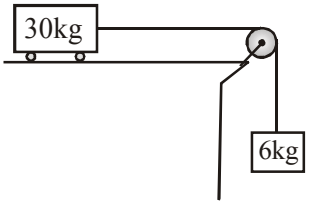
(4) (1)-Q (2)-R (3)-R (4)-T

62. A cylinder of mass $\frac{1}{\sqrt{3}}$ kg is placed on the corner of two inclined planes as shown in the figure. Find the normal reaction at contact point of cylinder with the slope of inclination 30°.



(1) 15 N (2) 10 N (3) 5 N (4) 7 N

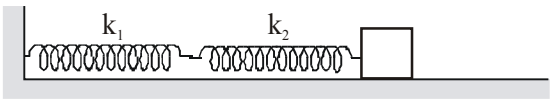
63. If the coefficient of kinetic friction between the trolley and surface is 0.1, then tension in the string connecting masses is – (Take g = 10m/s^2)



(1) 48 N (2) 51 N

(3) 53 N (4) 55 N

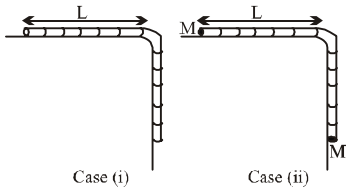
64. The mass in the figure can slide on a frictionless surface. When the mass is pulled out, spring 1 is stretched a distance x_1 and spring 2 is stretched a distance x_2. The spring constants are k_1 and k_2 respectively. Magnitude of spring force on the mass is



(1) k_1x_1 (2) $(k_1x_1 - k_2x_2)$

(3) $(k_1x_1 + k_2x_2)$ (4) All of these

65. A chain of mass M & length 2L is placed on smooth table in case(i). In case (ii) two identical small balls each of mass M is attached at ends with the same chain as shown in the figure.The case in which the chain will leave the edge of table early (chain during its motion touches the table)



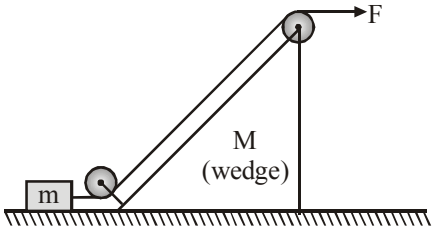
(1) case (i)

(2) case (ii)

(3) both will leave the edge simultaneously

(4) information are insufficient to decide the release

66. In the figure shown, the acceleration of wedge is (Neglect friction)



(1) $\frac{F}{M}$ (2) $\frac{F}{m+M}$

(3) zero (4) $\frac{F}{m}$

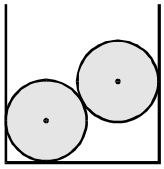
67. Two smooth spheres each of radius 5 cm and weight W rest one on the other inside a fixed smooth cylinder of radius 8 cm. The reactions between sphere and vertical side of the cylinder & between the two spheres are :-

(1) W/4 & 3 W/4

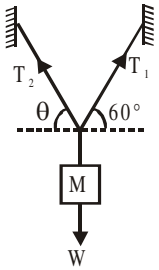
(2) W/4 & W/4

(3) 3W/4 & 5 W/4

(4) W & W



68. A weight W is supported by two cables as shown. The tension in the cable making angle θ with horizontal will be minimum, when the value of θ is



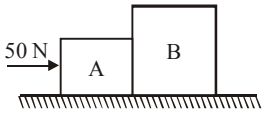
(1) 0

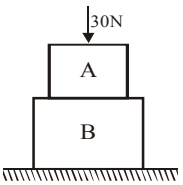
(2) 30°

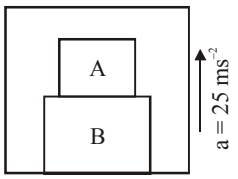
(3) 60°

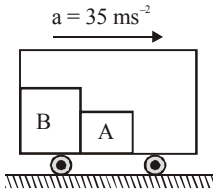
(4) None of these

69. In which of the following cases the contact force between A & B is maximum : ($m_A = m_B = 1kg$)

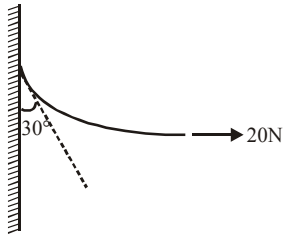
(1) 

(2) 

(3) 

(4) 

70. One end of a rope is fixed to a vertical wall and the other end is pulled by a horizontal force of 20N. The shape of the flexible rope is shown in figure. The mass of the rope is-



(1) 2 kg (2) 3 kg

(3) 3.5 kg (4) 4.5 kg

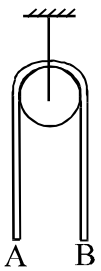
71. A uniform chain of length 2L is hanging in equilibrium position, if end B is given a slightly downward displacement the imbalance causes an acceleration. Here pulley is small and smooth & string is inextensible. The acceleration of end B when it has been displaced by distance x, is :-

(1) $\frac{x}{L}g$

(2) $\frac{2x}{L}g$

(3) $\frac{x}{2}g$

(4) g



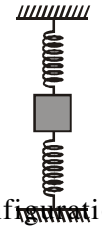
72. A block tied between two identical springs is in equilibrium. If upper spring is cut then the acceleration of the block just after cut is 6 m/s² downwards. Now, if instead of upper spring, lower spring is being cut then the acceleration of the block just after the cut will be.

(1) 4 m/s² downwards

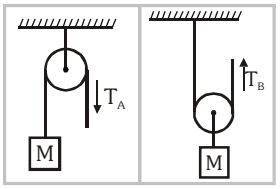
(2) 6 m/s² downwards

(3) 4 m/s² upwards

(4) 6 m/s² upwards



73. Consider the two configurations shown in equilibrium. Find ratio T_A/T_B.
(Ignore the mass of the rope & the pulley)

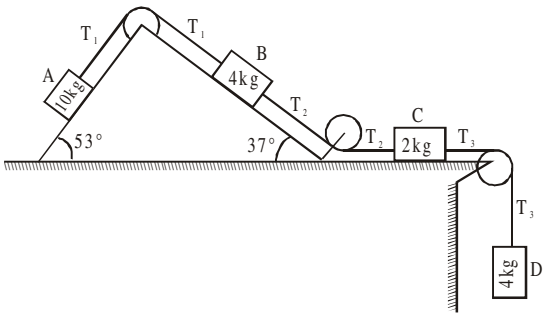


(1) 2:1 (2) 1:2

(3) 3:4 (4) 4:3

Paragraph for Q. 74 to 76

In shown system all surfaces are frictionless. All strings are massless and all pulleys are frictionless and massless. System is released from rest from shown position. [g = 10 m/s²]



74. Acceleration of block C is

(1) 0.6 m/s² towards right

(2) 0.8 m/s² towards left

(3) 0.8 m/s² towards right

(4) $\frac{8}{9}$ m/s² towards left

75. Value of tension T_3 is

(1) 40.3 N (2) 43.2 N

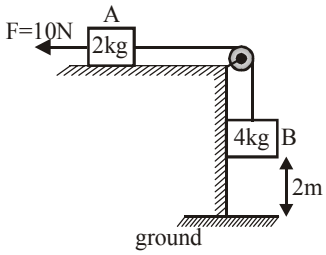
(3) 36.8 N (4) 48.6 N

76. Value of $T_1 + T_2$ is

(1) 44.8 N (2) 78 N

(3) 112.6 N (4) 116.8 N

77. The system shown in the diagram is released from rest. Pulley and string are massless. Neglect friction everywhere. ($g = 10\ ms^{-2}$)



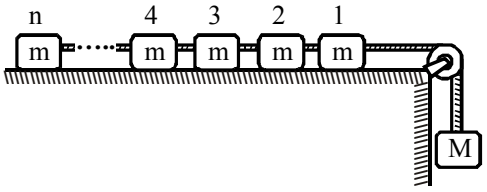
(1) Tension in the string during motion of both blocks is 20N

(2) Acceleration of blocks during motion is 5 ms^{-2}

(3) Block B reaches ground in $\frac{2}{\sqrt{5}}$ s

(4) All of the above statements are correct

78. In the given arrangement, n number of equal masses are connected by strings of negligible masses. The tension in the string connected to the n^{th} mass is–



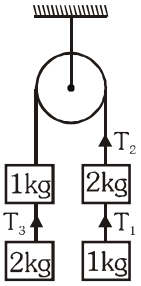
(1) $\frac{mMg}{nm+M}$

(2) $\frac{mMg}{nmM}$

(3) mg

(4) mng

79. In the figure shown all the strings are massless and friction is absent everywhere. Choose the correct option.



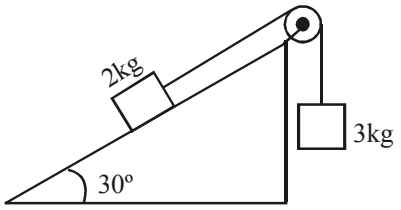
(1) $T_1 > T_2 > T_3$

(2) $T_2 > T_1 > T_3$

(3) $T_2 > T_3 > T_1$

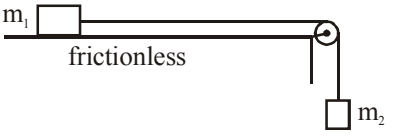
(4) $T_3 > T_2 > T_1$

80. In the arrangement shown, the 2 kg block is held to keep the system at rest. The string and pulley are ideal. When the 2 kg block is set free, by what amount the tension in the string changes? [$g = 10\ m/s^2$]



(1) Increase of 12 N
(2) Decrease of 12 N
(3) Increase of 18 N
(4) Decrease of 18 N

81. In the arrangement shown, the blocks of unequal masses are held at rest. When released, acceleration of the blocks :-



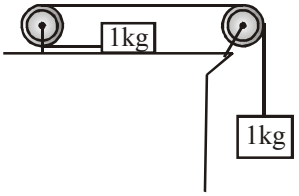
(1) is $\frac{g}{2}$

(2) is g

(3) is between zero and g

(4) could be greater than g

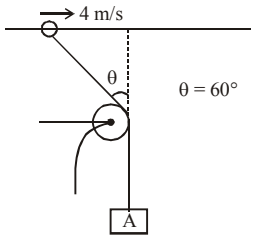
82. Find tension in the string. Surface is frictionless :-



(1) 0 N (2) 1 N

(3) 2 N (4) 5 N

83. For the given fig. find the speed of block A when $\theta = 60°$:-



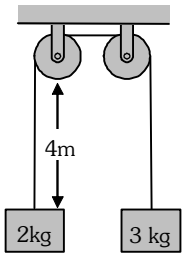
(1) $2\sqrt{3}$ m/s

(2) 4 m/s

(3) 2 m/s

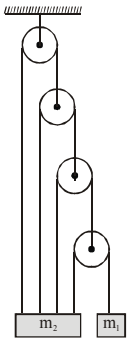
(4) None

84. How long it will take for the 2 kg block to strike the pulley after the system shown is released from rest?



(1) 1 s (2) 2 s (3) 3 s (4) 4 s

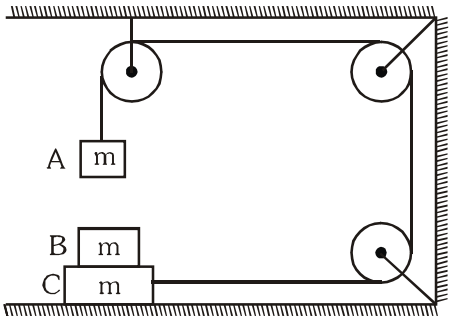
85. If system is in equilibrium then find relation between m_1 and m_2.



(1) $\frac{m_1}{m_2} = \frac{1}{2}$ (2) $\frac{m_1}{m_2} = \frac{1}{15}$

(3) $\frac{m_1}{m_2} = \frac{1}{10}$ (4) $\frac{m_1}{m_2} = 1$

86. Friction is absent everywhere. Find accelerations of blocks A, B and C at shown instant.



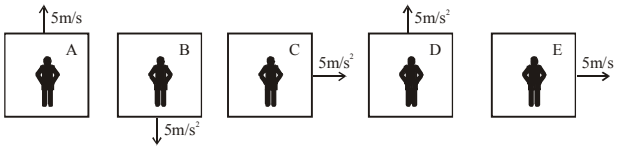
(1) $a_A = \frac{g}{2}; a_B = 0; a_c = \frac{g}{2}$

(2) $a_A = g; a_B = 0; a_c = g$

(3) $a_A = \frac{g}{3}; a_B = \frac{g}{3}; a_c = \frac{g}{3}$

(4) $a_A = \frac{g}{3}; a_B = 0; a_c = \frac{g}{3}$

87. 5 men each of mass 100 kg are travelling in different cars as shown. Choose the correct alternative(s)



(1) pseudo force on A as seen by B will be 500 N.

(2) pseudo force on C as seen by B will be $500\sqrt{2}$ N.

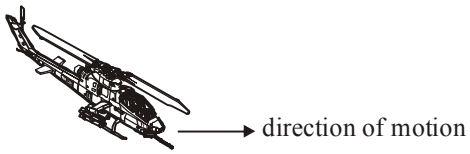
(3) pseudo force on D as seen by B will be 1000 N

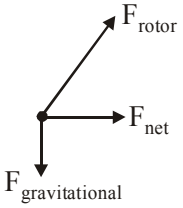
(4) pseudo force on B as seen by E will be 1000 N

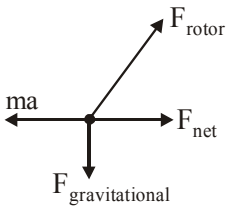
88. There is a long chain containing infinite link. If mass of links of chain is M, $\frac{M}{2}, \frac{M}{4}, \frac{M}{8}$ ....., then the net force on third link is :-

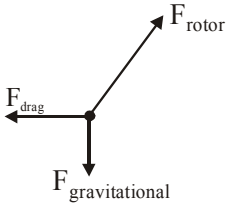
(1) 2F (2) $\frac{F}{2}$ (3) $\frac{F}{4}$ (4) $\frac{F}{8}$

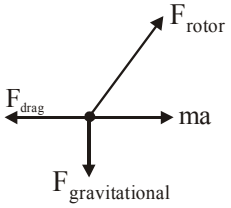
89. A helicopter is moving to the right in horizontal plane. It experiences three forces $\vec{F}_{gravitational}$, $\vec{F}_{drag}$ & upthurst force on it caused by rotor $\vec{F}_{rotor}$ and its net acceleration being 'a'. Which of the following diagrams can be correct free body diagram w.r.t. to a stationary observer on ground?



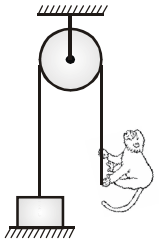
(1)


(2)


(3)


(4)


90. A monkey weighing 10 kg is climbing up a light rope which passes over an ideal pulley. The other end of the rope is attached a 15 kg mass as shown in the figure. In order to raise the 15 kg mass off the ground the monkey should climb up



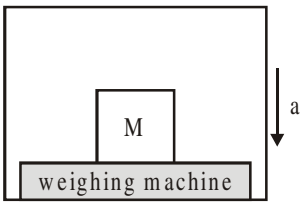
(1) with constant acceleration $\frac{g}{3}$.

(2) with an acceleration greater than $\frac{g}{2}$.

(3) with an acceleration equal to $\frac{g}{4}$.

(4) It is not possible because weight of monkey is lesser than the block.

91. With what acceleration 'a' shown the elevator descends so that the block of mass M exerts a force of $\frac{Mg}{10}$ on the weighing machine :



(1) –0.1 g

(2) 0.1 g

(3) 0.9 g

(4) –0.9 g

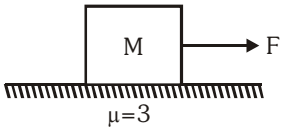
92. A block of mass M placed on rough surface of coefficient of friction equal to 3. If F is the (4/5) of the minimum force required to just move. Find out the force exerted by ground on the block.

(1) 2.6 Mg

(2) Mg

(3) 4 Mg

(4) 3.4 Mg



93. A box is lying on the floor of the carriage of a truck. If the coefficient of friction between the box and floor is 0.2, then max. acceleration of truck so that the box lying on its floor remains stationary, is :-

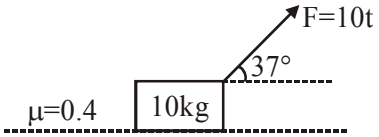
(1) 1 m/s^2

(2) 1.5 m/s^2

(3) 2 m/s^2

(4) None of these

94. A force acts on a block as shown in figure. Find time when block loses contact with surface.



(1) $t = \frac{25}{3}$ s

(2) $t = \frac{50}{3}$ s

(3) $t = \frac{100}{3}$ s

(4) t = 50 s

95. A block of mass 10 kg is kept on an inclined plane of inclination 30°. If the coefficient of friction between the block and plane's surface is 0.6, then force of friction on block is :-

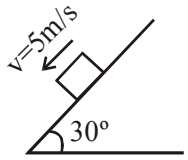
(1) 100 N

(2) 50 N

(3) $30\sqrt{3}$ N

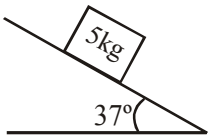
(4) None of these

96. A block of mass 5 kg is moving on rough fixed inclined plane with constant velocity of 5 m/s as shown in figure. Force of friction force acting on block by plane is .



(1) 25 N (2) 20 N (3) 30 N (4) None

97. A block of mass "5kg" is placed on a wedge having inclination of 37° with the horizontal. Coefficient of friction between block and wedge is 0.8. Then select the correct statement:



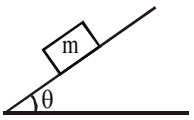
(1) Friction force between block and the wedge is 32 N.

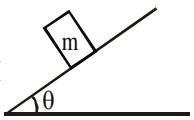
(2) Friction force between block and the wedge is 30 N.

(3) Contact force between block and wedge is 80 N.

(4) Contact force between block and wedge is 40 N.

98. A block is first placed on its long side and then on its short side on the same inclined plane (see figure). The block slides down in situation II but remains at rest in situation I. A possible explanation is

Situation–I 

Situation–II 

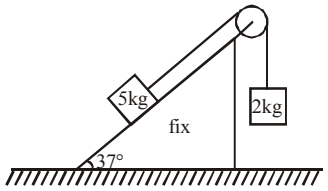
(1) The normal contact force is less in situation-II.

(2) The frictional force is less in situation-II because the contact area is less.

(3) The longer side is smoother.

(4) In situation-I, frictional force is more.

99. In the arrangement shown in figure coefficient of friction between 5kg block and incline plane is $\mu = 0.5$. Friction force acting on the 5kg block is:-



(1) 20 N (2) 15 N (3) 10 N (4) 5N

100. A block takes twice as much time to slide down a 45° rough inclined plane as it takes to slide down a similar smooth plane. The coefficient of friction is:

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

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

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	4	1	2	3	4	2	2	1	2	3	2	3	3	2	3	3	4	4	1	4
Que.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	4	4	3	3	2	3	1	3	2	4	3	1	2	2	3	3	2	4	2	2
Que.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	2	1	2	2	4	1	1	3	4	4	3	2	3	2	3	3	4	3	1	1
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Ans.	1	3	4	1	1	3	3	2	2	3	1	1	1	2	2	4	4	1	3	2
Que.	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Ans.	3	4	1	2	2	1	1	4	3	2	3	1	3	2	2	1	2	4	3	1