ALLEN CAREER INSTITUTE KOTA (RAJASTHAN)

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TG: @Chalnaayaaar

PRE-MEDICAL

PHYSICS

ENTHUSIAST | LEADER | ACHIEVER

EXERCISE

Newton's Laws of motion & Friction

ENGLISH MEDIUM

EXERCISE-I (Conceptual Questions) Build Up Your Understanding

BASIC QUESTION RELATED TO CONCEPT OF FORCE AND NEWTON'S LAWS OF MOTION

1. A particle is in a straight line motion with uniform velocity. A force is not required :-

(1) To increase the speed

(2) To decrease the speed

(3) To maintain the same speed

(4) To change the direction

NL0001

2. Essential characteristic of equilibrium is :-

(1) Momentum equals zero

(2) Acceleration equals zero

(3) K.E. equals zero

(4) Velocity equals zero

NL0002

3. When a constant force is applied to a body, it moves with uniform :-

(1) Acceleration (2) Velocity

(3) Speed (4) Momentum

NL0003

4. A 5 kg mass is accelerated from rest to 60 m/s in 1 s. What force acts on it : -

(1) 5×60 N

(2) $(5/60) \times 981$ N

(3) $60^2 \times 52$ N

(4) $(5/2) \times 60^2 \times 981$N

NL0004

5. A body of mass 40 g is moving with a constant velocity of 2 cm/s on a horizontal frictionless table. The force on the body (in dynes) is :-

(1) Zero (2) 39200

(3) 160 (4) 80

NL0005

6. A body of mass 2 kg moving on a horizontal surface with an initial velocity of 4 m/s comes to rest after 2 s. If one wants to keep this body moving on the same surface with a velocity of 4 m/s, the force required is :-

(1) 8 N (2) 4 N (3) Zero (4) 2 N

NL0006

7. The distance x covered in time t by a body having initial velocity v_0 and having a constant acceleration a is given by $x = v_0t + \left(\frac{1}{2}\right)at^2$. This result follows from :-

(1) Newton's first law

(2) Newton's second law

(3) Newton's third law

(4) None of these

NL0007

8. Working of rocket or jet is based on :-

(1) Newton's I law (2) Newton's II law

(3) Newton's III law (4) All the three laws

NL0008

9. When a horse pulls a wagon, the force that causes the horse to move forward is the force

(1) He exerts on the wagon

(2) The wagon exerts on him

(3) The ground exerts on him

(4) He exerts on the ground

NL0009

10. A man is at rest in the middle of a pond on perfectly smooth ice. He can get himself to the shore by making use of Newton's :-

(1) First law (2) Second law

(3) Third law (4) Law of gravitation

NL0010

11. A material body A of mass m_1 exerts a force on another material body B of mass m_2. If the acceleration of B be a_2, the magnitude of the acceleration of A is :-

(1) Zero (2) m_2a_2/m_1

(3) m_1a_2/m_2 (4) a_2

NL0011

12. If the force of gravity suddenly disappears :-
(1) The mass of all bodies will become zero
(2) The weight of all bodies will become zero
(3) Both mass and weight of all bodies will become zero
(4) Neither mass nor weight of all bodies will become zero

NL0012

13. Two bodies of masses 4 kg and 5 kg are acted upon by the same force. If the acceleration of lighter body is 2 m/s^2, then the acceleration of the heavier body is :-
(1) 4.2 m/s^2 (2) 3.6 m/s^2
(3) 2.4 m/s^2 (4) 1.6 m/s^2

NL0013

14. Action and reaction :- (For a given system)
(a) Act on the two different objects
(b) Have opposite directions
(c) Have equal magnitudes
(d) Have zero resultant
(1) a, b, c
(2) b, c, d
(3) All of the above
(4) None of the above

NL0014

15. An object with a mass 10 kg moves at a constant velocity of 10 m/s. A constant force then acts for 4 seconds on the object giving it a speed of 2 m/s in opposite direction. The acceleration produced is :-
(1) 3 m/s^2 (2) –3 m/s^2
(3) 0.3 m/s^2 (4) –0.3 m/s^2

NL0015

16. The velocity acquired by a mass m in travelling a certain distance d starting from rest under the action of a constant force is directly proportional to :-
(1) $\sqrt{m}$ (2) m°
(3) $\frac{1}{\sqrt{m}}$ (4) m

NL0016

17. Weight is defined as :-
(1) Force of attraction exerted by the earth
(2) Mass of a body
(3) Nature of a body
(4) None of these

NL0017

18. A ship of mass 3×10^7 kg initially at rest is pulled by a force of 5×10^4 N through a distance of 3m. Neglecting friction, the speed of the ship at this moment is :
(1) 3.0 m/s (2) 1.5 m/s
(3) 0.1 m/s (4) 2 m/s

NL0018

19. In Newton's second Law $\vec{F} = m\vec{a}$ (for constant mass m), $\vec{a}$ is the acceleration of the mass m with respect to
(1) any observer
(2) any inertial observer
(3) an observer at rest only
(4) an observer moving with uniform speed only

NL0019

20. The ratio of gravitational mass to inertial mass is equal to :
(1) $\frac{1}{2}$ (2) 2
(3) 1 (4) None of these

NL0020

MOMENTUM, IMPULSE, RATE OF CHANGE OF MOMENTUM AND AVERAGE FORCE RELATED PROBLEMS

21. A balloon of mass M is descending with a constant acceleration g/3. When a mass m is released from the balloon it starts rising with the same acceleration g/3. The value of m is (Assuming that its volume does not change) :-
(1) $\frac{M}{2}$ (2) $\frac{M}{4}$
(3) 4M (4) 2M

NL0021

22. Gravel is dropped onto a conveyer belt at a rate of 0.5 kg/s. The extra force required in newton to keep the belt moving at 2 m/s is :-

(1) 1 N (2) 2 N

(3) 4 N (4) 0.5 N

NL0022

23. A block of metal weighing 2 kg is resting on a frictionless plane. It is struck by a jet releasing water at a rate of 1 kg/s with a speed of 5 m/s. The initial acceleration of the block will be :-

(1) 2.5 m/s^2

(2) 5 m/s^2

(3) 10 m/s^2

(4) 15 m/s^2

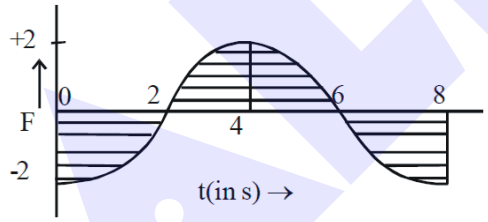
NL0023

24. A ball weighing 10 g hits a hard surface vertically with a speed of 5 m/s and rebounds with the same speed. The ball remains in contact with the surface for (0.01) s. The average force exerted by the surface on the ball is :-

(1) 100 N (2) 10 N (3) 1 N (4) 0.1 N

NL0024

25. Force-time graph for the motion of a body is shown in fig. Change in linear momentum between 0 to 8 s is :-



(1) Zero (2) 4 N-s

(3) 8 N-s (4) None

NL0025

26. Newton's II law of motion connects :

(1) Momentum and acceleration

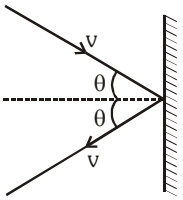
(2) Change of momentum and velocity

(3) Rate of change of momentum and external force

(4) Rate of change of force and momentum

NL0026

27. A water jet, whose cross sectional area is 'a' strikes a wall making an angle 'θ' with the normal and rebounds elastically. The velocity of water of density 'd' is v. Force exerted on wall is :-



(1) $2av^2d\cos\theta$ (2) $2av^2d\sin\theta$

(3) $2avd\cos\theta$ (4) $avd\cos\theta$

NL0027

28. When we kick a stone, we get hurt. Due to which of the following properties of stone does it happens ?

(1) Inertia (2) Velocity

(3) Reaction (4) Momentum

NL0028

29. 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 s, the force exerted on the player's hand is :-

(1) 8 N (2) 4 N (3) 2 N (4) 0

NL0029

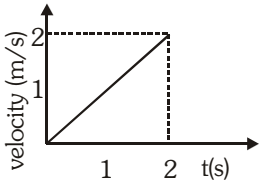
30. A tennis ball is dropped on the floor from a height of 20 m. It rebounds to a height of 5 m. The ball was in contact with the floor for 0.01 s. What was its average acceleration during the contact ? ($g=10m/s^2$)

(1) 3000 m/s^2 (2) 2000 m/s^2

(3) 1000 m/s^2 (4) 500 m/s^2

NL0030

31. For a body of 50 kg mass, the velocity-time graph is shown in figure.The force acting on the body is :

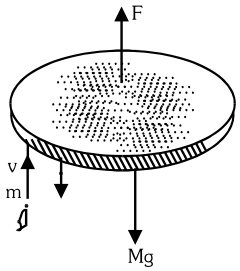


(1) 25 N (2) 50 N

(3) 12.5 N (4) 100 N

NL0031

32. A disc of mass 1·0 kg is kept floating horizontally in air by firing bullets of mass 0·05 kg each vertically at it, at the rate of 10 per second. If the bullets rebound with the same speed, the speed with which these are fired will be–



(1) 0·098 m/s (2) 0·98 m/s
(3) 9·8 m/s (4) 98·0 m/s

NL0032

33. A satellite in force free space sweeps stationary interplanetary dust at a rate (dM/dt) =+ αv. Here v is the velocity. The acceleration of satellite of mass M is :-

(1) $-2\alpha v^2/M$ (2) $-3\alpha v^2/M$
(3) $-\alpha v^2/M$ (4) $-\alpha v^2$

NL0033

34. If force F = 500 – 100t, then impulse as a function of time will be :-

(1) $500t - 50t^2$ (2) $50t - 10$
(3) $50 - t^2$ (4) $100t^2$

NL0034

35. For a Rocket propulsion velocity of exhaust gases relative to rocket is 2 km/s. If mass of rocket system is 1000 kg, then the rate of fuel consumption for a rocket to rise up with an acceleration 4.9 m/s^2 will be :-

(1) 12.25 kg/s (2) 17.5 kg/s
(3) 7.35 kg/s (4) 5.2 kg/s

NL0035

36. If the force on a rocket moving in force free space with an exhaust velocity of gases 300 m/sec is 210 N, then the rate of combustion of the fuel, is :-

(1) 0.7 kg/s (2) 1.4 kg/s
(3) 2.7 kg/s (4) 10.7 kg/s

NL0036

37. A rocket of mass 120 kg. is fired in a gravity free space is ejecting gases with velocity 600 m/s at the rate of 1 kg/s. What will be the initial acceleration of the rocket ?

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

NL0037

38. n bullet strike per second elastically on a wall and rebound. What will be the force exerted on the wall by bullets if mass of each bullet is m :-

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

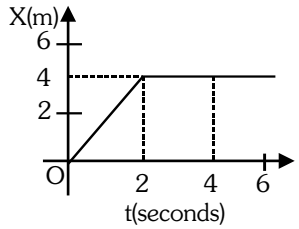
NL0038

39. A monkey of mass 20 kg is holding a vertical rope. The rope will not break when a mass of 25 kg is suspended from it but will break if the mass exceeds 25 kg what is the maximum acceleration with which the monkey can climb up along the rope ? (g = 10 m/s^2)

(1) 5 m/s^2 (2) 10 m/s^2
(3) 25 m/s^2 (4) 2.5 m/s^2

NL0039

40. In the figure given below, the position–time graph of a particle of mass 0·1 kg is shown. The impulse at t=2 sec is –



(1) 0·2 kg-m/s (2) –0·2 kg-m/s
(3) 0·1 kg-m/s (4) –0·4 kg-m/s

NL0040

41. A person is standing in an elevator. In which situation he finds his weight less ?

(1) when the elevator moves upward with constant acceleration
(2) when the elevator moves downward with constant acceleration
(3) when the elevator moves upward with uniform velocity
(4) when the elevator moves downward with uniform velocity

NL0041

42. A force of 10 N acts on a body of mass 20 kg for 10 seconds. The change in its momentum is

(1) 50 kg-m/s (2) 100 kg-m/s

(3) 300 kg-m/s (4) 1000 kg-m/s

NL0042

43. A rocket of mass 1000 kg is to be projected vertically upwards. The gases are exhausted vertically downwards with velocity 100 m/s with respect to the rocket. What is the minimum rate of burning fuel, so as to just lift the rocket upwards against the gravitational attraction ? (Take g = 10 m/s^2)

(1) 50 kg/s (2) 100 kg/s

(3) 200 kg/s (4) 400 kg/s

NL0043

44. A 150 g tennis ball coming at a speed of 40 m/s is hit straight back by a bat to speed of 60 m/s. The magnitude of the average force F on the ball, when it is in contact for 5 ms with the bat is:-

(1) 2500 N (2) 3000 N

(3) 3500 N (4) 4000 N

NL0044

45. Ten one-rupee coins are put on top of each other on a table. Each coin has a mass m. Which of the following statements is not true ? (counted from the bottom)

(1) The force on the 6^{th} coin due to all the coins on its top is equal to 4mg (downwards).

(2) The force on the 6^{th} coin due to the 7^{th} coin is 4mg (downwards)

(3) The reaction of the 6^{th} coin on the 7^{th} coin is 4mg (upwards).

(4) The total force on the 10^{th} coin is 9mg (downwards)

NL0045

46. A 140 g ball, in horizontal flight with a speed of 39.0 m/s, is struck by a bat. After leaving the bat, the ball travels in the opposite direction with speed v_2 = 39.0 m/s. If the impact time Δt for the ball-bat collision is 1.20 ms, what average force acts on the ball ?

(1) 1308 N (2) 1090 N

(3) 9100 N (4) 980 N

NL0046

FREE BODY DIAGRAM, EQUILIBRIUM OF CONCURRENT FORCES-LAMI'S THEOREM

47. A cork of mass 10 g is floating on water. Net force on the cork is :-

(1) 10 N (2) 10^{-3}N

(3) 10^{-2} N (4) Zero

NL0047

48. Two persons hold a rope of negligible weight tightly at its ends so that it is horizontal. A 15 kg weight is attached to the rope at the mid point which is now no longer remains horizontal. The minimum tension required to completely straighten the top is

(1) 15 kg (2) 15/2 kg

(3) 5 kg (4) Infinitely large

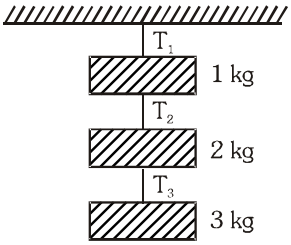
NL0048

49. A boy of mass 40 kg is hanging from a horizontal branch of a tree. The tension in his arms is minimum when the angle between the arms is :-

(1) 0° (2) 90° (3) 120° (4) 180°

NL0049

50. Find the tension T_2 for the system shown in fig.



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

NL0050

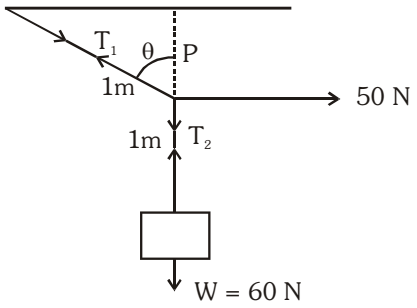
51. Ten one rupees coins are put on top of each other on a table. Each coin has a mass 'm' kg., then the force on the 7^{th} coin (counted from the bottom) due to all the coins on its top :-

(1) 3 mg (2) 7 mg

(3) 2 mg (4) 5 mg

NL0050

52. A mass of 6 kg is suspended by a rope of length 2 m from a ceiling. A force of 50 N is applied in horizontal direction at the mid point of the rope. What is the angle between the rope and the vertical in equilibrium :-

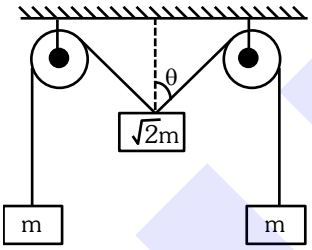


(1) $\tan^{-1}\left(\frac{4}{5}\right)$ (2) $\tan^{-1}\left(\frac{5}{4}\right)$

(3) $\tan^{-1}\left(\frac{5}{6}\right)$ (4) None

NL0052

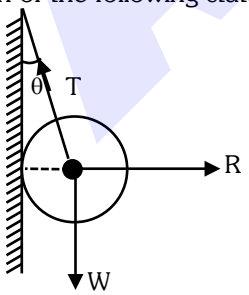
53. The pulleys and strings shown in the fig. are smooth and are of negligible mass. For the system to remain in equilibrium, the angle θ should be



(1) 0° (2) 30° (3) 45° (4) 60°

NL0053

54. A metal sphere is hung by a string fixed to a wall. The forces acting on the sphere are shown in fig. Which of the following statements is correct ?



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

(c) $T = R + W$ (d) $R = W \tan\theta$

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

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

NL0054

55. A block of mass 4 kg is suspended through two light spring balances A and B in series. Then A and B will read respectively.

(1) 4 kg and zero kg (2) zero kg and 4 kg

(3) 4 kg and 4 kg (4) 2 kg and 2 kg

NL0055

56. Two masses m_1 and m_2 are joined by a spring as shown. The system is dropped towards the ground from a certain height. The spring will be:-

(1) Stretched when $m_2 > m_1$

(2) compressed when $m_2 < m_1$

(3) neither compressed nor stretched only when $m_1 = m_2$

(4) neither compressed nor stretched regardless of the values of m_1 and m_2.

NL0056

57. 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) Zero (2) 400 N

(3) 800 N (4)1200 N

NL0057

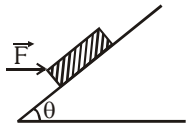
58. A block of mass m is placed on a smooth wedge of inclination θ. The whole system is accelerated horizontally so that the block does not slip on the wedge. The force exerted by the wedge on the block (g is acceleration due to gravity) will be :–

(1) mg sinθ (2) mg

(3) mg/cosθ (4) mg cosθ

NL0058

59. The figure shows a horizontal force $\vec{F}$ acting on a block of mass M on an inclined plane (angle θ). What is the normal reaction on the block ?



(1) mgsinθ + Fcosθ (2) mgsinθ – Fcosθ

(3) mgcosθ – Fsinθ (4) mgcosθ + Fsinθ

NL0059

60. A man, of mass 60 kg, is riding in a lift. The weights of the man, when the lift is accelerating upwards and downwards at 2 m/s^2 are respectively :- (Taking g = 10 m/s^2)

(1) 720 N and 480 N (2) 480 N and 720 N

(3) 600 N and 600 N (4) none of these

NL0060

FRAME OF REFERENCE - INERTIAL OR NON INERTIAL FRAME, PSEUDO FORCE, ACCELERATING LIFT

61. A man is standing at a spring platform. Reading of spring balance is 60 kg-wt. If the man jumps off from the platform, then reading of spring balance

(1) First increases then decreases to zero

(2) Decreases

(3) Increases

(4) Remains same

NL0061

62. A small sphere is suspended by a string from the ceiling of a car. If the car begins to move with a constant acceleration $\frac{g}{2}$, the inclination of the string with the vertical is :-

(1) $\tan^{-1}\left(\frac{1}{2}\right)$ in the direction of motion

(2) $\tan^{-1}\left(\frac{1}{2}\right)$ opposite to the direction of motion

(3) $\tan^{-1}(2)$ in the direction of motion

(4) $\tan^{-1}$ (2) opposite to the direction of motion

NL0062

63. A boy sitting on the upper berth in the compartment of a train, which is about to stop at a railway station, drops an apple aiming at the open hand of his brother vertically below his hands at a distance of about 2 m. The apple will fall :-

(1) In the hand of his brother

(2) Slightly away from the hands of his brother in the direction of motion of the train

(3) Slightly away from the hands of his brother in the direction opposite to the direction of motion of the train

(4) None of the above

NL0063

64. The force exerted by a person on the floor of an elevator is more 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) a, c (2) b, c (3) a, d (4) b, d

NL0064

65. The ratio of weights of a man in a stationary lift and in a lift accelerating downwards with a uniform acceleration is 3 : 2. The acceleration of the lift is:-

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

NL0065

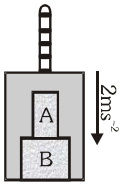
66. A frame will be inertial, if it moves with respect to another inertial frame with a constant :-

(1) Linear velocity (2) Angular velocity

(3) Linear acceleration (4) All of the above

NL0066

67. The elevator shown in figure is descending, with an acceleration of 2 m/s^2.



The mass of the block A is 0.5 kg. The force exerted by the block A on the block B is :

(1) 2 N (2) 4 N

(3) 6 N (4) 8 N

NL0067

68. A man weighing 100 kg carries a load of 10 kg on his head. He jumps from a tower with the load on his head. What will be the weight of the load as experienced by the man ?

(1) zero

(2) 10 kg

(3) slightly more than 10 kg

(4) 110 kg

NL0068

69. Drums of oil are carried in a truck. If the truck accelerates at a constant rate, the surface of the oil in the drum will -
(1) Remain unaffected
(2) Rise in the forward direction
(3) Rise in the backward direction
(4) Nothing is certain

NL0069

70. 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 :-

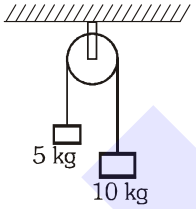
(1) $\sqrt{x^2-1}g$ (2) $\frac{\sqrt{x^2-1}}{x}g$

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

NL0070

MOTION OF BODIES IN CONTACT OR CONNECTED BY STRINGS, PULLEY SYSTEM

71. Two blocks of masses 5 kg and 10 kg are connected to a pulley as shown. What will be their acceleration if the pulley is set free ?
(g = acceleration due to gravity)



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

NL0071

72. Two particles of masses m and M (M > m) are connected by a cord that passes over a massless and frictionless pulley. The tension T in the string and the acceleration a of the particles is :-

(1) $T=\frac{2mM}{(M-m)}g;\ a=\left(\frac{Mm}{M+m}\right)g$

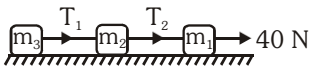
(2) $T=\frac{2mM}{(M+m)}g;a=\left(\frac{M-m}{M+m}\right)g$

(3) $T=\left(\frac{M-m}{M+m}\right)g;\ a=\left(\frac{2mM}{M+m}\right)g$

(4) $T=\left(\frac{Mm}{M+m}\right)g;\ a=\left(\frac{2mM}{M+m}\right)g$

NL0073

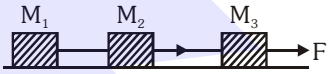
73. Three blocks of masses m_1,m_2 and m_3 are connected by massless strings as shown in the figure on a frictionless table. They are pulled with a force of 40 N. If m_1 = 10 kg, m_2 = 6 kg and m_3 = 4 kg, then tension T_2 will be :-



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

NL0074

74. Three masses M_1, M_2 and M_3 are lying on a frictionless table. The masses are connected by massless threads as shown. The mass M_3 is pulled by a constant force F as shown. The tension in the thread between masses M_2 and M_3 is



(1) $\left(\frac{M_1+M_2}{M_1+M_2+M_3}\right)F$ (2) $\left(\frac{M_2+M_3}{M_1+M_2+M_3}\right)F$

(3) $\left(\frac{M_1+M_3}{M_1+M_2+M_3}\right)F$ (4) $\left(\frac{M_1-M_2}{M_1+M_2+M_3}\right)F$

NL0075

75. Two bodies A and B of masses 10 kg and 15 kg respectively kept on a smooth, horizontal surface are tied to the ends of a light string. If T represents the tension in the string when a horizontal force F = 500 N is applied to A (as shown in figure 1) and T' be the tension when it is applied to B (figure2), then which of the following is true?

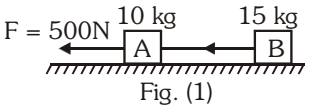


Fig. (1)

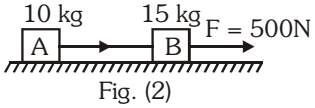


Fig. (2)

(1) T = T' = 500 N
(2) T = T' = 250 N
(3) T = 200 N, T' = 300 N
(4) T = 300 N, T' = 200 N

NL0076

76. If a parrot starts flying upwards with an acceleration in an air tight cage, then the boy will feel the weight of the cage:

(1) Unchanged

(2) Reduced

(3) Increased

(4) Nothing can be said

NL0077

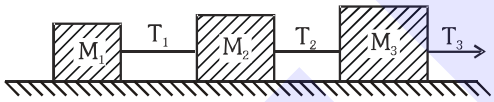
77. Two blocks of masses 2 kg and 1 kg are in contact with each other on a frictionless table. When a horizontal force of 3.0 N is applied to the block of mass 2 kg the value of the force of contact between the two blocks is -

(1) 4 N (2) 3 N

(3) 5 N (4) 1 N

NL0078

78. Three blocks are connected as shown in fig. on a horizontal frictionless table if m_1 = 1 kg, m_2 = 8 kg, m_3 = 27 kg and T_3 = 36N, T_2 will be:-



(1) 18 N (2) 9 N

(3) 3.375 N (4) 1.75 N

NL0079

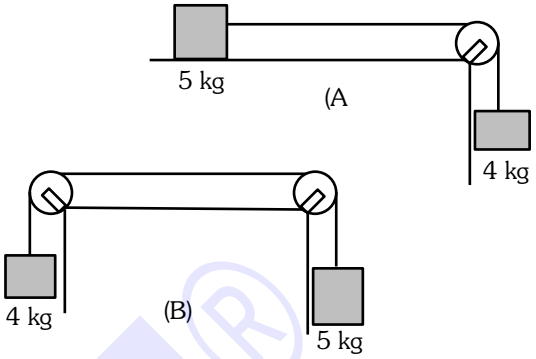
79. In the fig. given below masses m and m' are tied with a thread passing over a pulley, m is on a frictionless horizontal surface. If acceleration due to gravity is g, the acceleration of m' in this arrangement will be :-

(1) g (2) m'g/(m + m')

(3) mg/m' (4) mg/(m - m')

NL0080

80. Two bodies of masses 5 kg and 4 kg are arranged in two different ways as shown in fig. (A) and (B). If the pulleys and the table are perfectly smooth, the acceleration of the 5 kg body in case (A) and (B) are respectively :-

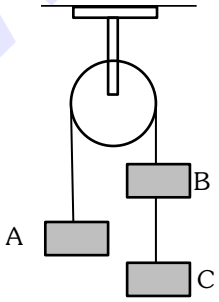


(1) g and (5/9) g (2) (4/9)g and (1/9)g

(3) g/5 and g/5 (4) (5/9)g and (1/9)g

NL0081

81. Three equal weights each of mass 4 kg are hanging on a string passing over a fixed pulley as shown in fig. What is the tension in the string connecting weights B and C.

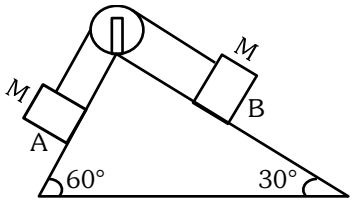


(1) Zero (2) 13.3 N

(3) 26.6 N (4) 19.6 N

NL0082

82. Two blocks each of mass M are resting on a frictionless inclined planes as shown in fig. then



(1) The block A moves down the plane

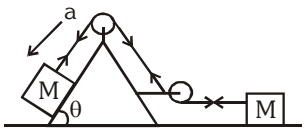
(2) The block B moves down the plane

(3) Both the blocks remain at rest

(4) Both the blocks move down the plane.

NL0083

83. Two blocks each having a mass M are placed as shown in the figure. The acceleration of the system is :-

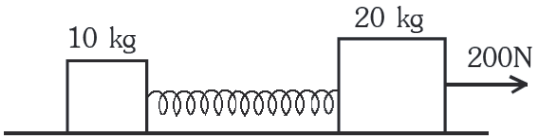


(1) 0 (2) $\frac{g\sin\theta}{2}$

(3) $g\sin\theta$ (4) $2g\sin\theta$

NL0084

84. Two masses of 10 kg and 20 kg respectively are connected by a massless spring as shown in the figure. A force of 200 N acts on the 20 kg mass. At the instant shown the 10 kg mass has an acceleration 4 m/s^2 rightwards. What is the acceleration of 20 kg mass ?

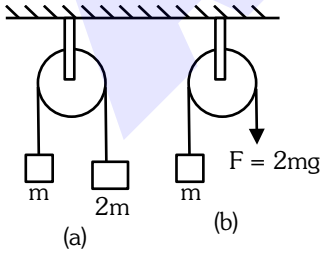


(1) Zero (2) 10 m/s^2

(3) 4 m/s^2 (4) 8 m/s^2

NL0085

85. 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

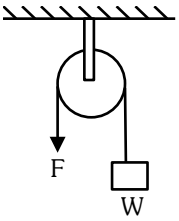
(2) More than that in case (b)

(3) Less than that in case (b)

(4) Equal to that in case (b)

NL0086

86. What is the mechanical advantage of single fixed pulley ?



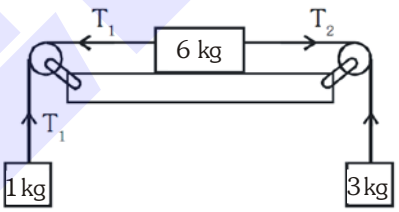
(1) 1 (2) 2

(3) 0.5 (4) 4

NL0087

87. Three masses of 1 kg, 6 kg and 3 kg are connected to each other with threads and are placed on a table as shown in figure. What is the acceleration with which the system is moving ?

(Take g = 10 m/s^2)

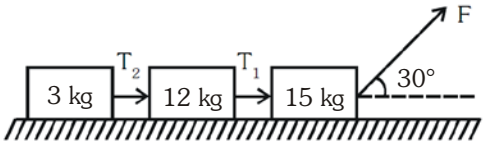


(1) Zero (2) 2 m/s^2

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

NL0088

88. The surface is frictionless, the ratio of T_1 and T_2 is :-



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

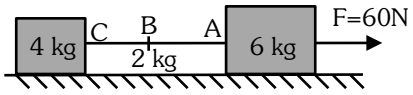
(2) $1:\sqrt{3}$

(3) 1 : 5

(4) 5 : 1

NL0089

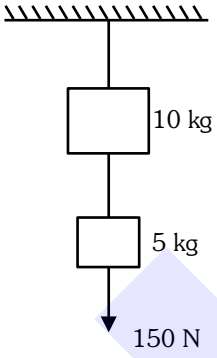
89. Two blocks of masses 6 kg and 4 kg connected by a rope of mass 2 kg are resting on a frictionless floor as shown in the following figure. If a constant force of 60 N is applied to 6 kg block, then the tension in the rope at points A, B and C are respectively given by:



(1) 60 N, 60 N, 60 N (2) 30 N, 25 N, 20 N
(3) 20 N, 25 N, 30 N (4) 20 N, 20 N, 20 N

NL0090

90. Two masses of 10 kg and 5 kg are suspended from a fixed support as shown in figure. The system is pulled down with a force of 150 N attached to the lower mass. The string attached to the support breaks and the system accelerates dowards. If the downward force continues to act, what is the acceleration of the system ?



(1) 20 m/s^2
(2) 10 m/s^2
(3) 5 m/s^2
(4) zero

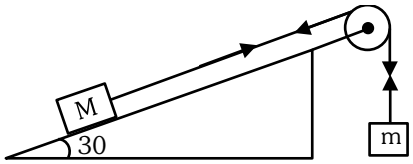
NL0091

91. A block of mass M is pulled along a horizontal frictionless surface by a rope of mass m. If a force F is applied at one end of the rope, the force which the rope exerts on the block is :-

(1) F/(M + m)
(2) F
(3) FM/(m + M)
(4) Zero

NL0092

92. In the fig. mass M = 10 g. is placed on an inclined plane. In order to keep it at rest, the value of mass m will be:



(1) 5 g (2) 10 $\sqrt{3}$ g
(3) 0.10 g (4) $\sqrt{3}$ g

NL0093

93. The mechanical advantage of a wheel axle is 5. What will be the force required to lift a 200 kg wt?

(1) 10 kg wt. (2) 2 kg wt.
(3) 20 kg wt. (4) 40 kg wt.

NL0094

94. Two bodies A (30 kg) and B (50 kg) tied with a light string are placed on a frictionless table. A force F acting at B pulls this system with an acceleration of 2 m/s^2. The tension in the string is:

(1) 60 N (2) 100 N (3) 35 N (4) 140 N

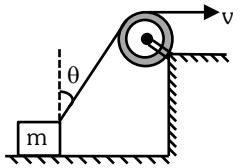
NL0095

95. A string of length L and mass M is lying on a horizontal table. A force F is applied at one of its ends. Tension in the string at a distance x from the end at which force is applied is

(1) Zero (2) F
(3) F(L - x)/L (4) F(L - x)/M

NL0096

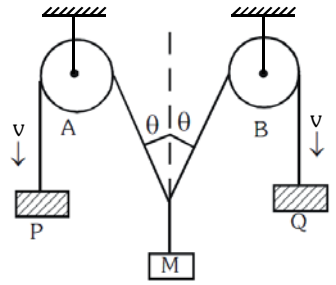
96. A block is dragged on a smooth plane with the help of a rope which moves with a velocity v as shown in figure. The horizontal velocity of the block is :



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

NL0097

97. In the fig., the ends P and Q of an unstrechable string move downward with uniform speed v. Mass M moves upwards with speed.



(1) v cosθ (2) v/cosθ

(3) 2v cosθ (4) 2/v cosθ

NL0098

FRICTION

98. The coefficient of static friction between two surfaces depend on

(1) the nature of surface
(2) the shape of the surface in contact
(3) the area of contact
(4) all of the above

NL0098

99. A block of mass 2 kg is placed on the floor. The coefficient of static friction is 0.4. Force of 2.8 N is applied on the block. The force of friction between the block and the floor is

(1) 2.8 N (2) 8.0 N
(3) 2.0 N (4) zero

NL0100

100. The frictional force of the air on a body of mass 0.25 kg, falling with an accleration of 9.2 m/s^2, will be :

(1) 1.0 N (2) 0.55 N
(3) 0.25 N (4) 0.15 N

NL0101

101. A block of mass 15 kg is placed on a long trolley. The coefficient of friction between the block and trolley is 0.18. The trolley accelerates from rest with 0.5 m/s^2 for 20 s. then what is the friction force ?

(1) 3.5 N (2) 133.3 N

(3) 7.5 N (4) N.O.T.

NL0102

102. A rope lies on a table such that a part of it hangs down the table. When the length of hanging part is 1/3 of entire length the rope just begins to slide. The coefficient of friction between the rope and the table is :-

(1) 2/3 (2) 1/2

(3) 1/3 (4) 1/6

NL0103

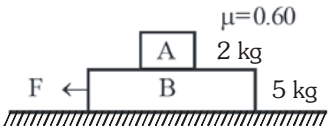
103. A 2 kg block (A) is placed on 8 kg block (B) which rests on a table. Coefficient of friction between (A) and (B) is 0.2 and between (B) and table is 0.5. A 25 N horizontal force is applied on the block (B), then the friction force between the blocks (A) and (B) is :-

(1) Zero (2) 3.9 N

(3) 5 N (4) 49 N

NL0104

104. Two blocks (A) 2 kg and (B) 5 kg rest one over the other on a smooth horizontal plane. The coefficient of static and dynamic friction between (A) and (B) is the same and equal to 0.60. The maximum horizontal force F that can be applied to (B) in order that both (A) and (B) do not have any relative motion is :



(1) 42 N (2) 42 kgf (3) 5.4 kgf (4) 1.2 N

NL0105

105. A body is placed on an inclined plane and has to be pushed down in order to make it move. The angle made by the normal reaction with the vertical will be :-

(1) Equal to angle of repose

(2) Equal to the angle of friction

(3) Less than the angle of repose

(4) More than the angle of friction

NL0106

106. 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) $\frac{2v_0^2}{\mu g}$

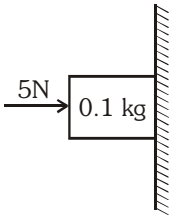
NL0107

107. The force required to just move a body up an inclined plane is double the force required to just prevent the body from sliding down the plane. The coefficient of friction is μ. The inclination θ of the plane is :-

(1) $\tan^{-1}(\mu)$ (2) $\tan^{-1}(\mu/2)$
(3) $\tan^{-1}(2\mu)$ (4) $\tan^{-1}(3\mu)$

NL0108

108. A block of mass 0.1 kg. is pressed against a wall with a horizontal force of 5N as shown in the figure. If the coefficient of friction between the wall and the block is 0.5 then the frictional force acting on the block will be ($g = 9.8\ m/s^2$) :-



(1) 9.8 N (2) 2.5 N
(3) 0.98 N (4) 0.49 N

NL0109

109. A block slides with constant velocity on a plane inclined at an angle θ. The same block is pushed up the plane with an initial velocity v_0. The distance covered by the block before coming to rest is :-

(1) $\frac{v_0^2}{2g\sin\theta}$ (2) $\frac{v_0^2}{4g\sin\theta}$
(3) $\frac{v_0^2\sin^2\theta}{2g}$ (4) $\frac{v_0^2\sin^2\theta}{4g}$

NL0110

110. 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) $mg\cos\theta + \mu mg\sin\theta$

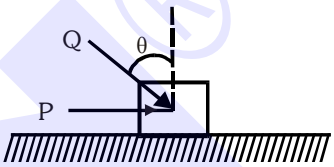
NL0111

111. A body is sliding down an inclined plane (angle of inclination 45°). If the coefficient of friction is 0.5 and $g = 9.8\ m/s^2$. then the downward acceleration of the body in m/s^2 is :-

(1) $\frac{4.9}{\sqrt{2}}$ (2) $4.9\sqrt{2}$ (3) $19.6\sqrt{2}$ (4) 4.9

NL0112

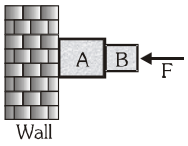
112. A block of mass m lying on a rough horizontal plane is acted upon by a horizontal force P and another force Q inclined at an angle θ to the vertical. The block will remain in equilibrium if the coefficient of friction between it and the surface is :-



(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) $\frac{P\sin\theta + Q}{mg - Q\cos\theta}$

NL0113

113. Adjoining figure shows two blocks A and B pushed against the wall with a force F. The wall is smooth but the surfaces in contact of A and B are rough. Which of the following is true for the system of blocks to be at rest against the wall ?



(1) F should be more than the weight of A and B
(2) F should be equal to the weight of A and B
(3) F should be less than the weight of A and B
(4) system cannot be in equilibrium

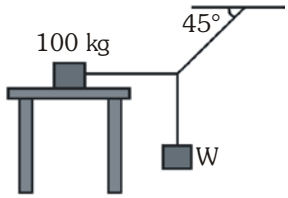
NL0114

114. A body of mass 100 g is sliding on a inclined plane with an inclination of 60^0. What is the fricitional force experienced, if coefficient of friction is 1.7 ? (Take $g = 10\ m/s^2$)

(1) 0.85 N (2) 0.95 N
(3) 1.05 N (4)1.145 N

NL0115

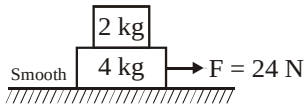
115. The system shown in the figure is in equilibrium. The maximum value of W, so that the maximum value of static frictional force on 100 kg body is 450 N, will be :-



(1) 100 N (2) 250 N
(3) 450 N (4)1000 N

NL0116

116.



In the arrangement coefficient of friction between the two blocks is $\mu = \frac{1}{2}$. The force of friction acting between the two blocks is :-

(1) 8 N (2) 6 N (3) 10 N (4) 12 N

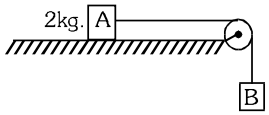
NL0117

117. A block has been placed on an inclined plane with the slope angle θ, the block slides down the plane at constant speed. The coefficient of kinetic friction is equal to :-

(1) sinθ (2) cosθ (3) g (4) tanθ

NL0118

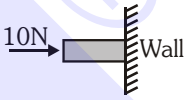
118. The coefficient of static friction, μ_s, between block A of mass 2 kg and the table as shown in the figure is 0.2. What would be the maximum mass value of block B so that the two blocks do not move ? The string and the pulley are assumed to be smooth and massless. (g = 10 m/s^2)



(1) 4.0 kg (2) 0.2 kg (3) 0.4 kg (4) 2.0 kg

NL0119

119. A horizontal force of 10 N is necessary to just hold a block stationary against a wall. The coefficient of friction between the block and wall is 0.2. The weight of the block is :-



(1) 20 N (2) 50 N (3) 100 N (4) 2 N

NL0120

120. A given object takes n times as much time to slide down a 45^0 rough incline as it takes to slide down a perfectly smooth 45^0 incline. The coefficient of kinetic friction between the object and the incline is given by :

(1) $\left(1-\frac{1}{n^2}\right)$ (2) $\left(\frac{1}{1-n^2}\right)$

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

NL0121

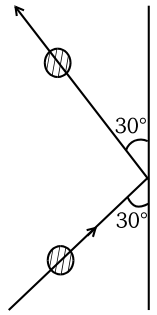
EXERCISE-I (Conceptual Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**3**	**2**	**1**	**1**	**1**	**2**	**2**	**3**	**3**	**3**	**2**	**2**	**4**	**3**	**2**
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	**3**	**1**	**3**	**2**	**3**	**1**	**1**	**1**	**2**	**1**	**3**	**1**	**1**	**1**	**1**
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	**2**	**3**	**3**	**1**	**3**	**1**	**2**	**3**	**4**	**2**	**2**	**2**	**2**	**2**	**4**
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	**3**	**4**	**4**	**1**	**3**	**1**	**3**	**3**	**3**	**3**	**4**	**4**	**3**	**4**	**1**
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	**1**	**2**	**2**	**2**	**1**	**1**	**2**	**1**	**3**	**4**	**3**	**2**	**2**	**1**	**4**
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	**3**	**4**	**2**	**2**	**2**	**3**	**1**	**2**	**4**	**3**	**1**	**2**	**4**	**2**	**1**
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	**3**	**1**	**4**	**1**	**3**	**2**	**2**	**1**	**1**	**4**	**3**	**2**	**1**	**1**	**3**
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	**1**	**4**	**3**	**2**	**1**	**1**	**1**	**4**	**1**	**3**	**1**	**4**	**3**	**4**	**1**

EXERCISE-II (Previous Year Questions) AIPMT/NEET

AIPMT 2006

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 :-



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

NL0122

AIPMT 2009

2. A body, under the action of a force $\vec{F} = 6\hat{i} - 8\hat{j} + 10\hat{k}$, acquires an acceleration of $1 m/s^2$. The mass of this body must be :-

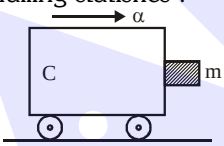
(1) $10\sqrt{2}$ kg (2) $2\sqrt{10}$ kg

(3) 10 kg (4) 20 kg

NL0124

AIPMT 2010

3. A block of mass m is in contact with the cart C as shown in the figure. 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 statisfies :-



(1) $\alpha < \frac{g}{\mu}$ (2) $\alpha > \frac{mg}{\mu}$

(3) $\alpha > \frac{g}{\mu m}$ (4) $\alpha \geq \frac{g}{\mu}$

NL0126

AIPMT 2011

4. A person of mass 60 kg is inside a lift of mass 940 kg and presses the button on control panel. Then lift starts moving upwards with an acceleration $1.0 m/s^2$. If g = 10 m/s^2 , the tension in the supporting cable is :

(1) 8600 N (2) 9680 N

(3) 11000 N (4)1200 N

NL0127

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 :

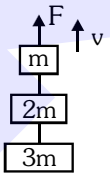
(1) MV (2) 1.5 MV

(3) 2 MV (4) Zero

NL0128

NEET-UG-2013

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)



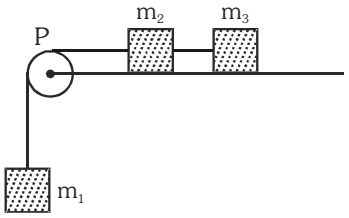
(1) 6 mg (2) zero

(3) 2 mg (4) 3 mg

NL0129

AIPMT 2014

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 $m_1 = m_2 = m_3 = m$)

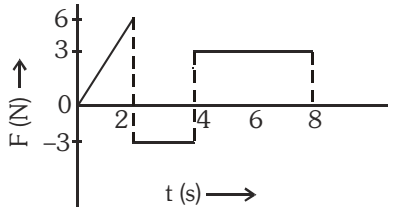


(1) $\frac{g(1-2\mu)}{9}$ (2) $\frac{2g\mu}{3}$

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

NL0130

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 :-



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

NL0131

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 an acceleration 'a' ? (Assume that it's volume does not change)

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

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

NL0132

AIPMT 2015

10. A block A of mass m_1 rests on 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 :-

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

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

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

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

NL0133

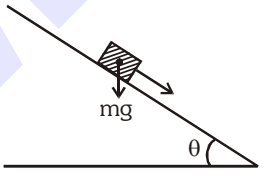
11. Three blocks A, B and C of masses 4 kg, 2 kg and 1 kg respectively, are in contact on a frictionless surface, as shown. If a force of 14 N is applied on the 4 kg block, then the contact force between A and B is :

(1) 6 N (2) 8 N
(3) 18 N (4) 2 N

NL0134

Re-AIPMT 2015

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 :

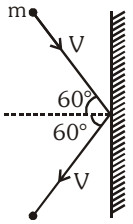


(1) 0.4 and 0.3 (2) 0.6 and 0.6
(3) 0.6 and 0.5 (4) 0.5 and 0.6

NL0135

NEET-II 2016

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 :-

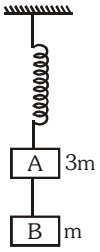


(1) $\frac{mV}{2}$ (2) $\frac{mV}{3}$
(3) mV (4) 2mV

NL0138

NEET(UG) 2017

14. Two blocks A and B of masses 3 m 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 :-



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

NL0143

NEET(UG) 2018

15. Which one of the following statements is ***incorrect*** ?

(1) Rolling friction is smaller than sliding friction

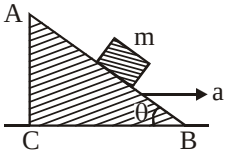
(2) Limiting value of static friction is directly proportional to normal reactions

(3) Frictional force opposes the relative motion

(4) Coefficient of sliding friction has dimensions of length

NL0148

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 :-



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

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

NL0149

NEET(UG) 2019 (Odisha)

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 :-

(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 $\tan^{-1}\left(\frac{g}{a}\right)$

NL0207

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 :

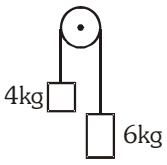
(1) $|\vec{F}| = mg + \mu mg$ (2) $|\vec{F}| = \mu mg$

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

NL0208

NEET(UG) 2020

19. 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 :



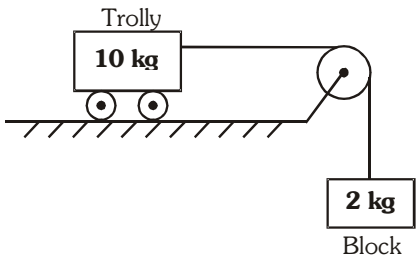
(1) g/10 (2) g

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

NL0209

NEET(UG) 2020 (COVID-19)

20. 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).



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

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

NL0210

NEET(UG) 2021

21. A ball of mass 0.15 kg is dropped from a height 10 m, strikes the ground and rebounds to the same height. The magnitude of impulse imparted to the ball is (g = 10 m/s^2) nearly :

(1) 0 kg m/s

(2) 4.2 kg m/s

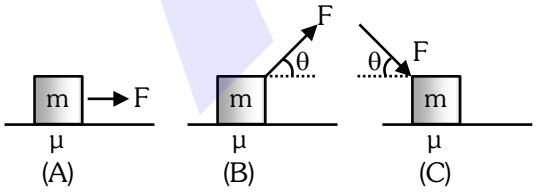
(3) 2.1 kg m/s

(4) 1.4 kg m/s

NL0211

NEET(UG) 2021 (Paper-2)

22. In the three cases, as shown in the figure, blocks are moving with constant velocity, the friction in (A), (B) and (C) is f_A, f_B and f_C. Then



(1) $f_A > f_B > f_C$

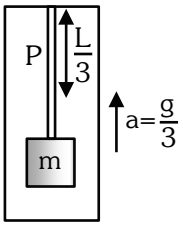
(2) $f_C > f_B > f_A$

(3) $f_C > f_A > f_B$

(4) $f_A = f_B = f_C$

NL0212

23. A block of mass m is attached to a uniform string of mass 3m and length L as shown in the figure. The lift is moving upward with acceleration a = g/3. the tension in the string at point P is



(1) 2 mg

(2) 4 mg

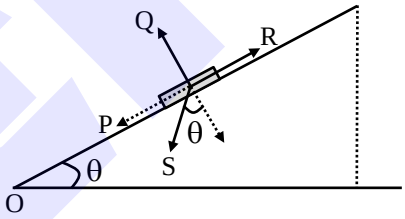
(3) 3 mg

(4) mg

NL0213

NEET(UG) 2022 (Overseas)

24.



When a body of mass 'm' just begins to slide as shown, match list-I with List-II:

List-I	List-II
(a) Normal reaction	(i) P
(b) Frictional force (f_s)	(ii) Q
(c) Weight (mg)	(iii) R
(d) mgsinθ	(iv) S

Choose the correct answer from the options given below:

(1) (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)

(2) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

(3) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

(4) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)

NL0214

25. Given below are two statements: One is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

Assertion (A): A standing bus suddenly accelerates. If there were no friction between the feet of a passenger and the floor of the bus, the passenger would move back.

Reason (R): In the absence of friction, the floor of the bus would slip forward under the feet of the passenger.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) **(A)** is false but **(R)** is true

(2) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**

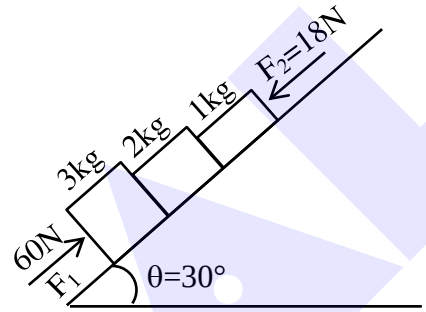
(3) Both **(A)** and **(R)** are true and **(R)** is not the correct explanation of **(A)**

(4) **(A)** is true but **(R)** is false

NL0215

Re-NEET(UG) 2022

26. In the diagram shown, the normal reaction force between 2 kg and 1 kg is (Consider the surface, to be smooth): Given g = 10 ms^{-2}

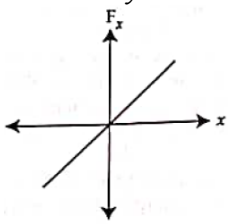


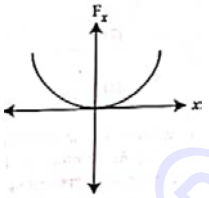
(1) 25 N (2) 39 N

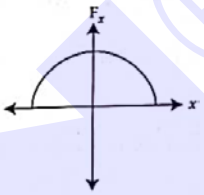
(3) 6 N (4) 10 N

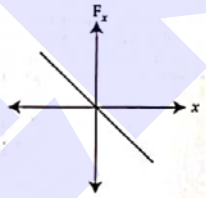
NL0216

27. The restoring force of a spring with a block attached to the free end of the spring is represented by :

(1) 

(2) 

(3) 

(4) 

NL0217

28. The distance covered by a body of mass 5 g having linear momentum 0.3 kg m/s in 5 s is:

(1) 300 m (2) 30 m

(3) 3 m (4) 0.3 m

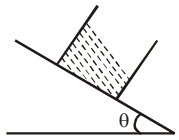
NL0218

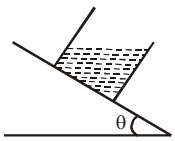
EXERCISE-II (Previous Year Questions) ANSWER KEY

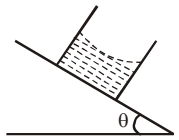
Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**2**	**1**	**4**	**3**	**3**	**2**	**3**	**3**	**1**	**2**	**1**	**3**	**3**	**1**	**4**
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28		
Ans.	**4**	**2**	**3**	**4**	**1**	**2**	**3**	**2**	**3**	**1**	**1**	**4**	**1**		

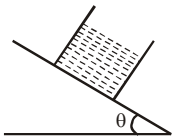
EXERCISE-III (Analytical Questions) Master Your Understanding

1. A beaker is half filled with water. It is allowed to slip down on smooth inclined plane with angle of inclination θ to the horizontal. The level of water in the beaker will be :-

(1) 

(2) 

(3) 

(4) 

NL0155

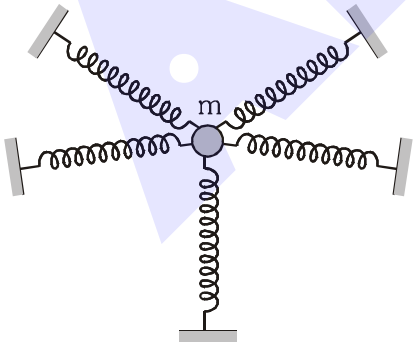
2. Three forces P, Q & R are acting at a point in a plane. The angle between P and Q, Q and R are 150° and 120° respectively. Then for equilibrium, forces P, Q & R are in the ratio :

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

(3) 3 : 2 : 1 (4) $3^{1/2}$: 2 : 1

NL0156

3. A sphere of mass m is kept in equilibrium with the help of several springs as shown in the figure. Measurements show that one of the springs applies a force $\vec{F}$ on the sphere. With what acceleration the sphere will move immediately after this particular spring is cut?



(1) zero

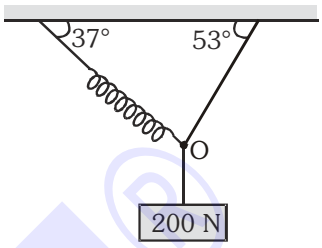
(2) $\vec{F}/m$

(3) $-\vec{F}/m$

(4) insufficient information

NL0157

4. In the set-up shown, a 200 N block is supported in equilibrium with the help of strings and a spring. all knotted at point O. Extension in the spring is 4 cm. Force constant of the spring is closest to [g = 10 m/s^2]

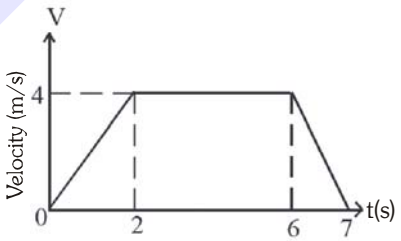


(1) 30 N/m (2) 2500 N/m

(3) 3000 N/m (4) 4000 N/m

NL0158

5. A lift of mass 100 kg starts moving from rests in the upward direction. Fig shows the variation of speed of the lift, T_1, T_2 and T_3 stand for tension in the rope form zero to two seconds, two to six seconds, six to seven seconds respectively then :-



(1) $T_1 : T_2 : T_3 :: 1 : 1 : 1$

(2) $T_1 : T_2 : T_3 :: 6 : 5 : 3$

(3) $T_1 : T_2 : T_3 :: 3 : 5 : 6$

(4) $T_1 : T_2 : T_3 :: 6 : 5 : 6$

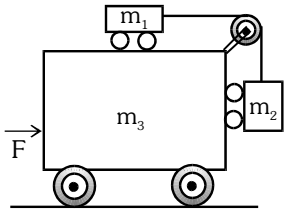
NL0159

6. A pulley is attached to the ceiling of a lift moving upwards. Two particles are attached to the two ends of a string passing over the pulley. The masses of the particles are in the ratio 2 : 1. If the acceleration of the particles relative to the lift is g/2, then the acceleration of the lift will be

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

NL0160

7. All surfaces are 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 :–

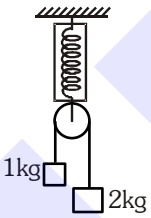


(1) $(m_1 + m_2 + m_3)\frac{m_2 g}{m_1}$ (2) $(m_1 + m_2)\frac{m_2 g}{m_1}$

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

NL0161

8. Two masses of 1 kg and 2 kg are attached to the ends of a massless string passing over a pulley of negligible weight. The pulley itself is attached to a light spring balance as shown in figure. The masses start moving; during this interval the reading of spring balance will be:-



(1) More than 3 kg.

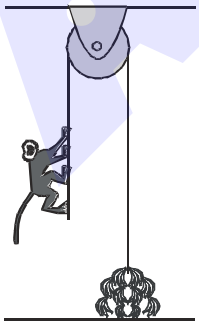
(2) Less than 3 kg.

(3) Equal to 3 kg.

(4) None of the above

NL0162

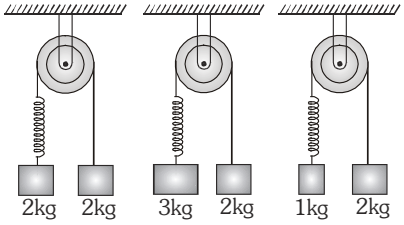
9. As shown in figure a monkey of 20 kg mass is holding a light rope that passes over a frictionless pulley. A bunch of bananas of the same mass 20 kg is tied to the other end of the rope. In order to get access to the bananas the monkey starts climbing the rope. The distance between the monkey and the bananas :-



(1) Decreases
(2) Increases
(3) remains unchanged
(4) Nothing can be stated

NL0163

10. Same spring is attached with 2 kg, 3 kg and 1 kg blocks in three different cases as shown in figure. If x_1, x_2 and x_3 be the respective extensions in the spring in these three cases, then :-

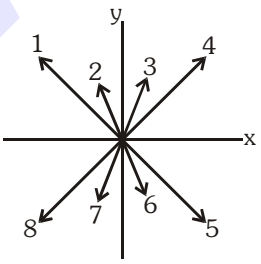


(1) $x_1 = 0, x_3 > x_2$ (2) $x_2 > x_1 > x_3$

(3) $x_3 > x_1 > x_2$ (4) $x_1 > x_2 > x_3$

NL0164

11. Two forces $\vec{F}_1 = (3N)\hat{i} - (4N)\hat{j}$ and $\vec{F}_2 = -(1N)\hat{i} - (2N)\hat{j}$ act on a point object. In the given figure which of the eight vectors represents $\vec{F}_1$ and $\vec{F}_2$? What is the magnitude of the net forces ?



(1) 4 and 8; $\sqrt{19}$ N

(2) 3 and 6;5 N

(3) 5 and 7 ; $\sqrt{40}$ N

(4) 2 and 6 ; 7 N

NL0165

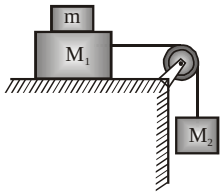
12. Two weights w_1 and w_2 are connected by a light thread which passes over a light smooth pulley. If the pulley is raised upwards with an acceleration equal to g, then the tension in the thread will be:-

(1) $\frac{2w_1w_2}{w_1 + w_2}$ (2) $\frac{w_1w_2}{w_1 + w_2}$

(3) $\frac{4w_1w_2}{w_1 + w_2}$ (4) $\frac{4w_1w_2}{w_1 - w_2}$

NL0166

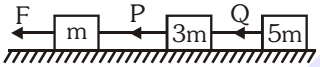
13. Two blocks of masses M_1 = 4 kg and M_2 = 6 kg are connected by a string of negligible mass passing over a frictionless pulley as shown in the figure below. The coefficient of friction between the block M_1 and the horizontal surface is 0.4. When the system is released, the masses M_1 and M_2 start accelerating. What additional mass m should be placed over M_1 so that the masses (M_1 + m) slide with a uniform speed ?



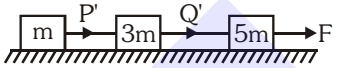
(1) 12 kg (2) 11 kg (3) 10 kg (4) 9 kg

NL0167

14. Three blocks of masses 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 values of P' and Q' shall be :-

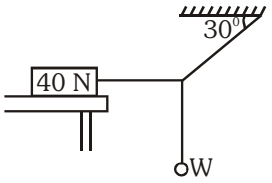


(1) 16N, 10N (2) 10N, 16N

(3) 8 N, 2N (4) None of these

NL0168

15. In the figure given, the system is in equilibrium. What is the maximum value W can have if the friction force on the 40 N block cannot exceed 12.0 N ?

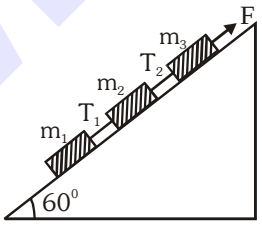


(1) 3.45 N (2) 6.92 N

(3) 10.35 N (4) 12.32 N

NL0169

16. Three blocks, of masses m_1 = 2.0, m_2 = 4.0 and m_3 = 6.0 kg are connected by strings on a frictionless inclined plane of 60^0, as shown in the figure. A force F = 120 N is applied upwards along the incline to the uppermost block, causing an upward movement of the blocks. The connecting cords are light. The values of tensions T_1 and T_2 in the cords are



(1) T_1 = 20 N, T_2 = 60 N

(2) T_1 = 60 N, T_2 = 60 N

(3) T_1 = 30 N, T_2 = 50 N

(4) T_1 = 20 N, T_2 = 1 00 N

NL0170

EXERCISE-III (Analytical Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**4**	**4**	**3**	**3**	**2**	**2**	**1**	**2**	**3**	**2**	**3**	**3**	**2**	**4**	**2**
Que.	16														
Ans.	**1**														