PHYSICS

AAKASH INSTITUTE ENGLISH

TEST 3

Example

1. A ring of radius 'R' having change 'q' uniformly distributed over it passes through a sphere lies at circumference of ring the centre

of ring lies at surface of sphere.Then flux linked with sphere is

A. $\frac{q}{3\varepsilon_0}$

B. $\frac{q}{2\varepsilon_0}$

C. $2\frac{q}{3\varepsilon_0}$

D. $\frac{q}{4\varepsilon_0}$

Answer:

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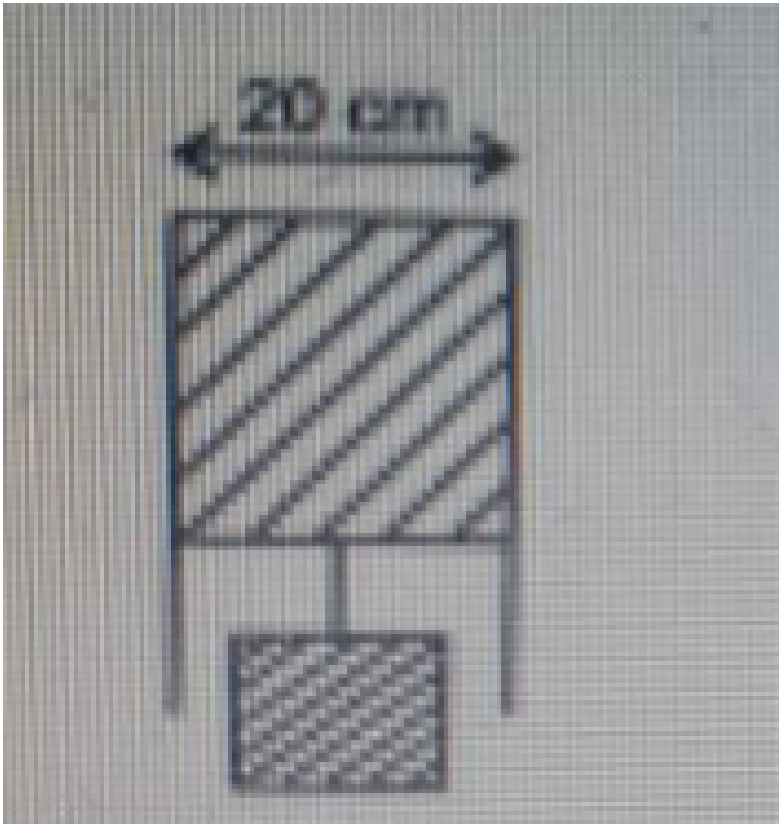
2. A thin film of liquid is formed in a rectangular frame of wire and a light slider supports a weight of $\left(2.5 \cdot 10^{-2}\right) N$.The length of slider is 20cm and its weight negligible. The surface tension is liquid is



A. $6.25 \cdot 10^{-2} Nm^{-1}$

B. $12.5 \cdot 10^{-2} Nm^{-1}$

C. $25 \cdot 10^{-2} Nm^{-1}$

D. $2.5 \cdot 10^{-2} Nm^{-1}$

Answer:

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3. A train is moving with speed 72 km/h towards a hill blows a whistle of frequency

1240Hz. the frequency of echo heard by driver is(speed of sound=330m/s)

A. 1440 Hz

B. 1400 Hz

C. 1320 Hz

D. 1420 Hz

Answer: B

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4. A cylinder containing water upto a height of 25cm has a hole of area of cross section $\frac{1}{4}cm^2$ in its bottom. It is counterpoised in a balance. The initial change in its weight, when water just starts flowing out is

A. Increases by 12.5 gm-wt

B. Increases by 6.25 gm-wt

C. Decreases by 12.5 gm-wt

D. Decreases by 6.25 gm-wt

Answer:

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5. Two bulbs of rated power 60W and 100W same specified voltage 220 V are connected in series to a 440 V DC source

A. 60W bulb gives more brightness

B. 100W bulb gives more brightness

C. 100W bulb will get fused

D. 60W bulb gets fused

Answer:

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6. A particle is executing SHM along a straight line. Then choose the correct statement

A. Acceleration always decreases the speed of particle

B. Acceleration is maximum at mean position

C. Acceleration is minimum at extreme position

D. Acceleration varies with time and becomes maximum when particle is at rest

Answer:

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7. The following configuration of gate is equivalent to

A. NAND

B. XOR

C. OR

D. NOR

Answer:

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8. In the following circuit the current flowing through zener diode is

A. 10 mA

B. 5 mA

C. 6.67mA

D. 3.33 mA

Answer:

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9. energy of an electron system in the first excited state is -13.6 eV . This is

A. H atom

B. He^+ ion

C. Li^{2+} ion

D. Be^{3+} ion

Answer:

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10. A proton and an alpha particle is projected with equal kinetic energy in transverse uniform magnetic field B. The ratio of radii of proton to that of alpha particle is

A. $1:1$

B. $1:2$

C. $1:\sqrt{2}$

D. $\sqrt{2}:1$

Answer:

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11. In the circuit shown there is a box containing a resistor and an inductor and the box in series with the capacitance C connected

to alternating power source of frequency to 2 rad/s. Box has power factor $\frac{1}{\sqrt{2}}$ and circuit has overall power factor 1. The impedance of the box is

A. $\frac{1}{\sqrt{2}C}$

B. $\frac{1}{2\sqrt{2}C}$

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

D. $\frac{1}{C}$

Answer:

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12. After 225 days the activity of a sample is 4000 decay/s. The activity reduces to 2000 decay/s after another 75 days. The initial activity of the sample is

A. 16000 decay/s

B. 20,000 decay/s

C. 24,000 decay/s

D. 32,000 decay/s

Answer:

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13. A nucleus at rest disintegrates into two equal parts which have their speeds in the ratio $8:1$. Ratio of the nucleus size will be

A. $2\sqrt{2}:1$

B. $1:2\sqrt{2}$

C. $1:2$

D. $1:1$

Answer:

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14. Two blocks A and B are shown in figure have masses 5 kg and 4kg respectively. The system is released from rest. The speed of B after A has travelled the distance 1 m along the incline is (take $g = 10\frac{m}{s^2}$,pulleys and strings are ideal and plane is smooth)

A. $\sqrt{\frac{6}{5}}$ m/s

B. $\sqrt{\frac{3}{2}}$ m/s

C. $\sqrt{\frac{5}{6}}$ m/s

D. $\sqrt{\frac{2}{3}}$ m/s

Answer:

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15. A small disc of mass m is released at height h ,on a circular track of radius R, whose part AB has sufficient friction to prevent slipping ,while BC smooth. The maximum height attained by disc on BC is

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

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

C. h

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

Answer:

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16. The electric and magnetic field of an electromagnetic wave are:-

A. In phase and parallel to each other and also parallel to the direction of propagation of wave

B. In phase, parallel to each other and perpendicular to the direction of propagation of wave

C. In phase and perpendicular to each other and also perpendicular to the direction of propagation of wave

D. Out of phase, perpendicular to each other and perpendicular to the direction of the propagation of life

Answer:

17. In a photoelectric experiment the wavelength of incident light changes from 4000 Å to 2000 Å. The change in stopping potential is

A. 6.2 V

B. 3.1 V

C. 2.1 V

D. 4.1 V

Answer:

18. An α - particle is accelerated through a potential difference of 100 V. Its de-Broglie's wavelength is

A. 0.2 nm

B. 0.02 nm

C. 0.1 nm

D. 0.001 nm

Answer:

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19. In the circuit as shown in figure, energy stored in capacitor at steady state is

A. 36 muJ

B. 48 muJ

C. 24 muJ

D. 72 muJ

Answer:

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20. In the given circuit current flowing through

2 Omega resistance is

A. 0.20833333333333

B. 2.5 A

C. Zero

D. 0.41666666666667

Answer:

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21. Two polaroids are placed such that their planes are parallel to each other with their access of transmission at 30°. If an unpolarised

light of intensity I_0 is incident on first polaroid polarizer then intensity of light that will be transmitted through the second polaroid is

A. $\frac{I_0}{2}$

B. $\frac{I_0}{8}$

C. $3\frac{I_0}{4}$

D. $3\frac{I_0}{8}$

Answer:

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22. A Ray of light is incident at an angle 60^{o} on one face of a prism which has protecting angle of 30^{o}. The emerging ray deviates through 30^{o} from incident light. The refractive index of material of prism is

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

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

C. 2

D. $\sqrt{3}$

Answer:

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23. A rod of mass m is hinged at upper end A as shown in the figure. A point object having mass m in Strike at lower end and stops. The maximum angle through which rod will rotate is $\left(Given v^2 < \left(2g\frac{l}{3}\right)\right)$

A. $\cos^{-1}\left(1-\left(\frac{3v^2}{2gl}\right)\right)$

B. $\cos^{-1}\left(1-\left(\frac{3v^2}{gl}\right)\right)$

C. $\cos^{-1}\left(1-\left(\frac{v^2}{2gl}\right)\right)$

D. $\cos^{-1}\left(1-\left(\frac{v^2}{gl}\right)\right)$

Answer:

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24. A thin rod, carrying current i_2 is placed near a long straight wire carrying current i_1 in the plane of rod as shown in figure. The motion of rod is

A. Translatory

B. Rotatory

C. Translatory as well as rotatory

D. Will not experience any force

Answer:

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25. A wire frame of given shape, carrying current of 10 A is placed in uniform magnetic field 100 T directed into the plane of paper as shown in figure. The net force acting on frame is

A. $100\hat{j}N$

B. 100

C. $67.5\hat{j}N$

D. $67.5\widehat{-j}N$

Answer:

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26. If angle of dip shown by a dip circle at 30° with magnetic meridian is 60°, then the angle of dip shown by dip circle at 45° with magnetic meridian is

A. $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$

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

C. $\tan^{-1}\left(\frac{1}{\sqrt{}}2\right)$

D. $\tan^{-1}\left(\frac{3}{\sqrt{}}2\right)$

Answer:

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27. The ratio of $v_{ms} : v_{mp} : v_{avg}$ is (Symbols have their usual meaning)

A. $\sqrt{3}:\sqrt{2}:\sqrt{\frac{\pi}{8}}$

B. $\sqrt{3}:\sqrt{2}:\sqrt{\frac{8}{3}}$

C. $\sqrt{3}:\sqrt{\frac{8}{\pi}}:\sqrt{2}$

D. $\sqrt{3}:\sqrt{2}:\sqrt{\frac{8}{\pi}}$

Answer:

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28. A satellite is moving with speed v in a circular orbit about the earth. An object of a mass 2m is ejected from the satellite such that

it just escapes from the gravitational pull of earth. At the time of ejection the kinetic energy of object is

A. $\frac{1}{2}mv^2$

B. mv^2

C. $2mv^2$

D. $\frac{3}{2}mv^2$

Answer:

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29. In a thermodynamic cyclic process ABC, internal energy at A is 10J and at B is 70J. Heat given in process B to C is 100J, then heat released or absorbed in process C to A is

A. 760 J (absorbed)

B. 760 J (released)

C. 240 J (absorbed)

D. 240 J (released)

Answer:

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30. A body of mass 10 kg moves along a straight line y=x+5, where x and y are in metres with velocity 2 m/s. Its angular momentum about a point having co-ordinate (0,1) is

A. $100kgm^2s^{-1}$

B. $80kgm^2s^{-1}$

C. $100\sqrt{2}kgm^2s^{-1}$

D. $40\sqrt{2}kgm^2s^{-1}$

Answer:

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31. A particle located at position x=0, at time t=0, starts moving along the positive x-direction with a velocity $v^2 = \alpha x$ (where alpha is a positive constant). The displacement of particle is proportional to

A. t^2

B. 2/t

C. t

D. 1/t

Answer:

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32. A projectile is projected in air with initial velocity $\vec{v} = \left(3\hat{i} + 4\hat{j}\right)$ m/s from the origin. The equation of trajectory of the projectile is given as $\left(g = -10\hat{j}\frac{m}{s^2}\right)$ (neglect air resistance)

A. $y = 12x - 5x^2$

B. $y = 3x - 4x^2$

C. $9y = 12x - 5x^2$

D. $12y = 12x - 5x^2$

Answer:

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33. When key K is open in a circuit as shown in figure, an ideal voltmeter reads 1.53 V. If key is closed then ideal ammeter reads 1A and voltmeter reads 1.03 V. Then EMF of cell and external resistance R are respectively

A. 1.03 V, 1.53 Omega

B. 1.53 V, 0.5 Omega

C. 1.53 V, 1.03 Omega

D. 1.03 V, 1.03 Omega

Answer:

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34. Let gravitational potential energy U is given by $U = A\frac{\sqrt{x}}{B + x^2}$, where x is distance. The dimensional formula of A/B is

A. $\left[ML^{\frac{5}{2}}T^{-2}\right]$

B. $\left[ML^{\frac{1}{2}}T^{-2}\right]$

C. $\left[ML^{\frac{3}{2}}T^{-2}\right]$

D. $\left[ML^{2}T^{-2}\right]$

Answer:

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35. A body of mass m hits a wall with speed v at an angle of $30 degree$ with normal and reflects at same angle from normal on other side of

normal. The magnitude of change in linear momentum of the body is (Consider elastic collision)

A. $\frac{8\sqrt{3}mv}{2}$

B. mv

C. $\sqrt{3}mv$

D. Zero

Answer: c

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36. If net external force acting on the system is zero then

A. Velocity of the individual particle of the system will remain constant

B. Velocity of the center of mass of the system will remain constant

C. Velocity of the center of mass of the system will be zero

D. Velocity of the individual particle of the system will be zero

Answer: c

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37. For given system as shown in figure, the acceleration of block of mass $m\left(m=\frac{M}{2}\right)$ kept on smooth table when the system is released from rest is (Strings and pulleys are ideal)

A. $\frac{g}{4}$

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

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

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

Answer: b

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38. A balloon os mass 2 KG is rising up with an acceleration of $4\frac{m}{s^2}$. The upward force acting on the balloon is `(g = 10 ms^-2)

A. 0.8 kgf

B. 2.8 kgf

C. 2.4 kgf

D. 2.0 kgf

Answer: b

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39. A 50 kg man stuck in flood is being lifted vertically by an army helicopter with the help of light rope which can bear a maximum tension of 70 kg-wt. The maximum acceleration

with which helicopter can rise so that rope does not breaks is $\left(g = 9.8ms^{-2}\right)$

A. $4.00ms^{-2}$

B. $3.92ms^{-2}$

C. $3.52ms^{-2}$

D. $3.00ms^{-2}$

Answer: d

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40. A block of mass M is in contact with a cart of mass M. The coefficient of static friction between block and cart is μ . To prevent the block from sliding on cart, acceleration a should be

A. $a > \frac{mg}{(m+M)\mu}$

B. $a \geq \frac{g}{\mu}$

C. $a < \frac{g}{\mu}$

D. $a < \frac{mg}{M\mu}$

Answer: b

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41. A circular race track of radius 120 m is banked at an angle of 53^o . The optimum speed of car to avoid wear and tear of its tyres is (g = 10 ms^-2)

A. 40 m/s

B. 20 m/s

C. 30 m/s

D. 10 m/s

Answer: b

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42. A force F is acting at an angle θ with horizontal on a block of mass 12 kg placed on a rough horizontal surface having coefficient of friction $\mu = \frac{3}{4}$ as shown in the figure. The minimum value of force F to just move the block will be ($g = 10ms^{-2}$)

A. 36N

B. 96N

C. 72N

D. 54N

Answer:

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43. If a body under the action of force $\left(6\hat{i}+8\hat{j}-10\hat{k}\right)$ N. acquires an acceleration of magnitude $5ms^{-2}$. Then the mass of body is

A. $\sqrt{2}$ kg

B. $10\sqrt{2}$ kg

C. $2\sqrt{2}$ kg

D. $5\sqrt{2}$ kg

Answer: b

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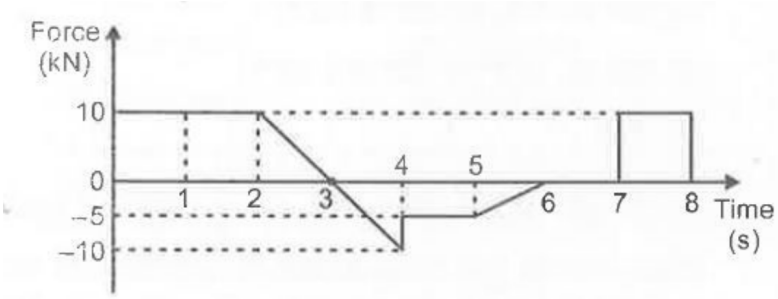
44. The force acting on a particle of mass 20 kg is indicated by force - time graph as shown in figure. The magnitude of change in linear

momentum of particle during time interval 0 to 6 second is



A. 27.5 kN-s

B. 2.5kN-s

C. 12.5kN-s

D. 15kN-s

Answer: c

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45. Velocity vectors of three masses 2kg,1kg and 3 kg are $\overrightarrow{v}_1 = \left(\hat{i} - 2\hat{j} + \hat{k}\right)\frac{m}{s}, \overrightarrow{V}_2 = \left(2\hat{i} + 2\hat{j} - \hat{k}\right)\frac{m}{s}$ and $\overrightarrow{v}_3$ respectively. If velocity vector of center of mass of the system is zero then value of $\overrightarrow{v}_3$ will be

A. $\left(\frac{2\hat{i} + 2\hat{j} - \hat{k}}{3}\right)$ m/s

B. $\left(\frac{-4\hat{i} + 2\hat{j} - \hat{k}}{3}\right)$ m/s

C. $\left(\frac{2\hat{i} + 3\hat{j} - \hat{k}}{3}\right)$ m/s

D. $\left(\frac{-2\hat{i}+3\hat{j}-\hat{k}}{3}\right)$ m/s

Answer: b

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46. A block is moving on a rough surface. At time t = 0, speed of the block is 20 m/s. Coefficient of friction (μ) between block and surface varies with time (t) as shown in figure. The magnitude of velocity of particle after t = 2 second is (g = 10 ms^-2)

A. -2.5 m/s

B. 17.5 m/s

C. 15.0 m/s

D. Zero

Answer: A

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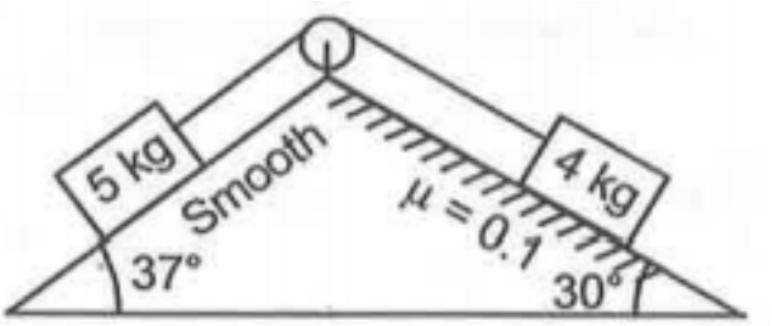
47. Two blocks of masses 5 kg and 4 kg are connected with ideal string which is passing over an ideal pulley as shown in figure. If the

system is released from rest then the magnitude of acceleration of the blocks will be (Take $g = 10ms^{-2}$ and $\sqrt{3} = 1.7$)



A. $\frac{11}{15}ms^{-2}$

B. $\frac{11}{45}ms^{-2}$

C. `frac{11}{30}ms^-2

D. $\frac{11}{60}ms^{-2}$

Answer: d

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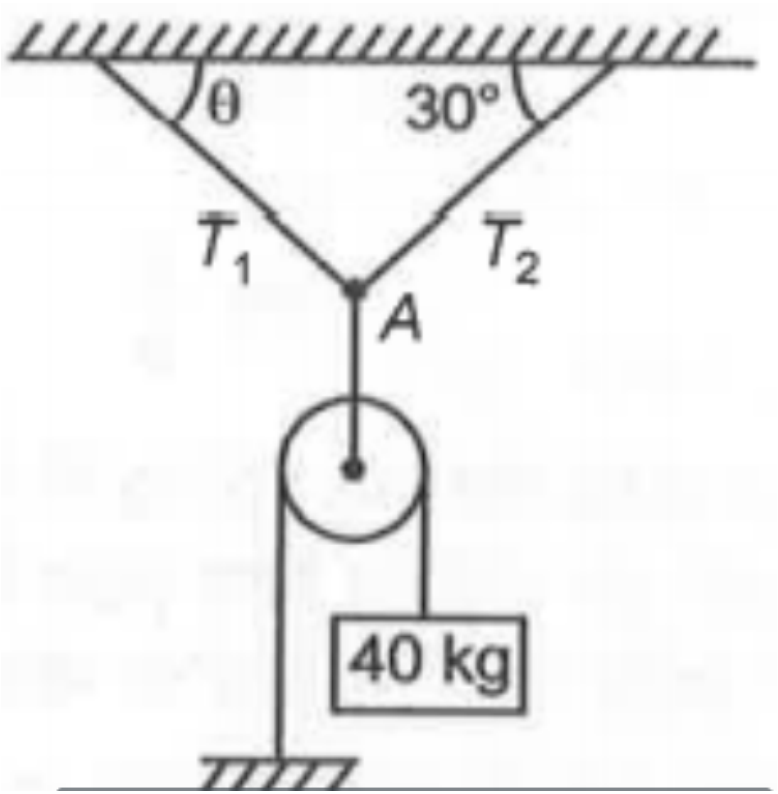
48. For the arrangement shown in figure, angle θ for which tension T_1 in the left string will be

minimum is (Pulley and strings are ideal)



A. 30^o

B. 60^o

C. 90^o

D. 45^o

Answer: a

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49. A particle of mass 200g is attached to an ideal string of length 1.30 m whose upper end is fixed to ceiling. The particle is made to revolve in a horizontal circle of radius 50 cm. The tension in the string is $\left(g = 10\frac{m}{s^2}\right)$

A. $\frac{13}{6}N$

B. $\frac{11}{6}N$

C. $\frac{26}{5}N$

D. Zero

Answer: d

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50. Two blocks of masses m_1 = 4 kg and m_2 = 2kg connected by a massless rod slide down on an inclined plane of inclination 37^o as shown in figure. If coefficient of friction of m_1 and m_2

with inclined plane are μ_1 = 0.75 and μ_2 = 0.25 respectively, then tension (T) in the rod is (g = 10 ms^{-2})

A. $\frac{16}{5}N$

B. $\frac{16}{3}N$

C. 0N

D. 3N

Answer: c

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51. The potential energy of a particle in a conservative field is `U =a/r^3-b/r^2, where a and b are positive constants and r is the distance of particle from the centre of field. For equilibrium, the value of r is

A. $\frac{2a}{b}$

B. $\frac{3a}{2b}$

C. $\frac{a}{2b}$

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

Answer: b

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52. A particie of mass 10 kg is driven by a machine that delivers a constant power of 20 watts. If particle starts from rest and moves along a straight line, then force (in Newton) on particle at time t(t> 0) is

A. $10\sqrt{t}$

B. $\frac{10}{\sqrt{t}}$

C. $\frac{20}{\sqrt{t}}$

D. $\frac{1}{\sqrt{t}}$

Answer: d

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53. A particle moves from point $\left(\hat{i}+\hat{j}\right)$m to a point $\left(6\hat{i}-2\hat{j}\right)$m under the action of force $\left(10\hat{i}-2\hat{j}\right)$N. The work done by the force is

A. 8 J

B. 56 J

C. 64 J

D. Zero

Answer: c

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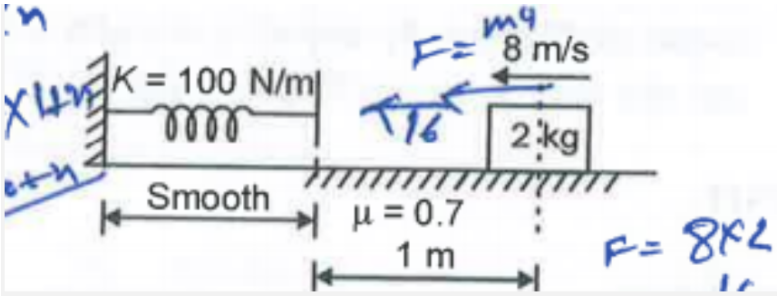
54. Free end of an ideal spring of spring constant 100 N/m is at a distance 1 m from a vertical block of mass 2 kg moving on rough surface with initial speed 8 m/s as shown in figure. If coefficient of friction is 0.7, then maximum compression in spring is

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



A. 1 m

B. 0.5 m

C. 0.75 m

D. 0.25 m

Answer: a

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55. 500 J of work is done in sliding a 4 kg block up along a rough inclined plane to a vertical height of 10 m slowly. The work done against friction is $\left(g = 10\frac{m}{s^2}\right)$

A. 400 J

B. 100 J

C. 200 J

D. Zero

Answer: a

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56. If force on a particle $\overrightarrow{F} = (\sin at)\hat{i} + (\cos at)\hat{j}$ and displacement $\overrightarrow{S} = \sin\left(\frac{at}{3}\hat{i}\right) + \cos\left(\frac{at}{3}\right)\hat{j}$ are functions of time (t) then value of t at which they are perpendicular for first time is (a is positive constant and t>0)

A. $t = \frac{\pi}{2}$

B. $t = \frac{3\pi}{2a}$

C. $t = \frac{3\pi}{4a}$

D. $t = \frac{\pi}{3}$

Answer: c

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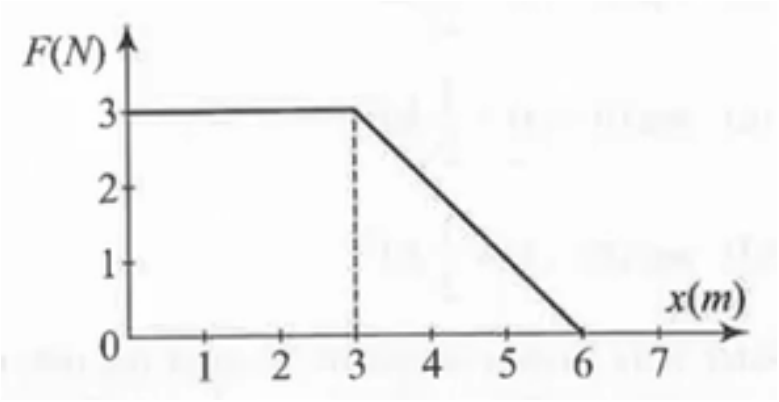
57. A force F acting on an object varies with distancex as shown in figure. Work done by the force in moving the object from x = 1 m to x= 6 m is



A. 275 J

B. 425 J

C. 250 J

D. 350 J

Answer: a

58. A particle starts moving from rest along y axis and a variable force F acts on it such that

$F \propto y^{-\frac{1}{5}}$ (y>0). The variation of power P of this force with y is given as

A. $P \propto y^{\frac{1}{5}}$

B. $P \propto y^{-\frac{1}{5}}$

C. $P \propto y^{\frac{2}{5}}$

D. P = constant

Answer:

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59. Two bodies of masses m and 2m are moving along positive x and y axes respectively with equal speed $4ms^{-1}$. They collide at origin and stick together. The final velocity of combined mass is

A. $\left(4\hat{i}+8\hat{j}\right)ms^{-1}$

B. $\left(\frac{4}{3}\hat{i}+\frac{8}{3}\hat{j}\right)ms^{-1}$

C. $\left(\frac{4}{3}\hat{i}+8\hat{j}\right)ms^{-1}$

D. $\left(4\hat{i}+\frac{8}{3}\hat{j}\right)ms^{-1}$

Answer: c

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60. A bullet of mass 0.05 kg moving with velocity 400 m/s gets embedded after collision with a block of mass 3.95 kg placed on a smooth horizontal platform as shown in the figure. If height of the platform from the ground is 20 m and block strikes the ground at B, then the value of AB is

(Take g = 10 m/s^2)

A. 5 m

B. 20 m

C. 15 m

D. 10 m

Answer:

61. A particle of mass 2 kg is projected vertically upward with a velocity of 20 m/s. It attains maximum height of 17 m. The loss in

mechanical energy due to air drag is $(g = 10ms^{-2})$

A. 100 J

B. 60 J

C. 80 J

D. Zero

Answer: d

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62. Potential energy of an ideal spring, when stretched by 1 cm is U. Spring is now cut in two equal parts and connected in parallel. If the new combination of spring is compressed by 2 cm, then potential energy stored is

A. 2U

B. 8U

C. 16U

D. 4U

Answer: a

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63. A body is displaced from position $\left(\hat{i}+\hat{j}+\hat{k}\right)$ m to position $\left(4\hat{i}+5\hat{j}+6\hat{k}\right)$ m under the action of force $\left(5\hat{i}+4\hat{j}-3\hat{k}\right)$ N. The angle between the force and displcement vector is

A. $\cos^{-1}\left(\frac{8}{25}\right.$

B. $\sin^{-1}\left(\frac{8}{25}\right)$

C. $\cos^{-1}\left(\frac{11}{25}\right)$

D. $\cos^{-1}\left(\frac{3}{25}\right)$

Answer: a

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64. A particle of mass 2 kg starts motion at time t = 0 under the action of variable force F = 4t (where F is in N and t is in s). The work done by this force in first two second is

A. 16 J

B. 8 J

C. 4 J

D. Zero

Answer: c

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65. Two spherical balls of masses m_1 and m_2 collide as shown in figure. After collision mass m_1 moves with velocity u/3 in a direction perpendicular to original direction. The angle θ at which mass m_2 will move after collision is

A. $\tan^{-1}\left(\frac{1}{2}\right)$

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

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

D. `tan^-1(3)

Answer:

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66. When kinetic energy of a body is increased by 800%, then percentage change in its linear momentum is

A. 100

B. 200

C. 400

D. 300

Answer: b

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67. A small ball of mass m is released in a smooth circular tube as shown in figure. The

minimum height h such that bead can complete the circle is

A. 2.5R

B. 2R

C. 1.5R

D. R

Answer:

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68. A block of mass m moving on a fixed smooth hemisphere of rudius R. If speed of block at top most point of the hemisohere is $\sqrt{gR}$ as shown in the figure, then the angle (θ) with the vertical, where the normal contact force becomes zero will be

A. $\cos^{-1}\left(\frac{2}{3}\right.$

B. $\cos^{-1}\left(\frac{1}{3}\right)$

C. $\cos^{-1}\left(\frac{1}{2}\right)$

D. Zero

Answer:

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69. Two blocks A and B of same material and of masses m and 2m moving with same kinetic energy on a surface enter in a region of identical rough surface. Choose the correct statement from the following options.

A. A will move more distance before stopping

B. B will move more distance before stopping

C. Both will move same distance before stopping

D. Both will never stop

Answer: A

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70. An engine pumps 373 kg of water upto height of 16 m in 40 seconds. Rated power of engine if its efficiency is 80% is (1 horse power = 746 W and g =10 m/s^2)

A. 1 horse power

B. 2 horse power

C. 2.5 horse power

D. 3 horse power

Answer: a

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71. A uniform circular disc of radius R and weight 90 N is shown in figure. If a small circular portion is cut out, then coordinates of new centre of mass will be (Remaining weight of disc is 65 N and y = $\frac{3R}{5}$)

A. $\left(\frac{3R}{13}, 0\right)$

B. $\left(-\frac{3R}{13}, 0\right)$

C. $\left(0, \frac{3R}{13}\right)$

D. $\left(0, -\frac{3R}{13}\right)$

Answer:

Watch Video Solution

72. A bomb is projected with speed 10 m/s at an angle 30^o with the horizontal. In the mid-air bomb explodes in different fragments and they all move in different directions. At the time when all fragments reach at ground, the displacement of the center of mass of bomb from initial point will be (g = 10 m/s^2)

A. $5\sqrt{3}$ m

B. 10 m

C. 5 m

D. Zero

Answer: b

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73. Two bodies of mass 2 kg and 5 kg have position (1 m, 2 m, 1 m) and (3 m, 2 m, -1 m)

respectively. The position vector of centre of mass is

A. $\left(\frac{17}{7}\hat{i}+2\hat{j}-\frac{3}{7}\hat{k}\right)m$

B. $\left(17\hat{i}+14\hat{j}-3\hat{k}\right)m$

C. $\left(2\hat{i}+\frac{17}{7}\hat{j}-\frac{3}{7}\hat{k}\right)m$

D. $\left(14\hat{i}+17\hat{j}-3\hat{k}\right)m$

Answer: b

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74. Two blocks each of mass 4 kg connected by a light string which is passing over an ideal pulley is as shown in figure. If the system is released from rest then the acceleration (in m/s^2) of centre of mass is (g = 10 m/s^2)

A. $5\hat{i}$

B. $-5\hat{i}$

C. $\left(5\hat{i}-5\hat{j}\right)$

D. $\left(2.5\hat{i}-2.5\hat{j}\right)$

Answer: d

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Exercise

1. Two bodies of mass 2 kg and 5 kg have position (1 m, 2 m, 1 m) and (3 m, 2 m, -1 m) respectively. The position vector of centre of mass is

A. $\left(\frac{17}{7}\hat{I} + 2\hat{j} - \frac{3}{7}\hat{k}\right)m$

B. $\left(17\hat{i} + 2\hat{j} - \frac{3}{7}\hat{k}\right)m$

C. $\left(2\hat{i} + \frac{17}{7}\hat{j} - \frac{3}{7}\hat{k}\right)m$

D. $\left(14\hat{i}+17\hat{j}-3\hat{k}\right)m$

Answer:

Watch Video Solution

2. An engine pumps 373 kg of water upto height of 16 m in 40 seconds. Rated power of engine if its efficiency is 80% is (1 horse power = 746 W and g =10 m/s^2)

A. 1 horse power

B. 2 horse power

C. 2.5 horse power

D. 3 horse power

Answer:

Watch Video Solution

3. Two blocks A and B of same material and of masses m and 2m moving with same kinetic energy on a surface enter in a region of identical rough surface. Choose the correct statement from the following options.

A. A will move more distance before stopping

B. B will move more distance before stopping

C. Both will move same distance before stopping

D. Both will never stop

Answer:

Watch Video Solution

4. A small ball of mass m is released in a smooth circular tube as shown in figure. The minimum height h such that bead can complete the circle is

A. 2.5R

B. 2R

C. 1.5R

D. R

Answer:

Watch Video Solution

5. When kinetic energy of a body is increased by 800%, then percentage change in its linear momentum is

A. 1

B. 2

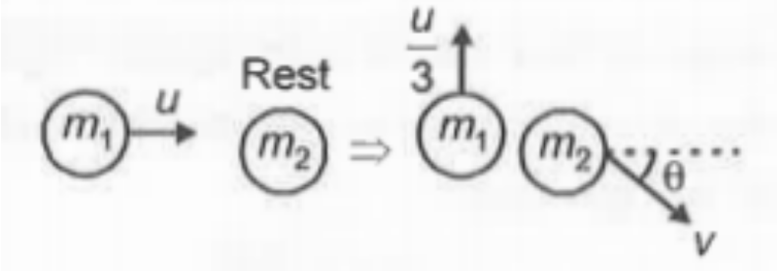
C. 4

D. 3

Answer:

 Watch Video Solution

6. Two spherical balls of masses m1 and m2 collide as shown in figure. After collision mass m1 moves with velocity u/3 in a direction perpendicular to original direction. The angle θ at which mass m2 will move after collision is



A. $\tan^{-1}\left(\frac{1}{2}\right)$

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

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

D. $\tan^{-1}(3)$

Answer:

Watch Video Solution

7. A body of mass m falls from height h, on the ground, If e is the coefficient of restitution between body and the ground, then the height upto which it rises after ten collisions is

A. $e^{10} \cdot h_0$

B. $e^{20} \cdot h_0$

C. $e^{5} \cdot h_0$

D. $e^{40} \cdot h_0$

Answer:

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8. A particle of mass 2 kg starts motion at time t = 0 under the action of variable force F = 4t (where F is in N and t is in s). The work done by this force in first two second is

A. 16J

B. 8J

C. 4J

D. Zero

Answer:

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9. A body is displaced from position $\left(\hat{i}+\hat{j}+\hat{k}\right)$ m to position $\left(4\hat{i}+5\hat{j}+6\hat{k}\right)$ m under the action of force $\left(5\hat{i}+4\hat{j}-3\hat{k}\right)$ N.

The angle between the force and displcement vector is

A. $\cos^{-1}\left(\frac{8}{25}\right)$

B. $\sin^{-1}\left(\frac{8}{25}\right)$

C. $\cos^{-1}\left(\frac{11}{25}\right)$

D. $\cos^{-1}\left(\frac{3}{25}\right)$

Answer:

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10. Potential energy of an ideal spring, when stretched by 1 cm is U. Spring is now cut in two equal parts and connected in parallel. If the new combination of spring is compressed by 2 cm, then potential energy stored is

A. 2U

B. 8U

C. 16U

D. 4U

Answer:

Watch Video Solution

11. A particle of mass 2 kg is projected vertically upward with a velocity of 20 m/s. It attains maximum height of 17 m. The loss in mechanical energy due to air drag is $(g = 10ms^{-2})$

A. 100J

B. 60J

C. 80J

D. Zero

Answer:

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12. Two bodies of masses m and 2m are moving along positive x and y axes respectively with equal speed $4ms^{-1}$. They collide at origin and stick together. The final velocity of combined mass is

A. $\left(4\hat{i}+8\hat{j}\right)ms^{-1}$

B. $\left(\frac{4}{3}\hat{i}+\frac{8}{3}\hat{j}\right)ms^{-1}$

C. $\left(\frac{4}{3}\hat{i}+8\hat{j}\right)ms^{-1}$

D. $\left(4\hat{i}+\frac{8}{3}\hat{j}\right)ms^{-1}$

Answer:

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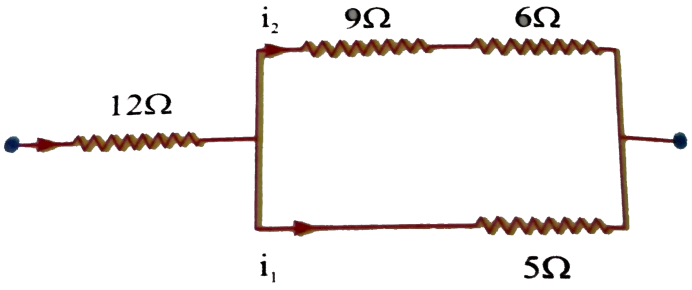
13.



In the following circuit, 5Ω resistor develops 45

J/s due to current flowing through it. The power developed across 12Ω resistor is

A. 16 W

B. 192W

C. 36W

D. 64W

A. 16 w

B. 192 w

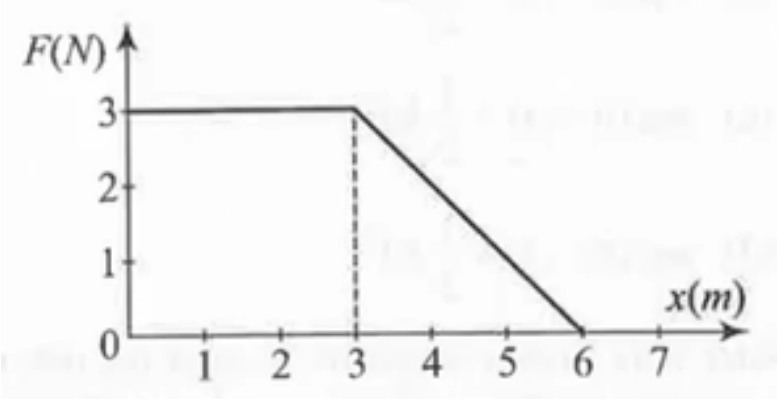
C. 36 w

D. 64 w

Answer:

Watch Video Solution

14. A force F acting on an object varies with distancex as shown in figure. Work done by the force in moving the object from x = 1 m to x= 6 m is



A. 275J

B. 425J

C. 250J

D. 300J

Answer:

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15. If force on a particle $\overrightarrow{F} = (\sin at)\hat{i} + (\cos at)\hat{j}$ and displacement $\overrightarrow{S} = \sin\left(\frac{at}{3}\hat{i}\right) + \cos\left(\frac{at}{3}\right)\hat{j}$ are functions of time (t) then value of t at which they are

perpendicular for first time is (a is positive constant and t>0)

A. $t = \frac{\pi}{2}$

B. $t = \left(\frac{3\pi}{2a}\right)$

C. $t = \frac{3\pi}{4}a$

D. $t = \frac{\pi}{3}$

Answer:

Watch Video Solution

16. 500 J of work is done in sliding a 4 kg block up along a rough inclined plane to a vertical height of 10 m slowly. The work done against friction is $\left(g = 10\frac{m}{s^2}\right)$

A. 400J

B. 100J

C. 200J

D. Zero

Answer:

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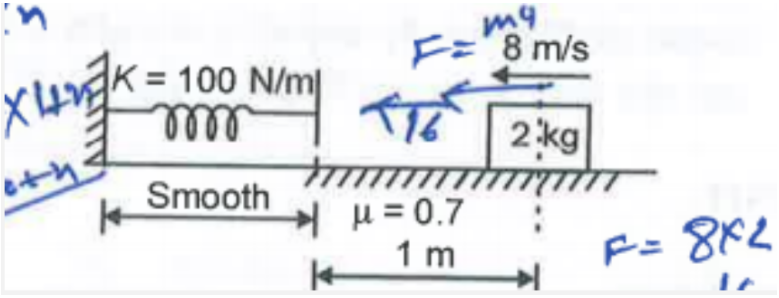
17. Free end of an ideal spring of spring constant 100 N/m is at a distance 1 m from a vertical block of mass 2 kg moving on rough surface with initial speed 8 m/s as shown in figure. If coefficient of friction is 0.7, then maximum compression in spring is $(g = 10ms^{-2})$



A. 1m

B. 0.5m

C. 0.75m

D. 0.25m

Answer:

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18. A particle moves from point $\left(\hat{i}+\hat{j}\right)$m to a point $\left(6\hat{i}-2\hat{j}\right)$m under the action of force $\left(10\hat{i}-2\hat{j}\right)$N. The work done by the force is

A. 8J

B. 56J

C. 64J

D. Zero

Answer:

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19. A particie of mass 10 kg is driven by a machine that delivers a constant power of 20 watts. If particle starts from rest and moves

along a straight line, then force (in Newton) on particle at time t(t> 0) is

A. $10\sqrt{t}$

B. $\frac{10}{\sqrt{t}}$

C. $\frac{20}{\sqrt{t}}$

D. $\frac{1}{\sqrt{t}}$

Answer:

Watch Video Solution

20. The potential energy of a particle in a conservative field is `U =a/r^3-b/r^2, where a and b are positive constants and r is the distance of particle from the centre of field. For equilibrium, the value of r is

A. 2a/b

B. $3\frac{a}{2b}$

C. $\frac{a}{2}b$

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

Answer:

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21. Two blocks of masses m_1 = 4 kg and m_2 = 2kg connected by a massless rod slide down on an inclined plane of inclination 37^o as shown in figure. If coefficient of friction of m_1 and m_2 with inclined plane are μ_1 = 0.75 and μ_2 = 0.25 respectively, then tension (T) in the rod is (g = 10 ms^{-2})

A. $\frac{16}{5}N$

B. $\frac{16}{3}N$

C. $4N$

D. $3N$

Answer:

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22. A particle of mass 200g is attached to an ideal string of length 1.30 m whose upper end is fixed to ceiling. The particle is made to revolve in a horizontal circle of radius 50 cm. The tension in the string is $\left(g = 10\frac{m}{s^2}\right)$

A. $\frac{13}{6}N$

B. $\frac{11}{6}N$

C. $\frac{26}{5}N$

D. Zero

Answer:

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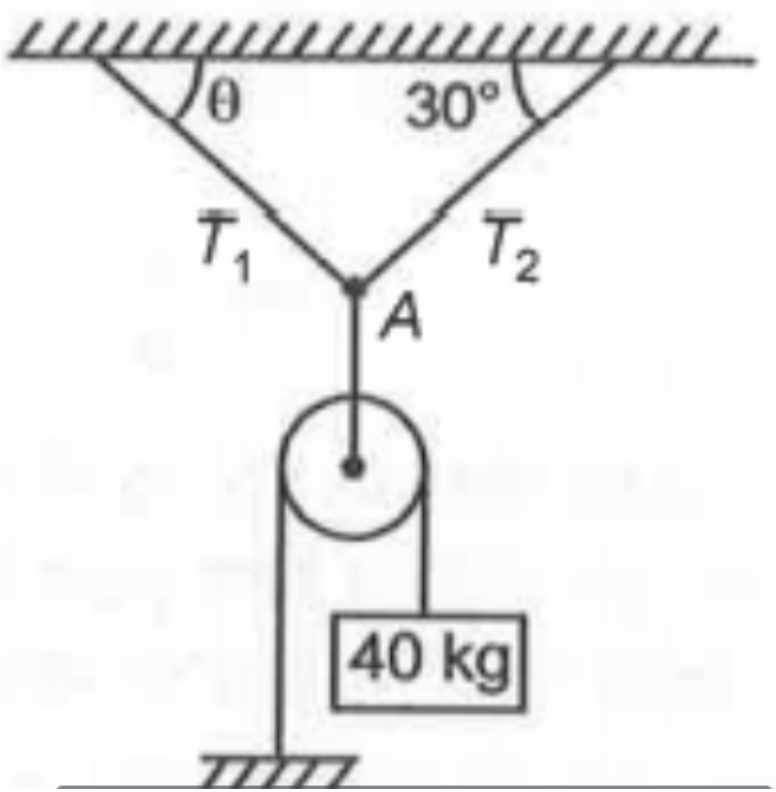
23. For the arrangement shown in figure, angle θ for which tension T_1 in the left string will be

minimum is (Pulley and strings are ideal)



A. $30 degree$

B. $60 degree$

C. $90 degree$

D. $45degree$

Answer:

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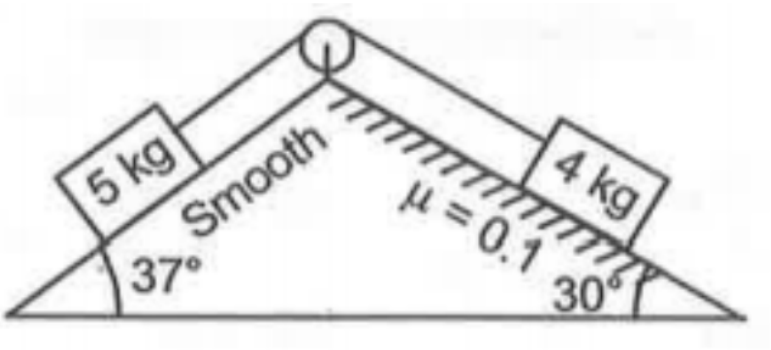
24. Two blocks of masses 5 kg and 4 kg are connected with ideal string which is passing over an ideal pulley as shown in figure. If the system is released from rest then the magnitude of acceleration of the blocks will be

(Take $g = 10ms^{-2}$ and $\sqrt{3} = 1.7$)



A. $\frac{11}{15}ms^{-2}$

B. $\frac{11}{45}ms^{-2}$

C. $\frac{11}{30}ms^{-2}$

D. $\frac{11}{60}ms^{-2}$

Answer:

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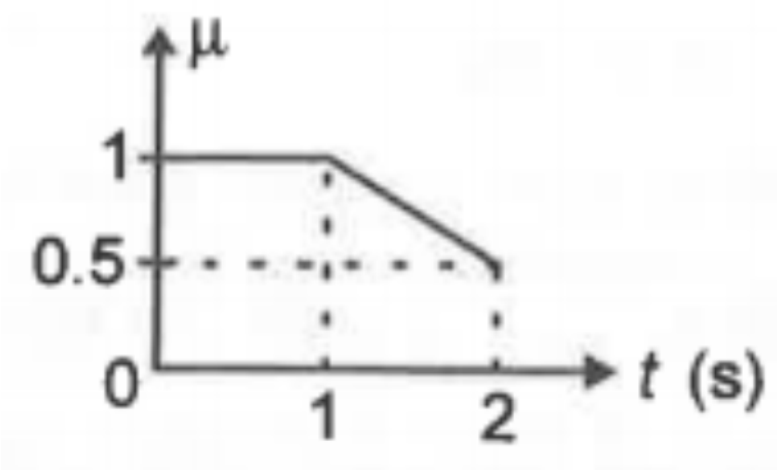
25. block is moving on a rough surface. At time t=0, speed of the block is 20 m/s. Coefficient of friction (μ) between block and surface varies with time (t) as shown in figure. The magnitude of velocity of particle after t = 2 second is ($g = 10ms^{-2}$)



A. 2.5m/s

B. 17.5m/s

C. 15.0m/s

D. Zero

Answer:

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26. Velocity vectors of three masses 2kg,1kg and 3 kg are $\overrightarrow{v}_1 = \left(\hat{i} - 2\hat{j} + \hat{k}\right)\frac{m}{s}, \overrightarrow{V}_2 = \left(2\hat{i} + 2\hat{j} - \hat{k}\right)\frac{m}{s}$

and $\overrightarrow{v}_3$ respectively. If velocity vector of center of mass of the system is zero then value of $\overrightarrow{v}_3$ will be

A. $\left(\frac{2\hat{i}+2\hat{j}-\hat{k}}{3}\right)\frac{m}{s}$

B. $\left(\frac{-4\hat{i}+2\hat{j}-\hat{k}}{3}\right)\frac{m}{s}$

C. $\left(\frac{2\hat{i}+3\hat{j}-\hat{k}}{3}\right)\frac{m}{s}$

D. $\left(\frac{-2\hat{i}+3\hat{j}-\hat{k}}{3}\right)\frac{m}{s}$

Answer:

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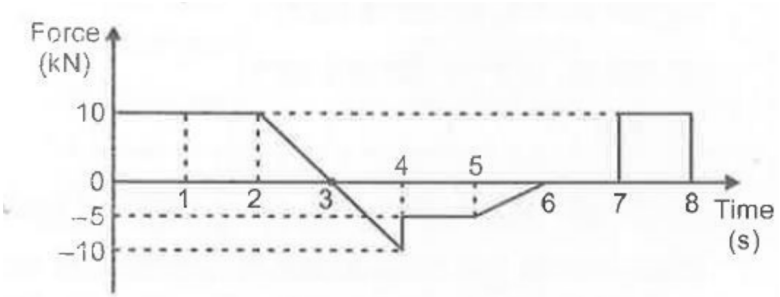
27. The force acting on a particle of mass 20 kg is indicated by force - time graph as shown in figure. The magnitude of change in linear momentum of particle during time interval 0 to 6 second is



A. 27.5kN-s

B. 2.5kN-s

C. 12.5kN-s

D. 15kN-s

Answer:

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28. If a body under the action of force $\left(6\hat{i}+8\hat{j}-10\hat{k}\right)$ N. acquires an acceleration of magnitude $5ms^{-2}$. Then the mass of body is

A. $\sqrt{2}kg$

B. $10\sqrt{2}kg$

C. $2\sqrt{2}kg$

D. $5\sqrt{2}kg$

Answer:

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29. A force F is acting at an angle θ with horizontal on a block of mass 12 kg placed on a rough 3 horizontal surface having coefficient of friction $\mu = \frac{3}{4}$ as shown in the figure. The

minimum value of force F to just move the block will be $\left(g = 10ms^{-2}\right)$

A. 36N

B. 96N

C. 72N

D. 54N

Answer:

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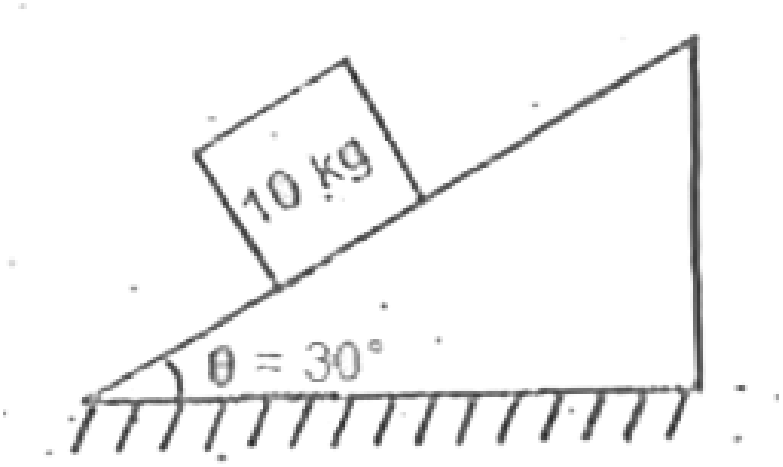
30. A block of mass 10 kg is kept on a fixed rough $(\mu = 0.8)$ inclined plane of angle of inclination 30°. The frictional force acting on the block is



A. $2.3ms^{-2}$ down the plane

B. $5mo^{-2}$ down the plane

C. $2.3mo^{-2}$ up the plane

D. Zero

Answer:

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31. A circular race track of radius 120 m is banked at an angle of 53^{o} . The optimum speed of car to avoid wear and tear of its tyres is (g = 10 ms^-2)

A. 40m/s

B. 20m/s

C. 30m/s

D. 10m/s

Answer:

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32. A block of mass M is in contact with a cart of mass M. The coefficient of static friction between block and cart is μ . To prevent the

block from sliding on cart, acceleration a should be

A. $a > \frac{mg}{(m+M)\mu}$

B. $a \geq \frac{g}{\mu}$

C. $a < \frac{g}{\mu}$

D. $a < \frac{mg}{M}\mu$

Answer:

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33. A 50 kg man stuck in flood is being lifted vertically by an army helicopter with the help of light rope which can bear a maximum tension of 70 kg-wt. The maximum acceleration with which helicopter can rise so that rope does not breaks is $\left(g = 9.8ms^{-2}\right)$

A. $4.00ms^{-2}$

B. 3.92ms^-2`

C. $3.52ms^{-2}$

D. $3.00ms^{-2}$

Answer:

Watch Video Solution

34. A balloon os mass 2 KG is rising up with an acceleration of $4\frac{m}{s^2}$. The upward force acting on the balloon is `(g = 10 ms^-2)

A. 0.8kgf

B. 2.8kgf

C. 2.4kgf

D. 2.0kgf

Answer:

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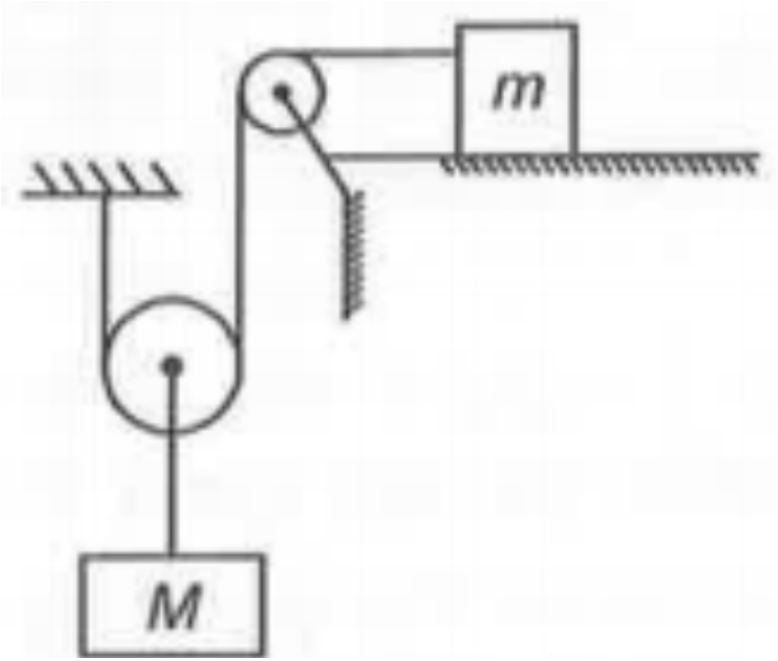
35. For given system as shown in figure, the acceleration of block of mass m(m=M/2) kept on smooth table when the system is released

from rest is (Strings and pulleys are ideal)



A. $\frac{g}{4}$

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

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

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

Answer:

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36. If net external force acting on the system is zero then

A. Velocity of the individual particle of the system will remain constant

B. Velocity of the center of mass of the system will remain constant

C. Velocity of the center of mass of the system will be zero

D. Velocity of the individual particle of the system will be zero

Answer:

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37. A body of mass m hits a wall with speed v at an angle of $30 degree$ with normal and reflects at same angle from normal on other side of

normal. The magnitude of change in linear momentum of the body is (Consider elastic collision)

A. $\frac{8\sqrt{3}mv}{2}$

B. mv

C. $\sqrt{3}mv$

D. Zero

Answer:

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