PHYSICS

BOOKS - MODERN PUBLICATION PHYSICS (KANNADA ENGLISH)

LAWS OF MOTION

Multiple Choice Question Level I

1. A65 kg horizontal force is just sufficient to draw 1300 kg block at level table surface at

uniform speed. Then, the coefficient of friction is:

A. 0.5

B. 5

C. 0.02

D. 0.05

Answer: d

 Watch Video Solution

2. The angle between frictional force and instantaneous velocity of a body moving over a rough surface is:

A. $\pi/2$

B. $\pi/2$

C. zero

D. $\pi/4$

Answer: a

Watch Video Solution

3. A boy sitting in a car moving at constant velocity throws a ball straight up into the air. Where will the ball fall ?

A. Behind him

B. Into his hands

C. In front of him

D. Towards the left

Answer: b

Watch Video Solution

4. A body of mass m, moving with the some velocity v collides with another body of same mass moving with same speed but in the opposite direction, sticks to it. The velocity of the compound body after collision is :

A. $\nu\psi lon$

B. $2v$

C. 0

D. $v/2$

Answer: c

Watch Video Solution

5. A bomb of mass 9 kg explodes into two pieces of mass 3 kg and 6 kg. The velocity of mass 3 kg is $16ms^{-1}$ The K.E. of mass 6 kg is:

A. 96 joules

B. 192 joules

C. 384 joules

D. 768 jules

Answer: b

Watch Video Solution

6. A machine gun fires n bullets per second and the mass of each bullet is m. If the speed of the bullet is v then, the force exerted on the machine gun is:

A. nmg

B. nm$v$

C. nmug

D. nmu$v$g

Answer: b

Watch Video Solution

7. A bullet of mass a moving with velocity b strikes a large stationary block of wood of mass c, and remains embed in it, the final velocity of the system is :

A. $\frac{b}{c+b}$

B. $\frac{a+b}{c}a$

C. $\frac{a}{a+c}b$

D. $\frac{a+b}{a}b$

Answer: c

Watch Video Solution

8. An explosion blows a rock into three pieces. Two pieces go off at right angles to each other. One of these two pieces of mass 1 kg moves with 12 m//s and other of mass 2 kg moves with 8 m/s. If the velocity of the third piece is 40 m//s, then its mass is:

A. 5 kg

B. 0.5 kg

C. 0.25 kg

D. 1 kg

Answer: b

Watch Video Solution

9. A uniform rope of length 'L' resting on a frictionless horizontal surface is pulled at one end by force F. The tension in the rope at a

distance l from the end where force is applied

is:

A. F

B. lF

C. $\left(1-\frac{l}{L}\right)F$

D. $\left(1+\frac{l}{L}\right)F$

Answer: c

View Text Solution

10. In Fig. three bodies are shown are connected to each other with strings. They are being pulled with a force F on a frictionless horizontal surface. The tension Pin the first string is 16 N. The tension Q in the second string is :

A. 16 N

B. 10N

C. 4N

D. 2 N

Answer: b

View Text Solution

11. With what minimum acceleration can a fireman slide down a rope whose breaking-strength is 2//3 rd of his weight?

A. $2/3g$

B. g

C. $1/3g$

D. zero

Answer: c

Watch Video Solution

12. A man of weight mg is moving upwards in a rocket with acceleration of 4 g. His apparent weight inside the rocket will be:

A. Zero

B. 4 mg

C. 5 mg

D. 1 mg.

Answer: c

Watch Video Solution

13. A particle of mass m strikes a wall normally with a velocity v and then its velocity reversed. The change in momentum is :

A. mv

B. $2mv$

C. zero

D. $-2mv$

Answer: d

Watch Video Solution

14. Three equal wts. of mass 2 kg each are hanging on a string passing over a frictionless pulley as shown in Fig. What is the tension in the string connecting the wt. B and C?

A. Zero

B. 13 N

C. 3.3 N

D. 19.6 N.

Answer: b

View Text Solution

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

A. t^2

B. A constant

C. t

D. $1/t$

Answer: c

Watch Video Solution

16. A particle of mass M is placed on the wedge. Now wedge is accelerated so that

block does not slide. The normal reaction is:

A. $Mg\sec\theta$

B. $Mg\cos\theta$

C. $Mg\tan\theta$

D. $Mg\cot\theta$

Answer: a

View Text Solution

17. block of mass 2 kg is resting on frictionless table. If it is struck by a jet releasing water at the rate of 1 kg/s and at the speed of 5 m/s, find initial acceleration of the block :

A. $1.5m/s^2$

B. $2.0\frac{m}{s^2}$

C. $2.5m/s^2$

D. None of these

Answer: c

Watch Video Solution

Watch Video Solution

18. A spring obeying Hook's law has a force constant K Now the spring is cut in two equal parts, the force constant of each part will be:

A. K

B. $K/2$

C. 2K

D. Zero.

Answer: c

Watch Video Solution

19. Two masses A and B each of mass M are connected together by a massless spring. A force F acts on the mass B as shown in fig. At the instant shown the mass A has an acceleration a. What is the acceleration of mass B ?

`

(##MOD_RPA_OBJ_PHY_C04_A_E01_019_Q01.png" width="80%">

A. a

B. $-a$

C. $\frac{F}{M}$

D. $\frac{F}{M} - a$

Answer: d

Watch Video Solution

20. If U^{238} nucleus at rest decays by emitting an alpha particle with a speed of V m/s. The recoil speed of residual nucleus in m//s is:

A. $\frac{-V}{4}$

B. $-V \times \frac{4}{238}$

C. $-V \times \frac{4}{234}$

D. $V\frac{4}{234}$

Answer: c

Watch Video Solution

21. A rocket has total mass 1000 kg with fuel of 900 kg. It ejects fuel at the rate of 1 kg/s with an exhaust velocity of $2km/s$ relative to

rocket. The maximum velocity attained by rockct is:

A. $2.3km/s$

B. $4.6km/s$

C. $2km/s$

D. $4.6\log_{10}\frac{10}{9}km/s$

Answer: b

Watch Video Solution

22. block of mass 0-1 kg is held against a wall by applying a horizontal force of 5 N on the block. If the coefficient of friction between the block and the mass is 0.5, the magnitude of the frictional force acting on the block is :

A. 0.98 N

B. 0.49 N

C. 4.9 N

D. 2.5 N

Answer: a

Watch Video Solution

23. A body of mass of 2 kg moving with velocity $4ms^{-1}$ horizontally stops after 2 s. If the body is to be kept in motion at the same surface with $4ms^{-1}$ force needed is :

A. IN

B. 2N

C. 4N

D. 18 N

Answer: c

Watch Video Solution

24. Two bodies of masses 6 kg and 4 kg respectively are connected to two ends of a light string passing over horizontal frictionless pulley. The acceleration in the string is :

A. $1ms^{-2}$

B. $2ms^{-2}$

C. $3ms^{-2}$

D. $2.5ms^{-2}$

Answer: d

Watch Video Solution

25. A man of weight W is standing on a lift which is moving upwards with acceleration 'a'. The apparent weight of the man is :

A. W

B. Zero

C. $W\left(1-\frac{a}{g}\right)$

D. $W\left(1+\frac{a}{g}\right)$

Answer: d

Watch Video Solution

26. A rocket is ejecting a mass m of gases per unit time with velocity V relative to the rocket, the thrust on the rocket is:

A. mV

B. $\frac{mV}{g^2}$

C. mVg

D. $\frac{mV^2}{g}$

Answer: a

Watch Video Solution

27. A canon ball is fired with a velocity $200m^{-1}$ at an angle of 60° with horizontal. At the highest point it explodes into 3 equal

parts. One moves vertically upwards with $100ms^{-1}$, second moves vertically downwards with $100ms^{-1}$. The third moves with velocity :

A. $100ms^{-1}$ horizontally

B. $300ms^{-1}$ horizonally

C. $200ms^{-1}$ making an angle of 60° with horizontal

D. $200ms^{-1}$ making an angle of 30° with horizontal.

Answer: b

Watch Video Solution

28. The resultant of two forces is 20/3 N. If one of the force is 20 N and makes an angle of 30° with the resultant, the other force has a mangitude:

A. 10 N

B. $20\sqrt{3}N$

C. $10\sqrt{3}N$

D. $20N$

Answer: d

Watch Video Solution

29. Two weights w, and w, are attached to the ends of a string which passes over a frictionless pulley. If the pulley is placed in a lift rising up with an acceleration equal to that of gravity i.e. '8', the tension in the string :

A. $\frac{4w_1w_2}{w_1+w_2}$

B. $\frac{2w_1w_2}{w_1+w_2}$

C. $\frac{w_1 w_2}{2(w_1 + w_2)}$

D. $\frac{w_1 w_2}{w_1 + w_2}$

Answer: a

Watch Video Solution

30. Two blocks of 100 kg and 50 kg connected by a massless chord passing over a frictionless pulley rest on a frictionless inclined plane inclined at angle 30° and 60° respectively. What is the acceleration and which way the

system moves?

A. $1ms^{-2}\text{left}$

B. $0.866ms^{-2}right$

C. $0.664ms^{-2}right$

D. $0446ms^{-2}:\text{left}$

Answer: d

View Text Solution

31. Three blocks of masses 1 kg, 6 kg and 3 kg are connected by a massless string passing over two frictionless pulleys attached at the two opposite ends of a smooth horizontal surface as shown in fig. What is the acceleration of the system if $g = 10ms^{-2}$?

A. $1ms^{-2}$

B. $4ms^{-2}$

C. $2ms^{-2}$

D. $3ms^{-2}$

Answer: c

View Text Solution

32. The potential energy U of a body of mass m is given by U = ax + by where x and y are the position coordinates of the particle, the net force acting on the particle is:

A. $\sqrt{a^2+b^2}$

B. $\sqrt{a+b}$

C. $\left(a^2+b^2\right)$

D. $(a+b)$

Answer: a

Watch Video Solution

33. The kinetic energy of a particle varies with time according to the relation $E_k=(8t+6)K$ The force acting on the particle (k = constant)

A. is constant

B. varies inversely with velocity

C. varies directly with velocity

D. None of the above

Answer: b

Watch Video Solution

34. A car is moving along a straight horizontal road with a speed V. If the coefficient of friction between road and tyres is H, the

shortest distance in which the car stops when engine is shut off, is :

A. $\frac{V^2}{2\mu g}$

B. $\frac{V}{\mu g}$

C. $\frac{V}{\mu}$

D. $\frac{V^4}{\mu^2 g^2}$

Answer: a

Watch Video Solution

35. A block takes n times as much time to slide down a rough incline of 45° as it takes to slide down a perfectly smooth 45° incline. Coefficient of kinetic friction is :

A. $\frac{1}{1-n^2}$

B. $1-\frac{1}{n^2}$

C. $\frac{1}{\sqrt{1-n^2}}$

D. $\sqrt{1-\frac{1}{n^2}}$

Answer: b

Watch Video Solution

Watch Video Solution

36. Uniform rope of length Tlies on a table with coefficient of friction between the rope and table being u. What is the maximum length of the rope which can over hang from the edge of the table without sliding down?

A. $(1)(\mu)$

B. $\frac{1}{\mu+1}$

C. $\frac{\mu l}{\mu+1}$

D. $\frac{\mu l}{\mu-1}$

Answer: c

Watch Video Solution

37. A block of mass Mrests on a rough horizontal surface. The coefficient of friction between the block and surface is u. A force F = Mg acts at an angle with the vertical side of block and is pushing the block. The block can be pushed only if :

A. $\tan\theta \geq \mu$

B. $\tan\theta/2 \geq \mu$

C. $\cos\theta \geq \mu$

D. $\cos\theta/2 \geq \mu$

Answer: b

View Text Solution

38. Pushing force making an angle o to the horizontal is applied on the block of weight W placed on the horizontal table. If o is the angle

of friction, the magnitude of the force required to move the body is equal to :

A. $\frac{W\cos\phi}{\cos(\theta-\phi)}$

B. $\frac{W\sin\phi}{\sin(\theta-\phi)}$

C. $W\sin\phi/\cos(\theta-\phi)$

D. $W\tan\theta/\sin(\theta-\phi)$

Answer: c

Watch Video Solution

39. A 40 kg slab rests on frictionless surface and a 10 kg block rests on the slab, If H, = 0-6 and H = 04, then find the acceleration of the slab when a force of 100 N acts on 10 kg block horizontally $(g = 9.8ms^{-2})$

A. $6 - 1ms^{-2}$

B. $4.9ms^{-2}$

C. $1 - 47ms^{-2}$

D. $0.98ms^{-2}$

Answer: d

View Text Solution

40. A horizontal force of 12 N pushes a block weighing 5 N against a vertical wall as shown. The coefficient of static friction between the block and the wall is 0-6. What is the force of friction ?

A. 3 N

B. 7.2 N

C. 5.0 N

D. Zero.

Answer: c

View Text Solution

41. A force vector applied on a mass is represented as $\vec{F} = 6\hat{i} - 8\hat{j} + 10\hat{k}$ and it accelerates it at 1 ms-2 What is the mass of the body?

A. $10\sqrt{2}kg$

B. $2\sqrt{10}kg$

C. $20kg$

D. $10kg$

Answer: a

Watch Video Solution

42. A block of mass 6 kg is suspended through two light spring balances, A and B. Then

readings of the two are :

A. 6 kg , zero kg

B. 3 kg: 3 kg

C. zero kg, 4 kg

D. 6 kg: 6 kg.

Answer: d

View Text Solution

43. A cricket ball of mass 0-5 kg strikes a bat normally with a velocity of $30ms^{-1}$ and rebounds with a velocity of $20ms^{-1}$ in the opposite direction. The impulse of the force exerted by the ball on the bat is :

A. $0.5Ns$

B. 25 Ns

C. 50 NS

D. 1.0 Ns

Answer: b

Watch Video Solution

44. 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 the free end of the rope, the net force exerted on the block will be:

A. F

B. $\frac{FM}{(M-m)}$

C. $\frac{FM}{(M+m)}$

D. $\frac{FM}{(M+m)}$

Answer: c

Watch Video Solution

45. The momentum of a body increases by 20%. What is the percentage increase in its K.E.?

A. 60

B. 52

C. 44

D. 36

Answer: c

 Watch Video Solution

46. A body of mass 2 kg is acted upon by two perpendicular forces 4 N along the X-axis and 3 N along the Y-axis. What is the magnitude of the acceleration of the body ?

A. $1.5ms^{-2}$

B. $2.0ms^{-2}$

C. $2.5ms^{-2}$

D. $3.5ms^{-20}$

Answer: c

Watch Video Solution

47. A rocket, set for vertical launching, has a mass of 50 kg and contains 450 kg of fuel. It can have a maximum exhaust speed of

$1kms^{-1}$ If $g = 10ms^{-2}$. What should be the minimum rate of fuel consumption to just lift it off the launching pad ?

A. $10kgs^{-1}$

B. $5kgs^{-1}$

C. $7.5kgs^{-1}$

D. $2.5kgs^{-1}$

Answer: b

Watch Video Solution

48. n a rocket, the mass of the fuel is 90% of the total mass. The rocket is blasted from the launching pad. If the exhaust gases are ejected at a speed of $1000S^{-1}$ what is the maximum speed attained by the rocket? (Neglect the effects of gravity and air resistance).

A. $2.3km/s$

B. $1km/s$

C. $1.5km/s$

D. $9km/s$

Answer: a

Watch Video Solution

49. Two blocks of masses $m_1 = 6kg$ and $m_2 = 7kg$ are connected by a light string passing over a light frictionless pulley as shown in fig. The mass mis at rest on the inclined plane and mass my hangs vertically. If the angle of incline $\theta = 30^\circ$. What is the magnitude and direction of the force of

friction on the 6 kg block? $\left(Takeg = 10cm^2\right)$

A. 40 N up the plane

B. 40 N down the plane

C. 90 N up the plane

D. 90 N down the plane

Answer: b

View Text Solution

50. A horizontal force of 300 N pulls two blocks of masses $m_1 = 10kg$ and $m_2 = 20kg$ which are connected by a light inextensible string and lying on a horizontal frictionless surface. What is the acceleration of each mass?

A. $10ms^{-2}$

B. $15ms^{-2}$

C. $30ms^{-2}$

D. Zero

Answer: a

View Text Solution

51. A car moving at a speed V is stopped by a retarding force F in a distance S. If the retarding force were 6F, the car will be stopped in a distance :

A. $\frac{S}{12}$

B. $a = \frac{1}{3}g$

C. $\frac{S}{6}$

D. $\frac{S}{3}$

Answer: c

Watch Video Solution

52. A body projected along an inclined plane of angle of inclination 300 stops after covering a distance x_1. The same body projected with the same speed stops after covering a distance x_2

when the angle of inclination of the inclined plane is increased to 60° the ratio of $x_1 / l x_2$ is

A. 1

B. 2

C. $\sqrt{2}$

D. $\sqrt{3}$

Answer: d

Watch Video Solution

53. A smooth inclined plane of angle of inclination 30° is placed on the floor of a compartment of a train moving with a constant acceleration a. When a block is placed on the inclined plane, it does not slide down or up the plane. The acceleration a must be

A. g

B. $\frac{g}{2}$

C. $\frac{g}{\sqrt{2}}$

D. $\frac{g}{\sqrt{3}}$

Answer: d

Watch Video Solution

54. A shell of mass 15 kg, initially a rest, explodes into three fragments of masses in the ratio 1:1: 3. The fragments with equal masses fly off in mutually perpendicular directions with a speed of $6ms^{-1}$ The speed of the heaviest fragment will be :

A. $12ms^{-1}$

B. $6ms^{-1}$

C. $\sqrt{6}ms^{-1}$

D. $\frac{2\sqrt{6}}{3}ms^{-1}$

Answer: d

Watch Video Solution

55. The velocity of a body of mass 2 kg moving in circle of radius 3 m at any time is 3 m//s. If its speed is increasing at the rate of $4m/s^2$ then the net acceleration on the body is :

A. $4m/s^2$

B. $3m/s^2$

C. $7m/s^2$

D. $5m/s^2$

Answer: d

Watch Video Solution

56. A constant force F equal to half of the hanging weight m, acts on the block of mass m_2 placed on a smooth horizontal surface as

shown. What is the acceleration of the block ?

A. $\frac{m_2 g}{2(m_1 + m_2)}$

B. $\frac{m_1 g}{2(m_1 + m_2)}$

C. $\frac{(m_1 + m_2)g}{2m_1}$

D. $\frac{(m_1 + m_2)g}{2m_2}$

Answer: a

View Text Solution

57. The coefficient of friction for an inclined plane and a biock is $\frac{1}{\sqrt{3}}$what is the acceleration of the block when angle of inclination of the plane is 30° ?

A. $\sqrt{3}ms^{-2}$

B. $\frac{1}{\sqrt{3}}ms^{-2}$

C. Zero

D. $3ms^{-2}$

Answer: c

Watch Video Solution

Watch Video Solution

58. An inclined plane is inclined at an angle θ when the block placed on it is just at the point of moving down the plane. What can be minimum acceleration with which the block can be moved up the inclined plane?

A. $g \sin \theta$

B. $2g \sin \theta$

C. $3g \sin \theta$

D. $4g \sin \theta$

Answer: b

Watch Video Solution

59. In the above question if the inital velocity of projection above the plane is u, the distance up to which the block can rise up is:

A. $\frac{u^2}{4g\sin\theta}$

B. $\frac{u}{4g\sin\theta}$

C. $\frac{u^2\sin\theta}{4g}$

D. $\frac{u\sin\theta}{4g}$

Answer: a

View Text Solution

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

A. t^2

B. $\frac{1}{t}$

C. $\frac{1}{t^2}$

D. t

Answer: d

Watch Video Solution

61. A particle is projected along the line of greatest slope up a rough inclined plane at an angle of 45° with the horizontal. If the coefficient of friction is $\frac{1}{2}$ then the retardation is :

A. $\frac{g}{\sqrt{2}}$

B. $\frac{g}{2\sqrt{2}}$

C. $\frac{g}{\sqrt{2}}\left(1+\frac{1}{2}\right)$

D. $\frac{g}{\sqrt{2}}\left(1-\frac{1}{2}\right)$

Answer: c

Watch Video Solution

62. A rocket of initial mass m_0 moving with a velocity of v discharges a jet of gases of mean density ρ and effective area A. The minimum

value of v of fuel gas which enables the rocket to rise vertically above is nearly :

A. $\left(\frac{\rho g}{m_0 A}\right)^{1/2}$

B. $\left(\frac{\rho g}{m_0}\right)^{1/2}$

C. $\left(\frac{m_0 g}{\rho A}\right)^{1/2}$

D. $\left(\frac{2m_0 g A}{\rho}\right)^{1/2}$

Answer: c

Watch Video Solution

63. A monkey of mass 20 kg is holding a vertical rope which breaks under a force of 25 kgf. What is the maximum acceleration with which the monkey can climb up the rope ?

A. $10ms^{-2}$

B. $2.5ms^{-2}$

C. $5ms^{-2}$

D. $7.5ms^{-2}$

Answer: b

Watch Video Solution

Watch Video Solution

64. An object is placed on the surface of smooth inclined plane of inclination . It takes time to reach the bottom. If the same object is allowed to slide down the rough inclined plane of the same inclination, the time to reach the bottom is increased n times, where $n > 1$. The coefficient of friction for the plane is :

A. $\mu = \tan\theta\left[1 - \frac{1}{n^2}\right]$

B. $\mu\cos\theta\left[1 - \frac{1}{n^2}\right]$

C. $\mu = \tan\theta\left[1 - \frac{1}{n^2}\right]^{\frac{1}{2}}$

D. $\mu = \cos\theta\left[1 - \frac{1}{n^2}\right]^{\frac{1}{2}}$

Answer: a

Watch Video Solution

65. In the above question, if the velocity of the object on reaching the bottom is v for the smooth plane and $\frac{v}{n}$ for the rough plane, then the coefficient of friction is given by :

A. $\mu = \tan\theta\left[1 - \frac{1}{n^2}\right]$

B. $\mu = \cos\theta\left[1 - \frac{1}{n^2}\right]$

C. $\mu = \tan\theta\left[1 - \frac{1}{n^2}\right]^{\frac{1}{2}}$

D. $\mu = \cos\theta\left[1 - \frac{1}{n^2}\right]^{\frac{1}{2}}$

Answer: a

View Text Solution

66. Two blocks of masses M_1 and M_2 are connected by a string passing over a pulley as

shown. The coefficient of friction between the block M_1 and horizontal surface on which it lies is μ What additional mass m should be placed on M_1 so that the system does not accelerate ?

A. $(M_2 - M_1)\mu$

B. $\frac{M_2 - M_1}{\mu}$

C. $\frac{M_2}{\mu} - M_1$

D. $M_2 - \frac{M_1}{\mu}$

Answer: c

View Text Solution

67. An object kept on a smooth inclined plane rising with height 1 units and length I units can be kept stationary relative to the inclined plane by giving a horizontal acceleration. The value of acceleration is :

A. $\frac{g}{\sqrt{l^2-1}}$

B. $g\sqrt{l^2-1}$

C. $\frac{g}{l}$

D. g.l.

Answer: a

Watch Video Solution

68. Two blocks of masses 2 kg and 1 kg are placed on a smooth horizontal surface in contact with each other. A horizontal force of 3 N is applied on the first so that the block moves with constant acceleration. The force F

between the blocks is:

A. 3N

B. 2N

C. IN

D. zero

Answer: c

View Text Solution

69. A block slides from an inclined plane of inclination 45° If it takes twice the time with friction than that without friction, the coefficient of friction between block and surface is :

A. 1

B. 0.75

C. 0.5

D. 0.25

Answer: b

Watch Video Solution

70. A body of mass 5 kg explodes into 3 fragments having masses in the ratio of 2:2 : 1. The fragments with equal masses fly in merely far direction with speed 15 ms^{-1}. What will be the velocity of lighter one ?

A. $15ms^{-1}$

B. $15\sqrt{2}ms^{-1}$

C. $30ms^{-1}$

D. $30\sqrt{2}ms^{-1}$

Answer: d

Watch Video Solution

71. A block of mass 2 kg is kept on a floor. The coefficient of static friction is 0.4. If a force F of 2.5 N is applied on the block as shown, the frictional force between the block and floor will be:

A. 2.5 N

B. 5 N

C. 7.84 N

D. 10 N

Answer: a

View Text Solution

72. A bomb of mass 1 kg is thrown vertically upwards with a speed of $100ms^{-1}$ After 5 sec. it explodes into two fragments. One of mass

400 g is found to go down with a speed of $25ms6(-1)$ what happens to the second justafter the explosion ?

A. Goes upwards with $40ms^{-1}$

B. Goes upwards with $100ms^{-1}$

C. Goes upwards with $60ms^{-1}$

D. Goes downwards with $40ms^{-1}$

Answer: b

Watch Video Solution

73. When forces F_1, F_2, F_3 are acting on a particle of mass m such that F, and Fy are mutually perpendicular, then the particle remains stationary. If the force F, is now removed then the acceleration of the particle is :

A. F_1 / m

B. $F_2 F_3 / m F_1$

C. $(F_2 - F_3) / m$

D. F_2 / m

Answer: a

Watch Video Solution

74. A lift is moving down with acceleration a. A man in the lift drops a ball inside the lift. The acceleration of the ball as observed by the man in the lift and a man standing stationary on the around are respectively :

A. g,g

B. g-a,g-a

C. g-a,a

D. a,g

Answer: c

Watch Video Solution

75. A light string passing over a smooth light pulley connects two blocks of masses m_1 and m_2 (vertically). If the acceleration of the system is g//8, then the ratio of the masses is:

A. 2N

B. 20N

C. 50N

D. 100N

Answer: b

Watch Video Solution

76. A ball whose kinetic energy is E is projected at an angle of 45° to the horizontal. The

kinetic energy of the ball at the highest point of its flight willbe:

A. E

B. $E\sqrt{2}$

C. $E/2$

D. zero

Answer: c

Watch Video Solution

77. 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 the free end of the rope, the net force exerted on the block will be:

A. $\frac{PM}{M+m}$

B. $\frac{Pm}{M+m}$

C. $\frac{Pm}{M-m}$

D. P

Answer: a

Watch Video Solution

78. A spring balance is attached to the ceiling of a lift. A man hangs his bag on the spring and the spring reads 49 N, when the lift is stationary. If the lift moves downward with an acceleration of $5m/s^2$, the reading of the spring balance will be :

A. 49 N

B. 24 N

C. 74 N

D. 15 N

Answer: b

Watch Video Solution

79. A rocket with a lift-off mass $3.5 \times 10^4 N$ kg is blasted upward with an initial acceleration of $10 m / s^2$. Then the initial thrust of the blast is:

A. $1.75 \times 10^5 N$

B. $3.5 \times 10^5 N$

C. $7.0 \times 10^5 N$

D. $14.0 \times 10^5 N$

Answer: c

Watch Video Solution

80. Two masses $m_1 = 5kg$ and $m_2 = 4.8kg$ tied to a string are hanging over a light frictionless pulley. What is the acceleration of the masses when left free to move ?

$(g = 9.8m/s^2)$:

A. $0.2m/s^2$

B. $9.8m/s^2$

C. $5m/s^2$

D. $4.8m/s^2$

Answer: a

View Text Solution

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

A. One

B. Four

C. Two

D. three

Answer: d

Watch Video Solution

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

A. $3m/s^2$

B. $15m/s^2$

C. $5m/s^2$

D. $10m/s^2$

Answer: d

Watch Video Solution

83. A mass of M kg is suspended by a weightless string. The horizontal force that is required to displace it until the string makes an angle of 45° with the initial vertical direction is :

A. $Mg\left(\sqrt{2}+1\right)$

B. Mg

C. $\frac{Mg}{\sqrt{2}}$

D. $Mg\left(\sqrt{2}-1\right)$

Answer: b

Watch Video Solution

84. A body of mass m =3.513 kg is moving along the X-axis with a speed of $5.00ms^{-1}$The magnitude of its momentum as recorded is :

A. $17.57kgms^{-1}$

B. $17.6kgm^{-1}$

C. $17.565kgm^{-1}$

D. $17.56kgms^{-1}$

Answer: b

Watch Video Solution

85. The minimum force required to start pushing a body up a rough (frictional coefficient) inclined plane is F_1 while the minimum force needed to prevent it from

sliding down is F_2 if the inclined plane makes an angle$\theta$with the horizontal such that $\theta = 2\mu$ then the ratio F_1 / F_2 is :

A. 1

B. 2

C. 3

D. 4

Answer: c

Watch Video Solution

Multiple Choice Question Level Ii

1. A 3 kg ball strikes a heavy rigid wall with a speed of 10 ms at an angle of 60°. It gets reflected with the wall is for 0.20 s, what is the average force exerted on the ball by the wall ?

A. 150 N

B. zero

C. $150\sqrt{3}N$

D. 300 N

Answer: c

Watch Video Solution

2. A lift is ascending by acceleration $g/3$. What will be the time period of a simple pendulum suspended from its ceiling if its time period in stationary lift is T?

A. $\frac{T}{2}$

B. $\left(\frac{\sqrt{3}}{2}\right) \times T$

C. $\sqrt{3}\frac{T}{4}$

D. $\frac{T}{4}$

Answer: b

Watch Video Solution

3. 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 a the other end. The acceleration of the system is (given

$g = 10ms^{-2}$):

A. $100ms^{-2}$

B. $3ms^{-2}$

C. $10ms^{-2}$

D. $30ms^{-2}$

Answer: b

View Text Solution

4. A chain AB of length l is lying in a smooth horizontal tube so that the fraction 'h' of its length hangs freely and just touches the surface of the table with its end B. At a certain moment the end A of the chain is set free. The velocity of end A of the chain when it just slips out of tube is :

`

(##MOD_RPA_OBJ_PHY_C04_A_E01_089_Q01.png" width="80%">

A. $h\sqrt{\frac{2g}{lh}}$

B. $\sqrt{2gh\log\left(\frac{l}{h}\right)}$

C. $\sqrt{2gl\log\left(\frac{l}{h}\right)}$

D. None of these

Answer: b

Watch Video Solution

5. A satellite in force-free space sweeps stationary interplanetary dust at a rate of $dM/dt = \alpha v$, where M is the mass and v the speed of the satellite, and α is a constant.

What is the deceleration that satallite experiences?

A. αv

B. $\frac{\alpha v}{M}$

C. $-\frac{\alpha v^2}{M}$

D. αv^2

Answer: c

Watch Video Solution

6. A mass M is hung with a light inextensible string as shown. Find the tension in horizontal part of string

A. Mg

B. $\frac{Mg}{2}$

C. $\sqrt{3}Mg$

D. None of these

Answer: c

View Text Solution

View Text Solution

7. A body of weight 2 kg is suspended as shown in the figure. The tension T_1 in the horizontal string (kg wt) is :

A. $2/\sqrt{3}$

B. $\frac{\sqrt{3}}{2}$

C. $2\sqrt{3}$

D. 2

Answer: c

View Text Solution

8. The horizontal acceleration that should be given to a smooth inclined plane of angle $\sin^{-1}\left(\frac{1}{l}\right)$ to keep an object stationary on the plane, relative to the inclined plane is :

A. $\frac{g}{\sqrt{l^2-1}}$

B. $g\sqrt{l^2-1}$

C. $\frac{\sqrt{l^2-1}}{g}$

D. $\frac{g}{\sqrt{l^2+1}}$

Answer: a

Watch Video Solution

9. A stationary body of mass 3 kg explodes into three equal pieces. Two of the pieces fly off at right angles to each other, one with a velocity of 2 i m/s and the other with a velocity of 3 j m/s. If the explosion takes place in $10^5 s$, the

average force acting on the third piece in newton is:

A. $\left(3\hat{i}+3\hat{j}\right)\times 10^{-5}$

B. $\left(2\hat{i}+3\hat{j}\right)\times 10^{5}$

C. $\left(2\hat{i}-3\hat{j}\right)\times 10^{5}$

D. $\left(2\hat{i}-3\hat{j}\right)\times 10^{-5}$

Answer: b

Watch Video Solution

10. A ball weighing 150g is moving with an initial velocity$\bar{u} = \left(3\hat{i} + 4\hat{j}\right)ms^{-1}$ After being hit by the player its final velocity is $\bar{u} = \left(3\hat{i} + 4\hat{j}\right)ms^{-1}$What is the magnitude of change in momentam in kg ms^{-1}

A. $1kgms^{-1}$

B. $2kgms^{-1}$

C. $1.5kgms^{-1}$

D. $2.5kgms^{-1}$

Answer: c

Watch Video Solution

11. A body of mass 2 kg is moving according to the equation for displacement at seconds as $x(t) = pt^2 + rt^3. If p = 3ms^{-1}, q = 4ms^{-1}$ and $r = 5ms^{-1}$ the force acting after 2 sec is :

A. $136N$

B. 128N

C. 68N

D. 64N

Answer: a

Watch Video Solution

12. A body of mass 5 kg is acted upon by a constant force $\vec{F} = \left(-3\hat{i} + 6\hat{j} \right) N$ Its initial velocity at t = 0 is $\vec{u} = \left(6 - \hat{2} \right) \hat{m} s^{-1}$ what is its velocity after 5s ? What is its magnitude ?

A. $\left(3\hat{i} + 6\hat{j} \right), 5ms^{-1}$

B. $\left(2\hat{i}-2\hat{j}\right), 2\sqrt{2}ms^{-1}$

C. $\left(3\hat{i}-4\hat{j}\right), 5ms^{-1}$

D. $\left(2\hat{i}-3\hat{j}\right), \sqrt{13}ms^{-1}$

Answer: a

Watch Video Solution

13. The velocity of a body of mass 2 kg is given by $\vec{v}=\left(2t\hat{i}+t^2\hat{j}\right)$ Find the momentum of the body after 2 seconds.

A. $\left(8\hat{i}+8\hat{j}\right)kgms^{-1}$

B. $\left(4\hat{i}+4\hat{j}\right)kgms^{-1}$

C. $\left(6\hat{i}+6\hat{j}\right)kgms^{-1}$

D. $\left(10\hat{i}+10\hat{j}\right)kgms^{-1}$

Answer: a

Watch Video Solution

14. In the above question what is the force acting after 2 sec ?

A. $\left(4\hat{i}+8\hat{j}\right)N$

B. $\left(4\hat{i}+4\hat{j}\right)N$

C. $\left(8\hat{i}+8\hat{j}\right)N$

D. $\left(6\hat{i}+6\hat{j}\right)N$

Answer: a

View Text Solution

15. Two masses 5 kg and 3 kg are suspended with an unyielding support AB as shown by a massless inextensible thread. What are the

values of tensions T_1 and T_2 if the whole system is being placed in a lift rising up with uniform upward acceleration of $2ms^{-2}$? Take $g = 9.8ms^{-2}$

A. $T_1 = 60N, T_2 = 36.0N$

B. $T_1 = 94.4N, T_2 = 35.0N$

C. $T_1 = 49.0N, T_2 = 29.0N$

D. $T_1 = 59.0N, T_2 = 35.0N$

Answer: b

View Text Solution

16. A gun weighing 100 kg is used to fire an iron ball weigh ing 1 kg horizontally from a cliff of height 500 m above the ground. The ball falls 400 m away from the bottom of the cliff. What is the recoil velocity of the gun? $(Takeg = 10ms^{-2})$

A. $0.8ms^{-1}$

B. $0.4ms^{-1}$

C. $1.2ms^{-1}$

D. $0.2ms^{-1}$

Answer: b

Watch Video Solution

17. The diagrams (a) and (b) given below are the displace ment-time graphs of the motion of a particle in X and Y directions

If the mass of the particle is 500g, What is the magnitude and direction of the force acting

on the particle ?

A. 1 N along Y-axis

B. 1 N along X-axis

C. 2 N along Y-axis

D. 2 N along X-axis

Answer: c

View Text Solution

18. A man is riding an elevator which is rising up with a uniform acceleration of $2ms^{-1}$ He tosses a coin vertically upwards with a speed of 20 ms. What time the coin would take to fall back into his hands? $(Takeg = 10ms^{-2})$

A. $\frac{20}{2}\text{sec}$

B. $5.0\,\text{sec}$

C. $\frac{10}{3}\text{sec}$

D. $\frac{5}{3}\text{sec}$

Answer: c

Watch Video Solution

19. A body slides down from rest along a smooth inclined plane making an angle of 45° with the horizontal and takes time 'Y' to slide down the whole length of the plane. If the plane surface is rough the same body takes n.t time to slide down same length of the plane where n is a number greater than one. What is the value of coefficient of friction between the body and rough plane surface?

A. $\mu = 1 - \frac{1}{n^2}$

B. $\mu = \frac{1}{n^2}$

C. $\mu = \frac{n^2}{1} - l$

D. $\mu = \left(l - \frac{1}{n^2}\right)$

Answer: a

Watch Video Solution

20. A string is tied to a point P in such a way that it leaves branches along PA, PB, PC and PD at angles as shown in the figure. The forces

acting on the respective branches are $F_1 IN, 2N, F_2$ as shown. What will be the values of $\overrightarrow{F}_1$ and $\overrightarrow{F}_2$ when the equilibrium is established in the system?

A. $\frac{1}{\sqrt{2}N}N, \frac{3}{\sqrt{2}}N$

B. $\frac{3}{\sqrt{2}N}N, \frac{1}{\sqrt{2}}N$

C. $\frac{1}{2}N, \frac{1}{3}N$

D. $\frac{3}{2}N, \frac{1}{2}N$

Answer: a

View Text Solution

21. The position-time graph for the motion of a body weighing 2 kg is shown in the figure. By the help of this graph calculate the impulse acting on the body at 1 = 0 sec. and t = 4 sec.

A. $zero, \ + \frac{3}{2} kgms^{-1}$

B. $zero, \ - \frac{3}{2} kgms^{-1}$

C. $zero, \ + \frac{3}{4} kgms^{-1}$

D. $zero, \ - \frac{3}{4} kgms^{-1}$

Answer: b

View Text Solution

22. Two solid balls A and B having masses 200 g and 400 grespectively are moving in opposite direction with velocity of A equal to 0.3 m//s. After the collision the two balls come to rest. The velocity of B before collision is :

A. $-0.15m/s$

B. $1.5m/s$

C. $0.1m/s$

D. zero

Answer: a

Watch Video Solution

23. A body of mass 2 kg rests on a rough inclined plane making an angle of 30° with the horizontal. The coefficient of static friction between the block and the plane is 0.7. The frictional force on the block is :

A. 9.8 N

B. $9.8\sqrt{3}N$

C. $0.7 \times 9.8N$

D. $0.7 \times 9.8 \times 3N$

Answer: c

Watch Video Solution

24. A block of mass 4 kg is placed on the floor. The coefficient of static friction is 0.4. If a force of 12 N is applied on the block parallel to the

floor, the force of friction between the block and floor $\left(g = 10ms^{-2}\right)$

A. zero

B. 8N

C. 12N

D. 16 N

Answer: d

Watch Video Solution

25. A block released from rest from the top of a smooth inclined plane of angle of inclinatione, reaches the bottom in time t_1 The same block, released from rest from the top of another smooth inclined plane of angle of inclination $\theta_2$reaches the bottom in time ty. If the two inclined planes have the same height, the relation between t_1 and t_2 is :

A. $\frac{t_2}{t_1} = 1$

B. $\frac{t_2}{t_1} = \frac{\sin\theta_1}{\sin\theta_2}$

C. $\frac{t_2}{t_1} = \left(\frac{\sin\theta_1}{\sin\theta_2}\right)^2$

D. $\frac{t_2}{t_1} = \left(\frac{\sin\theta_1}{\sin\theta_2}\right)^{1/2}$

Answer: b

Watch Video Solution

26. A metal block weighing 2 kg is resting on a frictionless horizontal plane. It is struck by a jet releasing water at the rate of 1 kg//s and at a speed of $5ms^{-1}$ The Initial acceleration of block is :

A. $25ms^{-1}$

B. $5ms^{-1}$

C. $10ms^{-2}$

D. None of these.

Answer: a

Watch Video Solution

27. An open truck is moving with a uniform velocity of $10ms^{-1}$ If rain adds water at the rate of 5 kgs with zero velocity, then the

additional force applied by the engine to maintain the same velocity is :

A. $0.5N$

B. 5.0N

C. 50N

D. 100N

Answer: c

Watch Video Solution

28. A man weighing 60 kg is standing on a trolley weighing 240 kg. The trolley is resting on a frictionless horizonral rails. If the man starts walking on the trolley with a constant speed of $1ms^{-1}$ then after 4 second. The displacement of the man relative to the ground is :

A. 4.2 m

B. 4.8 m

C. 3.2 m

D. 3 m

Answer: c

Watch Video Solution

29. A rocket of initial mass m, moving with a velocity of v, discharges a jet of gases of mean density $\rho$and effective area A. The minimum value of v of fuel gas which enables the rocket to rise vertically above is nearly :

A. $\left(\frac{\rho g}{m_0 A}\right)^{1/2}$

B. $\left(\frac{\rho g A}{m_0}\right)^{1/2}$

C. $\left(\frac{m_0 g}{\rho A}\right)^{1/2}$

D. $\left(\frac{2m_0 g A}{\rho}\right)^{1/2}$

Answer: c

Watch Video Solution

30. A block A of mass m, rests on a block B of mass $m_2$resting on a fixed surface as shown. A and B connected by massless string passing around a frictionless pulley fixed to rigid wall.

With what force should Abe dragged so as to keep both A and B moving with uniform speed ?

A. $\mu(3m_1 + m_2)g$

B. $\mu(3m_2 + m_1)g$

C. $\mu\left(\frac{m_1}{3} + m_2\right)g$

D. $\mu\left(m_1 + \frac{m_2}{3}\right)g$

Answer: a

View Text Solution

31. A constant force acts on a body of mass m at rest fort second and then ceases to act. In next 't' second the body travels a distance 'x'. Magnitude of force is :

A. $\frac{mx}{t^2}$

B. $\frac{mx}{t}$

C. mxt

D. mxt^2

Answer: a

Watch Video Solution

32. A block of mass m is placed on another block of mass M which itself is lying on the horizontal surface. The coefficient of friction between the two blocks is μ_1 while between the block and horizontal surface is μ_2 What maximum horizontal force can be applied to the lower block so that the two blocks move without separation ?

A. $(M+m)(\mu_2+\mu_1)g$

B. $(M-m)(\mu_2+\mu_1)g$

C. $(M+m)(\mu_2+\mu_1)g$

D. $(M-m)(\mu_2+\mu_1)g$

Answer: a

View Text Solution

33. A force of 750 N is applied to a block of 100 kg to prevent it from sliding down an inclined plane of 30° inclination. If coefficients of static

and kinetic friction are 0.4 and 0.2, the frictional force acting is :

A. 750 N

B. 500 N

C. 350 N

D. 250 N

Answer: c

Watch Video Solution

34. A bullet $(m_1 = 25g)$ is fired with a velocity $400ms^{-1}$ get embedded into a bag of sand $(m_2 = 4.9kg)$ suspended by a rope. The velocity of the bag is nearly :

A. $0.2ms^{-1}$

B. $8ms^{-1}$

C. $4\ ms^{-1}$

D. $2ms^{-1}$

Answer: d

Watch Video Solution

Watch Video Solution

35. A block 'A' of mass 1 kg is connected by a string pass ing over two frictionless pulleys and is placed on a smooth horizontal surface as shown. To the other end of the string is attached another block of mass 1 kg. What is the acceleration of system?

A. $1ms^{-1}$

B. $10ms^{-1}$

C. $5ms^{-1}$

D. zero

Answer: c

View Text Solution

36. In the above question what is the value of tension in the string?

A. zero

B. 1N

C. 2N

D. 5N

Answer: d

View Text Solution

37. Two blocks $m_1 5g$ and $m_2 = 10g$ are hung vertically over a light frictionless pulley. What is the acceleration of the masses when left free?

A. $\frac{g}{3}$

B. $\frac{g}{2}$

C. g

D. $\frac{g}{5}$

Answer: a

Watch Video Solution

38. Two equal masses of mass M each are attached to a string passing over a smooth

pulley which is attached by a chain to the celiling. The tension in the chain is:

A. 0

B. Mg

C. 2Mg

D. $\frac{1}{2}Mg$

Answer: c

Watch Video Solution

39. A gun of mass 10 kg fires 4 bullets per second. The mass of each bullet is 20 g and the vlocity of the bullet when it leaves the gun is $300ms^{-1}$ The force required to hold the gun while firing is :

A. 6N

B. 8N

C. 24 N

D. 240 N

Answer: c

Watch Video Solution

40. A force of 750 N is applied to a block of 100 kg to prevent it from sliding down an inclined plane of 30° inclination. If coefficients of static and kinetic friction are 0.4 and 0.2, the frictional force acting is :

A. 750 N

B. 500 N

C. 350 N

D. 250 N

Answer: c

Watch Video Solution

41. On the horizontal surface of a truck, a block of mass 1 kg is placed $(\mu = 0.6)$ and truck is moving with acceleration with $5m/s$ then the frictional force on the block will be:

A. 5N

B. 6N

C. 5.88 N

D. 8N

Answer: c

Watch Video Solution

42. A long horizontal rod has a bead which can slide along its length, and initially placed at a distance L from one end A of the rod. The rod is set in angular motion about A with constant

angular acceleration a. If the coefficient of friction between the rod and the bead is u, and gravity is neglected, then the time after which the bead starts slipping is :

A. infinitesimal

B. $\frac{mg}{4}$

C. $\frac{mg}{2}$

D. $mg(1-\mu)$

Answer: b

Watch Video Solution

43. A cubical block of side L rests on a rough horizontal surface with coefficient of friction u. A horizontal force F is applied on the block as shown. If the coefficient of friction is sufficiently high so that the block does not slide before toppling, the minimum force required to topple the block is:

A. infinitesimal

B. $\frac{mg}{4}$

C. $\frac{mg}{2}$

D. $mg(1-\mu)$

Answer: c

View Text Solution

44. The pulleys and strings shown in the Fig. are smooth and of negligible mass. For the system to be in equilibrium the value of angle θ is

A. 0°

B. 30°

C. 45°

D. 60°

Answer: c

View Text Solution

45. One end of a massless rope, which passes over a massless and frictionless pulley P is tied to a hook C. While the other end is free.

Maximum tension that the rope can bear is 360 N. With what value of maximum safe acceleration (in ms^{-2}) can a man of 60 kg climb on the rope ?

A. 16

B. 6

C. 4

D. 8

Answer: c

View Text Solution

46. What is the maximum value of the force F such that the block shown in the arrangement, does not move?

A. 20N

B. 10N

C. 12N

D. 15N

Answer: a

View Text Solution

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

A. 2N

B. 20N

C. 50N

D. 100N

Answer: a

View Text Solution

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

A. 0.01

B. 0.02

C. 0.03

D. 0.06

Answer: d

Watch Video Solution

49. 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

Answer: b

Watch Video Solution

50. When a U^{238} nucleus originally at rest, decays by emitting an alpha particle having speed 'u' the recoiled speed of residual nucleus is:

A. $\frac{-4u}{238}$

B. $\frac{4u}{238}$

C. $\frac{-4u}{234}$

D. $\frac{4u}{234}$

Answer: c

Watch Video Solution

51. A smooth block is released at rest on a 45° incline and then slides a distance 'd'. The time taken to slide is 'n' times as much to slide on rough incline than on a smooth incline. The coefficient of friction is

A. $\mu_k = 1 - \frac{1}{n^2}$

B. $\mu_k = \sqrt{1 - \frac{1}{n^2}}$

C. $\mu_s = 1 - \frac{1}{n^2}$

D. $\mu_s = \sqrt{1 - \frac{1}{n^2}}$

Answer: a

Watch Video Solution

52. The upper half of an inclined plane with inclination is perfectly smooth while the lower half is rough. A body starting from rest at the top will again come to rest at the bottom if

the coefficient of friction for the lower half is given by :

A. $2 \sin \phi$

B. $2 \cos \phi$

C. $2 \tan \phi$

D. $\tan \phi$

Answer: c

Watch Video Solution

53. A block is kept on a frictionless inclined surface with angle of inclination a. The incline is given an acceleration 'a' to keep the block stationary. Then a is equalto :

A. g//tan a

B. $g\cos ec\alpha$

C. g

D. $g\tan\alpha$

Answer: d

View Text Solution

54. A spherical shell of mass 20 kg is stationary at the top of a hill of height 100 m. It rolls down a smooth surface to the ground, then climbs up another hill of height 30 m and finally rolls down to a horizontal base at a height of 20 m above, the ground. The velocity attained by the ball is :

A. $40m/s$

B. $20m/s$

C. $10m/s$

D. $10\sqrt{30}m/s$

Answer: a

Watch Video Solution

55. The block of mass M moving on the frictionless horizontal surface collides with the spring of spring constant K and compresses it by length L. The maximum momentum of the

block after collision is

A. $\sqrt{MKL}$

B. $\frac{KL^2}{2M}$

C. zero

D. $\frac{ML^2}{K}$

Answer: a

View Text Solution

56. A 'T' shaped object with dimensions shown in the fig.,is lying on a smooth floor. A force 'F' is applied at the point P parallel to AB, such that the object has only the translational motion without rotation. Find the location of P with respect to C.

A. $\frac{2}{3}l$

B. $\frac{3}{2}l$

C. $\frac{4}{3}l$

D. I

Answer: c

View Text Solution

57. A player caught a circket ball of mass 150 g moving at a rate of 20 m/s. If the catching process is completed

in 0.1 s, the force of the blow exerted by the ball on the hand of the player is equal to :

A. 150 N

B. 3N

C. 30 N

D. 300 N.

Answer: c

View Text Solution

58. The string beween blocks of mass m and 2m is massless and inextensible. The system is suspended by a massless spring as shown. If

the string is cut find the magnitudes of accelerations of mass 2m and m (immediately after cutting):

A. g.g

B. $g, \frac{g}{2}$

C. $\frac{g}{2}, g$

D. $\frac{g}{2}, \frac{g}{2}$

Answer: c

Watch Video Solution

59. A block of mass 'm' is connected to another block of mass 'M' by a spring (massless) of spring constant 'k'. The blocks are kept on a smooth horizontal plane. Initially the blocks are at rest and the spring is unstretched. Then a constant force 'F' starts acting on the block of mass 'M' to pull it. Find the force on the block of mass 'm'.

A. $\frac{(M+m)F}{m}$

B. $\frac{mF}{(m+M)}$

C. $\frac{MF}{(m+M)}$

D. $\frac{mF}{M}$

Answer: b

Watch Video Solution

60. Two particles of mass m each are tied at the ends of a light string of length 2a. The whole system is kept on a frictionless horizontal surface with the string held tight so that each mass is at a distance 'a' from the center P (as shown in figure). Now, the mid-

point of the string is pulled vertically upwards with a small but constant force F. As a result, the particles move towards each other on the surface. The magnitude of acceleration, when the separation between them becomes 2x, is :

A. $\frac{F}{2m}\frac{a}{\sqrt{a^2-x^2}}$

B. $\frac{F}{2m}\frac{a}{\sqrt{x-x^2}}$

C. $\frac{F}{2m}\frac{x}{a}$

D. $\frac{F}{2m}\frac{\sqrt{a^2-x^2}}{x}$

Answer: b

Watch Video Solution

61. A particle moves in the X-Y plane under the influence of a force such that its linear momentum is $\overrightarrow{p}(t) = A[(\wedge)i\cos(kt) - (\wedge)\sin(kt)]$ where A and k are constants. The angle between the force and the momentum is:

A. 0°

B. 30°

C. 45°

D. 90°

Answer: d

View Text Solution

62. The figure shows the position-time (x-1)-graph of one dimensional motion of a body of mass 0.4 kg. The magnitude of each impulse is :

A. 0.2 Ns

B. 0.4 Ns

C. 0.8 Ns

D. 1.6 Ns.

Answer: c

View Text Solution

63. Two fixed frictionless inclined planes making an angle 30° and 60° with the vertical are shown in the Fig. Two blocks A and B are placed on the two planes. What is the relative

vertical acceleration of A with respect to B?

A. $4.9ms^{-2}$ in vertical direction

B. $4.9ms^{-2}$ in horizontal direction

C. $9.8ms^{-2}$ in vertical direction

D. Zero

Answer: a

View Text Solution

64. A block of mass m is on an inclined plane of angle e. The coefficient of friction between the block and the plane is μ and $\tan\theta > \mu$. The block is held stationary by applying a force P parallel to the plane. The direction of force pointing up the plane is taken to be positive. As P is varied from $P_1 = mg(\sin\theta - \mu\cos\theta)$ to $P_2 = mg(\sin\theta + \mu\cos\theta)$, the frictional force f versus P graph will look like.

A. 

B. 

C. 

D. 

Answer: a

View Text Solution

Multiple Choice Question Level Iii

1. A block of mass m is placed on a surface with a vertical cross section given by $y = \frac{x^3}{6}$ If the

coefficient of friction is 0.5, the maximum height above the ground at which the block can be placed without slipping is :

A. $\frac{1}{2}m$

B. $\frac{1}{6}m$

C. $\frac{2}{3}m$

D. $\frac{1}{3}m$

Answer: b

Watch Video Solution

2. Given in the figure are two blocks A and B of weight 20 N and 100 N, respectively. These are being pressed against a wall by a force F as shown. If the coefficient of friction between the blocks is 0.1 and between block B and the wall is 0.15, the frictional force applied by the wall on block B is:

A. 80 N

B. 120 N

C. 150 N

D. 100 N.

Answer: b

View Text Solution

Recent Competitive Questions

1. A ball rests upon a flat piece of paper on a table top.The paper is pulled horizontally but quickly towards right as shown. Relative to its initial position with respect to the table, the

ball :

(A) remains stationary if there is no friction between the paper and the ball.

(B) moves to the left and starts rolling backwards, i.e.to the left if there is a friction between the paper and the ball

(C) moves forward, i.e. in the direction in which the paper is pulled Here, the correct statement/s is/are :

A. only (A)

B. only (B)

C. both (A) and (B)

D. only (C)

Answer: c

View Text Solution

2. A boy throws a cricket ball from the boundary to the wicket-keeper. If the frictional force due to air cannot be ignored, the forces acting on the ball at the position X are

represented by :

A. 

B. 

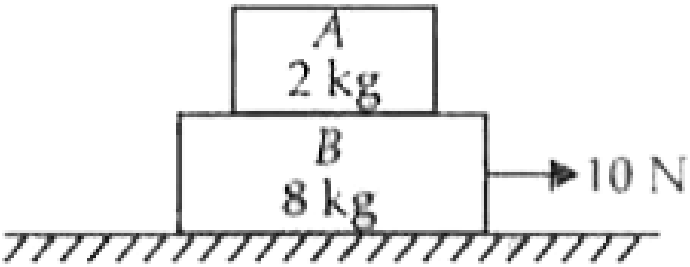
C. 

D. 

Answer: a

View Text Solution

3. Block A of mass 2 kg is placed over block B of mass 8 kg .The combination is placed over a rough horizonatal surface .Cofficient of friction between B and the floor is 0.5 .Coefficient of friction berween A and B is 0.4 .A horizontal force of 10 N is applied on block B .The force of friction between A and B is (g=10 ms^{-2})



A. 100N

B. 40N

C. 50N

D. zero

Answer: d

Watch Video Solution

4. A block kept on a rough surface starts sliding when the inclination of the surface is θ with respect to the horizontal . The coefficient of static friction between the block and the surface is

A. $\sin\theta$

B. $\tan\theta$

C. $\cos\theta$

D. $\sec\theta$

Answer: b

Watch Video Solution

5. A gun fires a small bullet with kinetic energy K. Then kinetic energy of the gun while recoiling is

A. K

B. more than K

C. less than K.

D. $\sqrt{K}$

Answer: c

Watch Video Solution

6. A uniform chain of length L is lying partly on a table the remaining part hanging down from the edge of the table. If the coefficient of friction between the chain and the table is 0.5, what is the minimum length of the chain that should lie on the table, to prevent the chain from slipping down to the ground ?

A. $L/3$

B. $L/2$

C. $2L/3$

D. $3L/4$

Answer: c

Watch Video Solution

7. A man weighing 70 kg, riding a motorbike weighing 230 kg at $54kmhr^{-I}$, accelerates at Ims^{-2} for 10 s when suddenly a child rushes into the road. The rider manages to apply brakes screeching to bring his vehicle to a halt

in 3 s, just in time to save the child. What should have been the average retarding force on the vehicle ?

A. $1.5N$

B. $2.5N$

C. 3.5

D. $4.5N$

Answer: (none)

Watch Video Solution

Revision Test

1. When a carpet is beaten with a stick, dust comes out of it. Explain.

A. Newton's Ist law of motion

B. Newton's Ist 2aw of motion

C. Newton's Ist 3aw of motion

D. None of these.

Answer: A

 Watch Video Solution

2. A Frame of reference attached to a satellite orbiting around earth can be regarded as:

A. An inertial frame of reference

B. Non-inertial frame of reference

C. both inertial as well as non-inertial

D. None of these

Answer: B

Watch Video Solution

3. A Diwali rocket is ejecting 0.05 kg of gases per second at a velocity of 200 m//s. The accelerating force on the rocket is :

A. 10 N

B. 20 N

C. SN

D. 5 dynes

Answer: A

Watch Video Solution

4. A 70 kg man stands spring balance in a lift that is going down with a constant speed of 10 m//s. If the lift is brought to rest in 10 m by a constant raterdation, then what does the scale read during this period ? Take $g = 10m/s^2$

A. 70 kg

B. 105 kg

C. 35 kg

D. None of these

Answer: B

 Watch Video Solution

5. A cannon after firing recoils due to:

A. Conservation of energy

B. Newton's first law of motion

C. Newton's third law of motion

D. Backward thrust of gases produced

Answer: C

Watch Video Solution

6. A man getting down a running train falls forward because :

A. Train exerts a force on the man in the forward direction

B. Road exerts a force on man in forward direction

C. Due to Inertia of rest, the road is left behind and man reaches forward

D. Due to inertia of motion upper part of the body con tinues to be in motion in forward direction while feet come to rest as soon as they touch the road

Answer: D

Watch Video Solution

7. An athlete takes a long run before the jump. Explain why?

A. It helps to apply a large force

B. By running the athlete gives himself larger inertia of motion

C. He gains energy to take him through long distance

D. By running action and reaction forces increase.

Answer: D

Watch Video Solution

8. Which one of the following force is conservative ?

A. Gravitational force

B. Frictional force

C. Air resistance

D. Viscous force.

Answer: A

Watch Video Solution

9. Which one of the following forces is non-conservative ?

A. Electrostatic force

B. Frictional force

C. Elastic force

D. Viscous force

Answer: D

 Watch Video Solution

10. A passenger in a moving train tosses a coin. If the coin falls behind him, the train must be moving :

A. With a uniform speed

B. With a deceleration

C. With an acceleration

D. Any of the above.

Answer: C

Watch Video Solution

11. A vehicle is driven along a straight horizontal track by a motor which exerts a constant driving force. The vehicle starts from rest and the effects of friction and air resistance are negligible. Which of these graphs represents the vehicles kinetic energy with time 'r'?

A. 

B. 

C. 

D. 

Answer: D

View Text Solution

12. A rocket of initial mass m, moving with a velocity of v, discharges a jet of gases of mean density $\rho$and effective area A. The minimum value of v of fuel gas which enables the rocket to rise vertically above is nearly :

A. $\left(\frac{\rho g}{M_0 A}\right)^{1/2}$

B. $\left(\frac{\rho g A}{M_0}\right)^{1/2}$

C. $\left(\frac{m_0 g}{\rho A}\right)^{1/2}$

D. $\left(\frac{2m_0 g}{\rho}\right)^{1/2}$

Answer: A

Watch Video Solution

13. A monkey is descending from the branch of a tree with a constant acceleration. If the breaking strength of the branch is 75% of the weight of the monkey, the minimum

acceleration with which hte monkey can slide down without breaking the branch is :

A. 8

B. $g/4$

C. $3g/4$

D. $g/2$

Answer: B

Watch Video Solution

14. A mass of 10 g moving horizontally with a velocity of 100 m/s, strikes a pendulum bob of mass 10 y. The two masses strike together. The maximum height reached by the system now is $g = 10m/s$):

A. zero

B. 5 cm

C. 125 m

D. 2.5 m

Answer: C

Watch Video Solution

15. A bomb at rest explodes into three parts of the same mass. The momentum of the parts are $2P\hat{i}$ and $P\hat{j}$ The momentum of the third part will have a magnitude of:

A. P

B. $P\sqrt{5}$

C. $\sqrt{3P}$

D. Zero

Answer: B

Watch Video Solution

16. A ball weighing 10 gm 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 sec. The average force exerted by the surface on the ball is :

A. 0.1 N

B. 10 N

C. 100 N

D. IN

Answer: B

Watch Video Solution

17. In the above question, if the string C is strucjed slowly then:

A. The portion AB of the string will break

B. Neither string will break

C. The portion BC will break

D. None of these.

Answer: A

View Text Solution

18. A force of 5 N making an angle with the horizontal acting on an object displaces it by 0.4 m along the horizontal direction. If the

object gains kinetic energy of 1 J, the horizontal component of the force is :

A. 1.5 N

B. 2.5 N

C. 3.5 N

D. 4.5 N

Answer: B

Watch Video Solution

19. A uniform chain of length L and mass m is lying on a smooth table. One third of its length is hanging verti cally down over the edge of the table. How much work need to be done to pull the hanging part back to the table ?

A. $\frac{mgL}{2}$

B. $\frac{mgL}{18}$

C. $\frac{mgL}{32}$

D. $\frac{mgL}{24}$

Answer: B

Watch Video Solution

20. An object is placed on the surface of smooth inclined plane of inclination . It takes time to reach the bottom. If the same object is allowed to slide down the rough inclined plane of the same inclination, the time to reach the bottom is increased n times, where $n > 1$. The coefficient of friction for the plane is :

A. $\mu = \cot\theta\left[1 - \frac{1}{n^2}\right]^{1/2}$

B. $\mu = \tan\theta\left[1 - \frac{1}{n^2}\right]$

C. $\mu = \tan\theta\left[1 - \frac{1}{n^2}\right]$

D. $\mu = \cot\theta\left[1 - \frac{1}{n^2}\right]$

Answer: C

Watch Video Solution

21. Three concurrent forces of the same magnitude are in equilibrium. What is the

angle between the forces ? Also name the triangle formed by the forces as sides :

A. 60°, equilatreal triangle.

B. 120°, equilateral triangle

C. $120^\circ, 30^\circ, 30^\circ$ an isosceles triangle

D. 120°, an obtuse angled triangle.

Answer: B

Watch Video Solution

22. A particle is projected along the line of greatest slope up a rough inclined plane at an angle of 45° with the horizontal. If the coefficient of friction is $\frac{1}{2}$ then the retardation is :

A. $\frac{g}{2}$

B. $\frac{g}{2\sqrt{2}}$

C. $\frac{3g}{2\sqrt{2}}$

D. $\frac{g}{\sqrt{2}}$

Answer: C

Watch Video Solution

23. A mass of 1 kg is suspended by a thread. It is : (i) lifted up with an acceleration $4.9m/s^2$, (ii) lowered with an acceleration $4.9m/s^2$. The ratio of the tensions is :

A. $3:1$

B. $1:2$

C. $1:3$

D. $2:1$

Answer: A

Watch Video Solution

24. A long horizontal rod has a bead which can slide along its length, and initially placed at a distance L from one end A of the rod. The rod is set in angular motion about A with constant angular acceleration a. If the coefficient of friction between the rod and the bead is u, and gravity is neglected, then the time after which the bead starts slipping is :

A. $\sqrt{\frac{\mu}{\alpha}}$

B. $\frac{\mu}{\sqrt{\alpha}}$

C. $\frac{1}{\sqrt{\mu\alpha}}$

D. infinitesimal.

Answer: A

Watch Video Solution

25. A cart is moving with a velocity 20 m/s. Sand is being dropped into the cart at the rate

of 50 kg/min. The force required to move the cart with constant velocity will be :

A. 50 N

B. 30.33 N

C. 26.45 N

D. 16.66 N.

Answer: D

Watch Video Solution

26. The mass of block A is 100 kg and that of block B is 200 kg. The coefficient of friction between A and B is 0.2 and that between B and ground level is 0.3. The minimum force which will make the block B move, will be:

A. 900 N

B. 100 N

C. 1100 N

D. 1200 N.

Answer: C

Watch Video Solution

27. A body of weight 64 N' is pushed with justs enough force to start it move in 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.

Answer: D

 Watch Video Solution

28. 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°

B. 120°

C. 150°

D. 90°

Answer: B

Watch Video Solution

29. A cylinder rolls up an inclined plane, reaches some height, and then rolls down (without slipping throughout these motions).

The directions of the frictional force acting on the cylinder are :

A. up the incline while ascending and down the incline while descending

B. up the incline while ascending as well as descending

C. own the incline while ascending and up the incline while descending.

D. down the incline whiel ascending as well as descending.

Answer: A

Watch Video Solution

30. A block of weight 200 N is pulled along a rough hori zontal surface at constant speed by a force 100 N acting at an angle 30° above the horizontal. The coefficient of kinetic friction between the block and the surface is :

A. 0.43

B. 0.58

C. 0.75

D. 0.83

Answer: B

Watch Video Solution

31. A force $\overrightarrow{F} = 6t^2\hat{i} + 4t\hat{j}$ is acting on a particle of mass 3 kg, then what will be velocity of particel at t = 3 sec if at t = 0, particle is at rest :

A. $181\hat{i} + 6\hat{j}$

B. $181\hat{i} + 12\hat{j}$

C. $12\hat{i} + 6\hat{j}$

D. none.

Answer: A

Watch Video Solution

32. A 10 kg box is placed on a surface. Coefficient of friction between surface and box

is u = 0.5. Horizontal force of 100N is applied.

Acceleration of block will be :

A. $2.5m/s^2$

B. $5m/s^2$

C. $7.5m/s^2$

D. none of these.

Answer: B

Watch Video Solution

33. A boat is travelling on a river with a speed of 3m/sec. The force on the boat by water is 500N. The power delivered by the engine of the boat is :

A. 1.5 kW

B. 50 kW

C. 150 W

D. 15 kW.

Answer: A

Watch Video Solution

Watch video solution

34. A constant force acts on a body of mass 0.9 kg at rest for 10s. If the body moves a distance of 250m, the magnitude on the force is :

A. 8N

B. 36 N

C. 4.0 N

D. 4.5 N

Answer: D

Watch Video Solution

35. A rope of length 5m, is kept on frictionless surface and a force of 5N is applied to one of its end. Find tension in the rope at 1 m from this end

A. 1N

B. 3N

C. 4N

D. 5 N

Answer: C

Watch Video Solution

36. A rocket of mass 5000 kg is to be projected vertically.The gases are exhausted with a velocity 1000 ms-w.rt. to the rocket vertically downwards what will be the minimum rate of burning the fuel against gravity ?

A. $49kgs^{-1}$

B. $147kgs^{-1}$

C. $98kgs^{-1}$

D. $196kgs^{-1}$

Answer: A

Watch Video Solution

37. In the above question, if the rocket is to be launched with acceleration 3g' what is the minimum rate of burning the fuel ?

A. $49kgs^{-1}$

B. $147kgs^{-1}$

C. $196kgs^{-1}$

D. $98kgs^{-1}$

Answer: C

View Text Solution

38. The ratio of the weight of the man in stationary lift and in a life accelerating downwards with uniform acceleration is 3:2. The acceleration of the lift is :

A. $g/3$

B. $g/2$

C. g

D. $2g$

Answer: A

Watch Video Solution

39. A particle moves so that it acceleration is always twice its velocity. If its initial velocity is $0.1ms^{-1}$ its velocity after it has gone 0.1 mis :

A. $0.3ms^{-1}$

B. $0.7ms^{-1}$

C. $1.2ms^{-1}$

D. $3.6ms^{-1}$

Answer: A

Watch Video Solution

40. A block of wood is kept on the floor of a stationary lift.The lift begins to descend with an acceleration of $12ms^{-2}$. The displacement

of the block duringthe first 0.2 second after the start is $\left(g = 10ms^{-2}\right)$:

A. 0.02

B. 0.1 m

C. 0.2 m

D. 0.4 m

Answer: C

Watch Video Solution

41. Two Trolleys of masses m and 3m are connected by a spring. They are compressed are released on uniformly rough surface. They move in the opposite directions through distances S, and S, Iespectively. The ratio of distances S: S, is:

A. $1:9$

B. $1:3$

C. $3:1$

D. $9:1$

Answer: D

Watch Video Solution

42. A body of mass 'm' has its position x at a time t given by $x = 3t^{3/2} + 2t - 1/2$. The instantaneous force acting is proportional to :

A. $t^{3/2}$

B. t

C. $t^{-1/2}$

D. $t^{1/2}$

Answer: C

Watch Video Solution

43. An insect crawls a rough hemispherical surface. The coefficient of friction between it and surface is $1/3$. If the line joining the insect and the centre of surfaces makes an angle a with the vertical, the maximum possible value of a is :

A. $\cot \alpha = 3$

B. $\tan\alpha = 3$

C. $\sec\alpha = 3$

D. $\cos ec.\ \alpha = 3.$

Answer: A

 Watch Video Solution