EXERCISE-I

First law of motion

1. Newton's first law of motion describes the following

(A) Energy (B) Work

(C) Inertia (D) Moment of inertia

2. A person sitting in an open car moving at constant velocity throws a ball vertically up into air. The ball falls

(A) Outside the car

(B) In the car ahead of the person

(C) In the car to the side of the person

(D) Exactly in the hand which threw it up

3. A bird weighs 2 *kg* and is inside a closed cage of 1 *kg*. If it starts flying, then what is the weight of the bird and cage assembly

(A) 1.5 *kg* (B) 2.5 *kg*

(C) 3 *kg* (D) 4 *kg*

4. A particle is moving with a constant speed along a straight line path. A force is not required to

(A) Increase its speed

(B) Decrease the momentum

(C) Change the direction

(D) Keep it moving with uniform velocity

5. When a bus suddenly takes a turn, the passengers are thrown outwards because of

(A) Inertia of motion

(B) Acceleration of motion

(C) Speed of motion

(D) Both (B) and (C)

Second Law of Motion

6. In the above question, the acceleration of the car will be

(A) $0.25\,m/sec^2$ (B) $2.5\,m/sec^2$

(C) $5.0\,m/sec^2$ (D) $0.025\,m/sec^2$

7. A person is standing in an elevator. In which situation he finds his weight less than actual when

(A) The elevator moves upward with constant acceleration

(B) The elevator moves downward with constant acceleration.

(C) The elevator moves upward with uniform velocity

(D) The elevator moves downward with uniform velocity

8. A particle of mass 0.3 *kg* is subjected to a force $F = -kx$ with $k = 15\,N/m$. What will be its initial acceleration if it is released from a point 20 *cm* away from the origin

(A) 5 m/s^2 (B) 10 m/s^2

(C) 3 m/s^2 (D) 15 m/s^2

9. 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/sec* and at a speed of 5 *m/sec*. The initial acceleration of the block will be

(A) $2.5\,m/sec^2$ (B) $5.0\,m/sec^2$

(C) $10\,m/sec^2$ (D) None of the above

10. Gravels are dropped on a conveyor belt at the rate of 0.5 *kg/sec*. The extra force required in *newtons* to keep the belt moving at 2 *m/sec* is

(A) 1 (B) 2

(C) 4 (D) 0.5

11. A parachutist of weight '*w*' strikes the ground with his legs fixed and comes to rest with an upward acceleration of magnitude 3 *g*. Force exerted on him by ground during landing is

(A) *w* (B) 2*w*

(C) 3*w* (D) 4*w*

12. At a place where the acceleration due to gravity is $10\,m\,sec^{-2}$ a force of 5 *kg-wt* acts on a body of mass 10 *kg* initially at rest. The velocity of the body after 4 *second* is

(A) $5\,m\,sec^{-1}$ (B) $10\,m\,sec^{-1}$

(C) $20\,m\,sec^{-1}$ (D) $50\,m\,sec^{-1}$

13. In a rocket of mass 1000 *kg* fuel is consumed at a rate of 40 *kg/s*. The velocity of the gases ejected from the rocket is $5\times10^4\,m/s$. The thrust on the rocket is

(A) $2\times10^3\,N$ (B) $5\times10^4\,N$

(C) $2\times10^6\,N$ (D) $2\times10^9\,N$

14. A man is standing on a weighing machine placed in a lift. When stationary his weight is recorded as 40 *kg*. If the lift is accelerated upwards with an acceleration of $2\,m/s^2$, then the weight recorded in the machine will be $(g=10\,m/s^2)$

(A) 32 *kg* (B) 40 *kg*

(C) 42 *kg* (D) 48 *kg*

15. A body of mass 4 *kg* weighs 4.8 *kg* when suspended in a moving lift. The acceleration of the lift is

(A) $9.80\,ms^{-2}$ downwards (B) $9.80\,ms^{-2}$ upwards

(C) $1.96\,ms^{-2}$ downwards (D) $1.96\,ms^{-2}$ upwards

16. An elevator weighing 6000 *kg* is pulled upward by a cable with an acceleration of $5\,ms^{-2}$. Taking *g* to be $10\,ms^{-2}$, then the tension in the cable is

(A) 6000 *N* (B) 9000 *N*

(C) 60000 *N* (D) 90000 *N*

17. A ball of mass 0.2 *kg* moves with a velocity of 20 *m/sec* and it stops in 0.1 *sec*; then the force on the ball is

(A) 40 *N* (B) 20 *N*

(C) 4 *N* (D) 2 *N*

18. A vehicle of 100 *kg* is moving with a velocity of 5 *m/sec*. To stop it in $\frac{1}{10}\sec$, the required force in opposite direction is

(A) 5000 *N* (B) 500 *N*

(C) 50 *N* (D) 1000 *N*

19. A boy having a mass equal to 40 *kilograms* is standing in an elevator. The force felt by the feet of the boy will be greatest when the elevator $(g=9.8\,\text{metres}/\sec^2)$

(A) Stands still

(B) Moves downward at a constant velocity of 4 *metres/sec*

(C) Accelerates downward with an acceleration equal to $4\,\text{metres}/\sec^2$

(D) Accelerates upward with an acceleration equal to $4\,\text{metres}/\sec^2$

20. A rocket has an initial mass of $20\times10^3\,kg$. If it is to blast off with an initial acceleration of $4\,ms^{-2}$, the initial thrust needed is $(g\cong10\,ms^{-2})$

(A) $6\times10^4\,N$ (B) $28\times10^4\,N$

(C) $20\times10^4\,N$ (D) $12\times10^4\,N$

21. The ratio of the weight of a man in a stationary lift and when it is moving downward with uniform acceleration '*a*' is 3 : 2. The value of '*a*' is (*g*-Acceleration due to gravity of the earth)

(A) $\frac{3}{2}g$ (B) $\frac{g}{3}$

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

22. The mass of a lift is 500 *kg*. When it ascends with an acceleration of $2\,m/s^2$, the tension in the cable will be $[g=10\,m/s^2]$

(A) 6000 *N* (B) 5000 *N*

(C) 4000 *N* (D) 50 *N*

23. If force on a rocket having exhaust velocity of 300 *m/sec* is 210 *N*, then rate of combustion of the fuel is

(A) 0.7 *kg/s* (B) 1.4 *kg/s*

(C) 0.07 *kg/s* (D) 10.7 *kg/s*

24. In an elevator moving vertically up with an acceleration *g*, the force exerted on the floor by a passenger of mass *M* is

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

(C) Zero (D) 2 *Mg*

25. A mass 1 *kg* is suspended by a thread. It is

(i) lifted up with an acceleration $4.9\,m/s^2$

(ii) lowered with an acceleration $4.9\,m/s^2$.

The ratio of the tensions is

(A) 3 : 1 (B) 1 : 3

(C) 1 : 2 (D) 2 : 1

26. A force vector applied on a mass is represented as $\vec{F} = 6\hat{i} - 8\hat{j} + 10\hat{k}$ and accelerates with $1\,m/s^2$. What will be the mass of the body

(A) $10\sqrt{2}$ kg (B) $2\sqrt{10}$ kg

(C) 10 *kg* (D) 20 *kg*

27. A cart of mass *M* is tied by one end of a massless rope of length 10 *m*. The other end of the rope is in the hands of a man of mass *M*. The entire system is on a smooth horizontal surface. The man is at $x = 0$ and the cart at $x = 10$ *m*. If the man pulls the cart by the rope, the man and the cart will meet at the point

(A) $x = 0$ (B) $x = 5\,m$

(C) $x = 10\,m$ (D) They will never meet

28. A cricket ball of mass 250 *g* collides with a bat with velocity 10 *m/s* and returns with the same velocity within 0.01 second. The force acted on bat is

(A) 25 *N* (B) 50 *N*

(C) 250 *N* (D) 500 *N*

29. A pendulum bob of mass 50 *gm* is suspended from the ceiling of an elevator. The tension in the string if the elevator goes up with uniform velocity is approximately

(A) 0.30 *N* (B) 0.40 *N*

(C) 0.42 *N* (D) 0.50 *N*

30. A train is moving with velocity 20 *m/sec*. on this dust is falling at the rate of 50 *kg/minute*. The extra force required to move this train with constant velocity will be

(A) 16.66 *N* (B) 1000 *N*

(C) 166.6 *N* (D) 1200 *N*

31. The average force necessary to stop a bullet of mass 20 *g* moving with a speed of 250 *m/s*, as it penetrates into the wood for a distance of 12 *cm* is

(A) 2.2×10^3 N (B) 3.2×10^3 N

(C) 4.2×10^3 N (D) 5.2×10^3 N

32. The average resisting force that must act on a 5 *kg* mass to reduce its speed from 65 *cm/s* to 15 *cm/s* in 0.2*s* is

(A) 12.5 *N* (B) 25 *N*

(C) 50 *N* (D) 100 *N*

33. A mass is hanging on a spring balance which is kept in a lift. The lift ascends. The spring balance will show in its reading

(A) Increase

(B) Decrease

(C) No change

(D) Change depending upon velocity

34. An army vehicle of mass 1000 *kg* is moving with a velocity of 10 *m/s* and is acted upon by a forward force of 1000 *N* due to the engine and a retarding force of 500 *N* due to friction. What will be its velocity after 10 *s*

(A) 5 *m/s* (B) 10 *m/s*

(C) 15 *m/s* (D) 20 *m/s*

35. A body of mass 2 *kg* is moving with a velocity 8 *m/s* on a smooth surface. If it is to be brought to rest in 4 seconds, then the force to be applied is

(A) 8 *N* (B) 4 *N*

(C) 2 *N* (D) 1 *N*

36. The apparent weight of the body, when it is travelling upwards with an acceleration of $2m/s^2$ and mass is 10 *kg*, will be

(A) 198 *N* (B) 164 *N*

(C) 140 *N* (D) 118 *N*

37. A man measures time period of a pendulum (T) in stationary lift. If the lift moves upward with acceleration $\frac{g}{4}$, then new time period will be

(A) $\frac{2T}{\sqrt{5}}$ (B) $\frac{\sqrt{5}T}{2}$

(C) $\frac{\sqrt{5}}{2T}$ (D) $\frac{2}{\sqrt{5}T}$

38. A 30 *gm* bullet initially travelling at 120 *m/s* penetrates 12 *cm* into a wooden block. The average resistance exerted by the wooden block is

(A) 2850*N* (B) 2200 *N*

(C) 2000*N* (D) 1800 *N*

39. A force of 10 Newton acts on a body of mass 20*kg* for 10 seconds. Change in its momentum is

(A) 5 $kg\,m/s$ (B) $100\,kg\,m/s$

(C) $200\ kg\,m/s$ (D) 1000 $kg\,m/s$

40. A body of mass 1.0*kg* is falling with an acceleration of $10\,m/sec^2$. Its apparent weight will be $(g = 10\,m/\sec^2)$

(A) $1.0\,kg\,wt$ (B) $2.0\,kg\,wt$

(C) $0.5\,kg\,wt$ (D) Zero

41. A player caught a cricket ball of mass 150 *gm* moving at the rate of 20 *m/sec*. if the catching process be completed in 0.1 *sec* the force of the blow exerted by the ball on the hands of player is

(A) 0.3 *N* (B) 30 *N*

(C) 300 *N* (D) 3000 *N*

42. If rope of lift breaks suddenly, the tension exerted by the surface of lift

(*a* = acceleration of lift)

(A) *mg* (B) $m(g+a)$

(C) $m(g-a)$ (D) 0

43. A boy whose mass is 50*kg* stands on a spring balance inside a lift. The lift starts to ascent with an acceleration of $2ms^{-2}$. The reading of the machine or balance $(g = 10\,ms^{-2})$ is

(A) $50\,kg$ (B) Zero

(C) $49\,kg$ (D) $60\,kg$

44. A rocket is ejecting $50\,g$ of gases per sec at a speed of $500\,m/s$. The accelerating force on the rocket will be

(A) $125\ N$ (B) $25\ N$

(C) $5\ N$ (D) Zero

45. A block of mass $5\,kg$ is moving horizontally at a speed of 1.5 *m/s*. A perpendicular force of 5*N* acts on it for 4 sec. What will be the distance of the block from the point where the force started acting

(A) 10 *m* (B) 8 *m*

(C) 6 *m* (D) 2 *m*

46. A body of mass 2 *kg* has an initial velocity of 3 *meters* per second along *OE* and it is subjected to a force of 4 *N* in a direction perpendicular to *OE*. The distance of the body from *O* after 4 seconds will be

(A) 12 *m* (B) 20 *m*

(C) 8 *m* (D) 48 *m*

47. 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

(A) $mg\cos\theta$ (B) $mg\sin\theta$

(C) mg (D) $mg/\cos\theta$

48. A machine gun fires a bullet of mass 40 *g* with a velocity $1200\ ms^{-1}$. The man holding it can exert a maximum force of 144 *N* on the gun. How many bullets can he fire per second at the most

(A) One (B) Four

(C) Two (D) Three

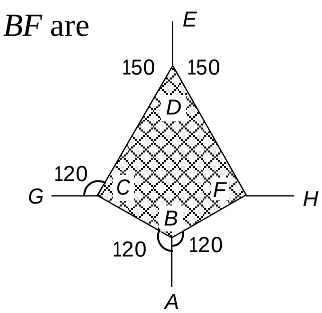
49. An automobile travelling with a speed of $60\ km/h$, can brake to stop within a distance of 20 *m*. If the car is going twice as fast, *i.e.* 120 *km/h*, the stopping distance will be

(A) 20 *m* (B) 40 *m*
(C) 60 *m* (D) 80 *m*

50. A man of weight 75 *kg* is standing in an elevator which is moving with an acceleration of $5\,m/s^2$ in upward direction the apparent weight of the man will be $(g = 10\ m/s^2)$

(A) 1425 *N* (B) 1375 *N*
(C) 1250 *N* (D) 1125 *N*

51. The adjacent figure is the part of a horizontally stretched net. section *AB* is stretched with a force of 10 *N*. The tensions in the sections *BC* and *BF* are



(A) 10 *N*, 11 *N*
(B) 10 *N*, 6 *N*
(C) 10 *N*, 10 *N*
(D) Can't calculate due to insufficient data

52. The linear momentum *p* of a body moving in one dimension varies with time according to the equation $p = a + bt^2$ where *a* and *b* are positive constants. The net force acting on the body is

(A) A constant
(B) Proportional to t^2
(C) Inversely proportional to *t*
(D) Proportional to *t*

53. The spring balance inside a lift suspends an object. As the lift begins to ascent, the reading indicated by the spring balance will

(A) Increase
(B) Decrease
(C) Remain unchanged
(D) Depend on the speed of ascend

54. There is a simple pendulum hanging from the ceiling of a lift. When the lift is stand still, the time period of the pendulum is *T*. If the resultant acceleration becomes $g/4$, then the new time period of the pendulum is

(A) 0.8 *T* (B) 0.25 *T*
(C) 2 *T* (D) 4 *T*

55. A man of weight 80 *kg* is standing in an elevator which is moving with an acceleration of $6\ m/s^2$ in upward direction. The apparent weight of the man will be $(g = 10\,m/s^2)$

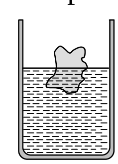
(A) 1480 *N* (B) 1280 *N*
(C) 1380 *N* (D) None of these

Third Law of Motion

56. A cannon after firing recoils due to

(A) Conservation of energy
(B) Backward thrust of gases produced
(C) Newton's third law of motion
(D) Newton's first law of motion

57. A body floats in a liquid contained in a beaker. If the whole system as shown in figure falls freely under gravity, then the upthrust on the body due to liquid is



(A) Zero
(B) Equal to the weight of liquid displaced
(C) Equal to the weight of the body in air
(D) None of these

58. Newton's third law of motion leads to the law of conservation of

(A) Angular momentum (B) Energy
(C) Mass (D) Momentum

59. A man is carrying a block of a certain substance (of density 1000 kgm^{-3}) weighing 1 *kg* in his left hand and a bucket filled with water and weighing 10 *kg* in his right hand. He drops the block into the bucket. How much load does he carry in his right hand now

(A) 9 *kg* (B) 10 *kg*
(C) 11 *kg* (D) 12 *kg*

60. A man is standing on a balance and his weight is measured. If he takes a step in the left side, then weight
(A) Will decrease
(B) Will increase
(C) Remains same
(D) First decreases then increases

61. A man is standing at a spring platform. Reading of spring balance is 60 *kg wt*. If man jumps outside platform, then reading of spring balance
(A) First increases then decreases to zero
(B) Decreases
(C) Increases
(D) Remains same

62. A cold soft drink is kept on the balance. When the cap is open, then the weight
(A) Increases
(B) Decreases
(C) First increases then decreases
(D) Remains same

63. Action and reaction forces act on
(A) The same body
(B) The different bodies
(C) The horizontal surface
(D) Nothing can be said

64. A bird is sitting in a large closed cage which is placed on a spring balance. It records a weight of 25 *N*. The bird (mass m = 0.5 *kg*) flies upward in the cage with an acceleration of $2\,m/s^2$. The spring balance will now record a weight of
(A) 24 *N* (B) 25 *N*
(C) 26 *N* (D) 27 *N*

65. A light spring balance hangs from the hook of the other light spring balance and a block of mass *M kg* hangs from the former one. Then the true statement about the scale reading is
(A) Both the scales read *M*/2 *kg* each
(B) Both the scales read *M kg* each
(C) The scale of the lower one reads *M kg* and of the upper one zero
(D) The reading of the two scales can be anything but the sum of the reading will be *M kg*

Conservation of Linear Momentum and Impulse

66. A rope of length 5*m* is kept on frictionless surface and a force of 5*N* is applied to one of its end. Find tension in the rope at 1*m* from this end
(A) 1 *N* (B) 3 *N*
(C) 4 *N* (D) 5 *N*

67. An aircraft is moving with a velocity of $300\,ms^{-1}$. If all the forces acting on it are balanced, then
(A) It still moves with the same velocity
(B) It will be just floating at the same point in space
(C) It will fall down instantaneously
(D) It will lose its velocity gradually

68. A rocket of mass 1000 *kg* exhausts gases at a rate of 4 *kg*/*sec* with a velocity 3000 *m*/*s*. The thrust developed on the rocket is
(A) 12000 *N* (B) 120 *N*
(C) 800 *N* (D) 200 *N*

69. The momentum is most closely related to
(A) Force (B) Impulse
(C) Power (D) K.E.

70. Rocket engines lift a rocket from the earth surface because hot gas with high velocity
(A) Push against the earth
(B) Push against the air
(C) React against the rocket and push it up
(D) Heat up the air which lifts the rocket

71. A man fires a bullet of mass 200 *g* at a speed of 5 *m*/*s*. The gun is of one *kg* mass. by what velocity the gun rebounds backwards
(A) 0.1 *m*/*s* (B) 10 *m*/*s*
(C) 1 *m*/*s* (D) 0.01 *m*/*s*

72. A bullet of mass 5 *g* is shot from a gun of mass 5 *kg*. The muzzle velocity of the bullet is 500 *m*/*s*. The recoil velocity of the gun is
(A) 0.5 *m*/*s* (B) 0.25 *m*/*s*
(C) 1 *m*/*s* (D) Data is insufficient

73. A force of 50 *dynes* is acted on a body of mass 5 *g* which is at rest for an interval of 3 seconds, then impulse is

(A) $0.15\times10^{-3}\ Ns$ (B) $0.98\times10^{-3}\ Ns$

(C) $1.5\times10^{-3}\ Ns$ (D) $2.5\times10^{-3}\ Ns$

74. A body of mass *M* at rest explodes into three pieces, two of which of mass *M*/4 each are thrown off in perpendicular directions with velocities of 3 *m*/*s* and 4 *m*/*s* respectively. The third piece will be thrown off with a velocity of

(A) 1.5 *m*/*s* (B) 2.0 *m*/*s*

(C) 2.5 *m*/*s* (D) 3.0 *m*/*s*

75. The momentum of a system is conserved

(A) Always

(B) Never

(C) In the absence of an external force on the system

(D) None of the above

Equilibrium of Forces

76. The resultant force of 5 *N* and 10 *N* can not be

(A) 12 *N* (B) 8 *N*

(C) 4 *N* (D) 5 *N*

77. The resultant of two forces $3P$ and $2P$ is *R*. If the first force is doubled then the resultant is also doubled. The angle between the two forces is

(A) 60^o (B) 120^o

(C) 70^o (D) 180^o

78. The resultant of two forces, one double the other in magnitude, is perpendicular to the smaller of the two forces. The angle between the two forces is

(A) 60^0 (B) 120^0

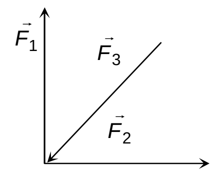
(C) 150^0 (D) 90^0

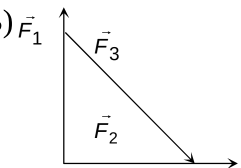
79. Two forces are such that the sum of their magnitudes is 18 *N* and their resultant is perpendicular to the smaller force and magnitude of resultant is 12 N. Then the magnitudes of the forces are

(A) 12 *N*, 6 *N* (B) 13 *N*, 5*N*

(C) 10 *N*, 8 *N* (D) 16 *N*, 2 *N*

80. Which of the four arrangements in the figure correctly shows the vector addition of two forces $\vec{F_1}$ and $\vec{F_2}$ to yield the third force $\vec{F_3}$

(A)


(B)


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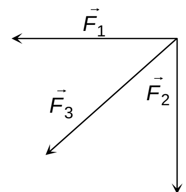

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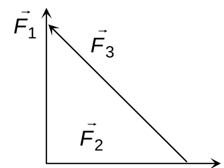


81. Which of the following sets of concurrent forces may be in equilibrium

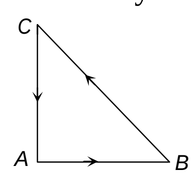
(A) $F_1 = 3N,\ F_2 = 5N,\ F_3 = 9N$

(B) $F_1 = 3N,\ F_2 = 5N,\ F_3 = 1N$

(C) $F_1 = 3N, F_2 = 5N, F_3 = 15N$

(D) $F_1 = 3N,\ F_2 = 5N,\ F_3 = 6N$

82. Three forces starts acting simultaneously on a particle moving with velocity $\vec{v}$. These forces are represented in magnitude and direction by the three sides of a triangle *ABC* (as shown). The particle will now move with velocity



(A) $\vec{v}$ remaining unchanged

(B) Less than $\vec{v}$

(C) Greater than $\vec{v}$

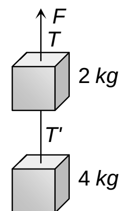
(D) $\vec{v}$ in the direction of the largest force *BC*

83. Which of the following groups of forces could be in equibrium

(A) 3 *N*, 4 *N*, 5 *N* (B) 4*N*, 5 *N*, 10 *N*

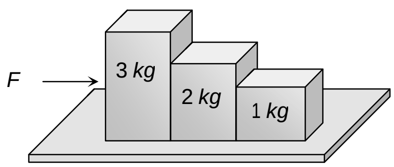
(C) 30*N*, 40 *N*, 80 *N* (D) 1*N*, 3 *N*, 5 *N*

84. Two blocks are connected by a string as shown in the diagram. The upper block is hung by another string. A force F applied on the upper string produces an acceleration of $2 m/s^2$ in the upward direction in both the blocks. If T and T' be the tensions in the two parts of the string, then



(A) $T = 70.8 N$ and $T' = 47.2 N$
(B) $T = 58.8 N$ and $T' = 47.2 N$
(C) $T = 70.8 N$ and $T' = 58.8 N$
(D) $T = 70.8 N$ and $T' = 0$

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

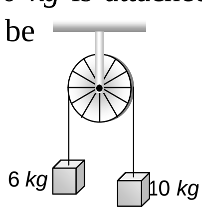


A. All blocks move with the same acceleration
B. The net force on each block is the same
Which of these statements are/is correct
(A) A only (B) B only
(C) Both A and B (D) Neither A nor B

Motion of Connected Bodies

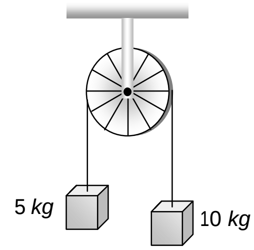
86. A 2 kg block is lying on a smooth table which is connected by a body of mass 1 kg by a string which passes through a pulley. The 1 kg mass is hanging vertically. The acceleration of block and tension in the string will be
(A) $3.27\, m/s^2, 6.54\, N$ (B) $4.38\, m/s^2, 6.54\, N$
(C) $3.27\, m/s^2, 9.86\, N$ (D) $4.38\, m/s^2, 9.86\, N$

87. A light string passes over a frictionless pulley. To one of its ends a mass of 6 kg is attached. To its other end a mass of 10 kg is attached. The tension in the thread will be



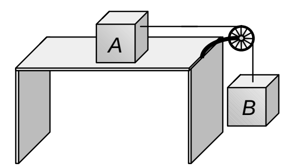
(A) 24.5 N
(B) 2.45 N
(C) 79 N
(D) 73.5 N

88. USS 150) Two masses of 5kg and 10kg are connected to a pulley as shown. What will be the acceleration of the system (g = acceleration due to gravity)



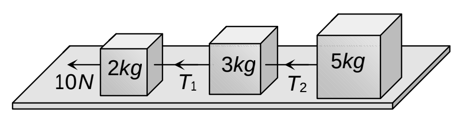
(A) g
(B) $\frac{g}{2}$
(C) $\frac{g}{3}$
(D) $\frac{g}{4}$

89. A block A of mass 7 kg is placed on a frictionless table. A thread tied to it passes over a frictionless pulley and carries a body B of mass 3 kg at the other end. The acceleration of the system is (given g = 10 ms^{-2})



(A) 100 ms^{-2}
(B) $3 ms^{-2}$
(C) $10 ms^{-2}$
(D) $30 ms^{-2}$

90. Three blocks of masses 2 kg, 3 kg and 5 kg are connected to each other with light string and are then placed on a frictionless surface as shown in the figure. The system is pulled by a force $F = 10 N$, then tension T_1 =



(A) 1N
(B) 5 N
(C) 8 N
(D) 10 N

Static and Limiting Friction

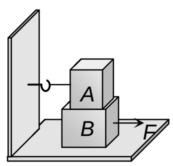
91. Work done by a frictional force is
(A) Negative (B) Positive
(C) Zero (D) All of the above

92. A uniform chain of length L changes partly from a table which is kept in equilibrium by friction. The maximum length that can withstand without slipping is l, then coefficient of friction between the table and the chain is
(A) $\frac{l}{L}$ (B) $\frac{l}{L+l}$
(C) $\frac{l}{L-l}$ (D) $\frac{L}{L+l}$

93. When two surfaces are coated with a lubricant, then they
(A) Stick to each other
(B) Slide upon each other
(C) Roll upon each other
(D) None of these

94. A 20 *kg* block is initially at rest on a rough horizontal surface. A horizontal force of 75 *N* is required to set the block in motion. After it is in motion, a horizontal force of 60 *N* is required to keep the block moving with constant speed. The coefficient of static friction is
(A) 0.38 (B) 0.44
(C) 0.52 (D) 0.60

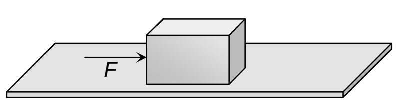
95. A block *A* with mass 100 *kg* is resting on another block *B* of mass 200 *kg*. As shown in figure a horizontal rope tied to a wall holds it. The coefficient of friction between *A* and *B* is 0.2 while coefficient of friction between *B* and the ground is 0.3. The minimum required force *F* to start moving *B* will be
(A) 900 *N*
(B) 100 *N*
(C) 1100 *N*
(D) 1200 *N*



96. To avoid slipping while walking on ice, one should take smaller steps because of the
(A) Friction of ice is large
(B) Larger normal reaction
(C) Friction of ice is small
(D) Smaller normal reaction

97. A box is lying on an inclined plane what is the coefficient of static friction if the box starts sliding when an angle of inclination is 60^o
(A) 1.173 (B) 1.732
(C) 2.732 (D) 1.677

98. A block of mass 2 *kg* is kept on the floor. The coefficient of static friction is 0.4. If a force *F* of 2.5 *Newtons* is applied on the block as shown in the figure, the frictional force between the block and the floor will be
(A) 2.5 *N*
(B) 5 *N*
(C) 7.84 *N*
(D) 10 *N*

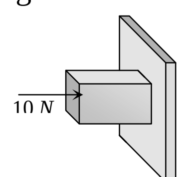


99. Which one of the following is not used to reduce friction
(A) Oil (B) Ball bearings
(C) Sand (D) Graphite

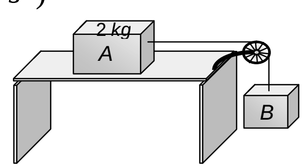
100. If a ladder weighing 250*N* is placed against a smooth vertical wall having coefficient of friction between it and floor is 0.3, then what is the maximum force of friction available at the point of contact between the ladder and the floor
(A) 75 *N* (B) 50 *N*
(C) 35 *N* (D) 25 *N*

101. A body of mass 2 *kg* is kept by pressing to a vertical wall by a force of 100 *N*. The coefficient of friction between wall and body is 0.3. Then the frictional force is equal to
(A) 6 *N* (B) 20 *N*
(C) 600 *N* (D) 700 *N*

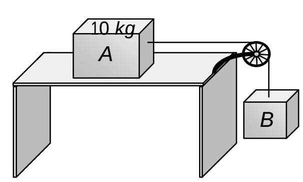
102. A horizontal force of 10 *N* is necessary to just hold a block stationary against a wall. The coefficient of friction between the block and the wall is 0.2. the weight of the block is
(A) 2 *N*
(B) 20 *N*
(C) 50 *N*
(D) 100 *N*



103. 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. $(g = 10\, m/s^2)$
(A) 2.0 *kg*
(B) 4.0 *kg*
(C) 0.2 *kg*
(D) 0.4 *kg*



104. If mass of $A = 10\ kg$, coefficient of static friction = 0.2, coefficient of kinetic friction = 0.2. Then mass of *B* to start motion is
(A) 2 *kg*
(B) 2.2 *kg*
(C) 4.8 *kg*
(D) 200 *gm*



105. A uniform metal chain is placed on a rough table such that one end of chain hangs down over the edge of the table. When one-third of its length hangs over the edge, the chain starts sliding. Then, the coefficient of static friction is

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

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

Kinetic Friction

106. On a rough horizontal surface, a body of mass 2 *kg* is given a velocity of 10 *m*/*s*. If the coefficient of friction is 0.2 and $g = 10\, m/s^2$, the body will stop after covering a distance of

(A) 10 *m* (B) 25 *m*

(C) 50 *m* (D) 250 *m*

107. A block of mass 50 *kg* can slide on a rough horizontal surface. The coefficient of friction between the block and the surface is 0.6. The least force of pull acting at an angle of 30° to the upward drawn vertical which causes the block to just slide is

(A) 29.43 *N* (B) 219.6 *N*

(C) 21.96 *N* (D) 294.3 *N*

108. A body of 10 *kg* is acted by a force of 129.4 *N* if $g = 9.8\, m/\sec^2$. The acceleration of the block is $10\, m/s^2$. What is the coefficient of kinetic friction

(A) 0.03 (B) 0.01

(C) 0.30 (D) 0.25

109. Assuming the coefficient of friction between the road and tyres of a car to be 0.5, the maximum speed with which the car can move round a curve of 40.0 *m* radius without slipping, if the road is unbanked, should be

(A) 25 *m*/*s* (B) 19 *m*/*s*

(C) 14 *m*/*s* (D) 11 *m*/*s*

110. Consider a car moving along a straight horizontal road with a speed of 72 *km*/*h*. If the coefficient of kinetic friction between the tyres and the road is 0.5, the shortest distance in which the car can be stopped is $[g = 10\, ms^{-2}]$

(A) 30 *m* (B) 40 *m*

(C) 72 *m* (D) 20 *m*

111. A 500 *kg* horse pulls a cart of mass 1500 *kg* along a level road with an acceleration of $1 ms^{-2}$. If the coefficient of sliding friction is 0.2, then the force exerted by the horse in forward direction is

(A) 3000 *N* (B) 4000 *N*

(C) 5000 *N* (D) 6000 *N*

112. The maximum speed of a car on a road turn of radius 30*m*; if the coefficient of friction between the tyres and the road is 0.4; will be

(A) 9.84 *m/s* (B) 10.84 *m/s*

(C) 7.84 *m/s* (D) 5.84 *m/s*

113. A block of mass 50 *kg* slides over a horizontal distance of 1 *m*. If the coefficient of friction between their surfaces is 0.2, then work done against friction is

(A) 98 *J* (B) 72*J*

(C) 56 *J* (D) 34 *J*

114. On the horizontal surface of a truck (μ = 0.6), a block of mass 1 *kg* is placed. If the truck is accelerating at the rate of 5m/sec^2 then frictional force on the block will be

(A) 5 *N* (B) 6 *N*

(C) 5.88 *N* (D) 8 *N*

115. A vehicle of mass *m* is moving on a rough horizontal road with momentum *P*. If the coefficient of friction between the tyres and the road be μ, then the stopping distance is

(A) $\frac{P}{2\mu m g}$ (B) $\frac{P^2}{2\mu m g}$

(C) $\frac{P}{2\mu m^2 g}$ (D) $\frac{P^2}{2\mu m^2 g}$

116. A body of weight 64 N is pushed with just enough force to start it moving across a horizontal floor and the same force continues to act afterwards. If the coefficients of static and dynamic friction are 0.6 and 0.4 respectively, the acceleration of the body will be (Acceleration due to gravity = g)

(A) $\frac{g}{6.4}$ (B) 0.64 g

(C) $\frac{g}{32}$ (D) 0.2 g

117. When a body is moving on a surface, the force of friction is called

(A) Static friction (B) Dynamic friction

(C) Limiting friction (D) Rolling friction

118. A block of mass 10 kg is placed on a rough horizontal surface having coefficient of friction $\mu = 0.5$. If a horizontal force of 100 N is acting on it, then acceleration of the block will be

(A) 0.5 m/s^2 (B) 5 m/s^2

(C) 10 m/s^2 (D) 15 m/s^2

119. It is easier to roll a barrel than pull it along the road. This statement is

(A) False (B) True

(C) Uncertain (D) Not possible

120. A marble block of mass 2 kg lying on ice when given a velocity of 6 m/s is stopped by friction in 10s. Then the coefficient of friction is

(A) 0.01 (B) 0.02

(C) 0.03 (D) 0.06

Motion on Inclined Surface

121. A body of mass 100 g is sliding from an inclined plane of inclination 30°. What is the frictional force experienced if $\mu = 1.7$

(A) $1.7\times\sqrt{2}\times\frac{1}{\sqrt{3}}N$ (B) $1.7\times\sqrt{3}\times\frac{1}{2}N$

(C) $1.7\times\sqrt{3}\,N$ (D) $1.7\times\sqrt{2}\times\frac{1}{3}N$

122. A body takes just twice the time as long to slide down a plane inclined at 30^o to the horizontal as if the plane were frictionless. The coefficient of friction between the body and the plane is

(A) $\frac{\sqrt{3}}{4}$ (B) $\sqrt{3}$

(C) $\frac{4}{3}$ (D) $\frac{3}{4}$

123. A brick of mass 2 kg begins to slide down on a plane inclined at an angle of 45^o with the horizontal. The force of friction will be

(A) 19.6 $sin\ 45^o$ (B) 19.6 cos 45^o

(C) 9.8 $sin\ 45^o$ (D) 9.8 cos 45^o

124. The upper half of an inclined plane of inclination θ is perfectly smooth while the lower half is rough. A body starting from the rest at top comes back to rest at the bottom if the coefficient of friction for the lower half is given by

(A) $\mu = \sin\theta$ (B) $\mu = \cot\theta$

(C) $\mu = 2\cos\theta$ (D) $\mu = 2\tan\theta$

125. A body is sliding down an inclined plane having coefficient of friction 0.5. If the normal reaction is twice that of the resultant downward force along the incline, the angle between the inclined plane and the horizontal is

(A) 15^o (B) 30^o

(C) 45^o (D) 60^o

126. A body of mass 10 kg is lying on a rough plane inclined at an angle of 30^o to the horizontal and the coefficient of friction is 0.5. the minimum force required to pull the body up the plane is

(A) 914 N (B) 91.4 N

(C) 9.14 N (D) 0.914 N

127. A block of mass 1 kg slides down on a rough inclined plane of inclination 60^o starting from its top. If the coefficient of kinetic friction is 0.5 and length of the plane is 1 m, then work done against friction is (Take $g = 9.8\ m/s^2$)

(A) 9.82 J (B) 4.94 J

(C) 2.45J (D) 1.96 J

128. A block of mass 10 *kg* is placed on an inclined plane. When the angle of inclination is 30^o, the block just begins to slide down the plane. The force of static friction is

(A) 10 *kg wt* (B) 89 *kg w*

(C) 49 *kg wt* (D) 5 *kg wt*

129. A body of 5 *kg* weight kept on a rough inclined plane of angle 30^o starts sliding with a constant velocity. Then the coefficient of friction is (assume $g = 10\ m/s^2$)

(A) $1/\sqrt{3}$ (B) $2/\sqrt{3}$

(C) $\sqrt{3}$ (D) $2\sqrt{3}$

130. 300 *Joule* of work is done in sliding up a 2 *kg* block on an inclined plane to a height of 10 *metres*. Taking value of acceleration due to gravity '*g*' to be 10 m/s^2, work done against friction is

(A) 100 *J* (B) 200 *J*

(C) 300 *J* (D) Zero