KD EDUCATION ACADEMY [9582701166]

Time : 5 Hour | **STD 11 Science Physics** | **Total Marks : 300**

kd 90+ question ch-5 work, energy and power

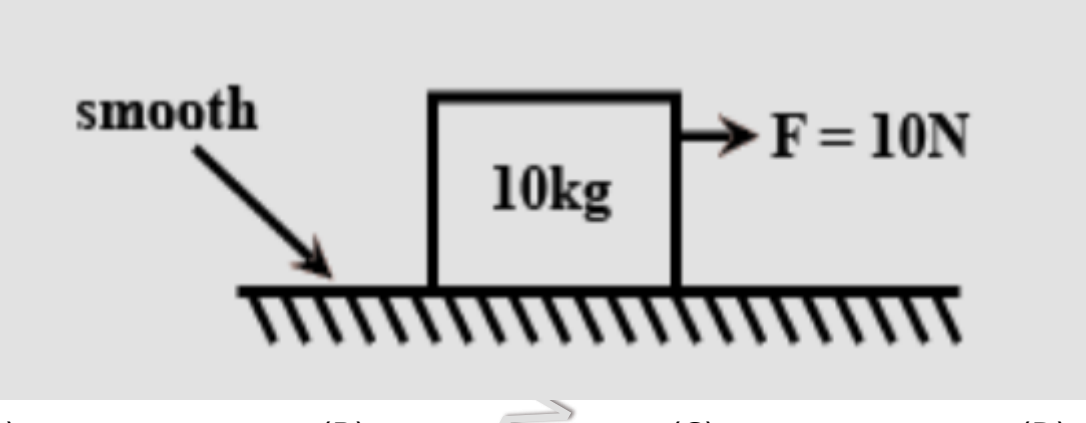
*** Choose The Right Answer From The Given Options.[1 Marks Each] [53]**

1. The K.E. of a body becomes 4 times its initial value. The new linear momentum will be:
   (A) Same as initial value. (B) Four times the initial value. (C) Twice the initial value. (D) Eight times the initial value.

2. Two bodies P and Q of equal masses are kept at heights x and 4x respectively. What will be the ratio of their potential energies?
   (A) 1 : 8 (B) 4 : 1 (C) 1 : 4 (D) 8 : 1

3. A long spring is stretched by 2cm. Its potential energy is V. If the spring is stretched by 10cm, its potential energy would be:
   (A) $\frac{v}{25}$ (B) $\frac{v}{5}$ (C) 5V (D) 25V

4. Force shown acts for 2 seconds. Find out work done by force F on 10kg in 3 seconds.



   (A) 30J (B) 20J (C) 50J (D) 60J

5. A ball of mass 3kg collides with a wall with velocity 10m/ sec at an angle of 30° with the wall and after collision reflects at the same angle with the same speed. The change in momentum of ball in MKS unit is:
   (A) 20 (B) 30 (C) 15 (D) 45

6. Two weights of 5kg and 10kg are placed on a horizontal table of height 1.5m. Which will have more potential energy?
   (A) 5kg (B) 10kg (C) Both will have equal energy (D) None of the above

7. Two bodies of masses m and 4m are moving with equal linear momentum. The ratio of their kinetic energies is:
   (A) 1 : 4 (B) 4 : 1 (C) 1 : 1 (D) 1 : 2

8. Two bodies of masses m and 4m are moving with equal kinetic energy. The ratio of their linear momenta is:
   (A) 1 : 4 (B) 4 : 1 (C) 1 : 2 (D) 1 : 1

9. A ball of mass m moving with a velocity v collides with an identical ball at rest. After collision, the first ball comes to rest. The speed of the other ball is:
(A) $\frac{v}{2}$ (B) 2v (C) v (D) zero

10. A man does a given amount of work in 10s. Another man does the same amount of work in 20s. The ratio of the output power of the first man to that of second man is
(A) 1 (B) 1 : 2 (C) 2 : 1 (D) 3 : 1

11. A force of 16N is distributed uniformly on one surface of a cube of edge 8cm. The pressure on this surface is:
(A) 3500Pa (B) 2500Pa (C) 4500Pa (D) 5500Pa

12. What is the ratio of kinetic energy of a particle at the bottom to the kinetic energy at the top when it just loops a vertical loop of radius r?
(A) 5 : 1 (B) 2 : 3 (C) 5 : 2 (D) 7 : 2

13. In a hydroelectric power station, the water is flowing at $2ms^{-1}$ in the river which is 100m wide and 5m deep. The maximum power output from the river is:
(A) 1.5MW. (B) 2MW. (C) 2.5MW. (D) 3MW.

14. A stationary particle explodes into two particles of masses m_1 and m_2, which move in opposite directions with velocities v_1 and v_2. The ratio of their kinetic energies $\frac{E_1}{E_2}$ is:
(A) $\frac{m_2}{m_1}$ (B) $\frac{m_1}{m_2}$ (C) 1 (D) $\frac{m_1 v_2}{m_2 v_1}$

15. A body of mass m is rotating in a vertical circle of radius 'r' with critical speed. The difference in its K.E. at the top and the bottom is _____.
(A) 2mgr (B) 4mgr (C) 6mgr (D) 3mgr

16. If g is acceleration due to gravity on earth's surface, the gain in potential energy of an object of mass m raised from surface of earth to a height equal to radius R of the earth is:
(A) $\frac{1}{2}mgR$ (B) $2mgR$ (C) mgR (D) $\frac{1}{4}mgR$

17. The ratio of spring constants of two springs is 2 : 3. What is the ratio of their potential energy if they are stretched by the same force?
(A) 2 : 3 (B) 3 : 2 (C) 4 : 9 (D) 9 : 4

18. In a head on elastic collision of a very heavy body moving with velocity v with a light body at rest. Then, the velocity of heavy body after collision is:
(A) v. (B) 2. (C) Zero. (D) $\frac{v}{2}$.

19. A cricket ball of mass 150g moving with a speed of 126km/ h hits at the middle of the bat, held firmly at its position by the batsman. The ball moves straight back to the bowler after hitting the bat. Assuming that collision between ball and bat is completely elastic and the two remain in contact for 0.001s, the force that the batsman had to apply to hold the bat firmly at its place would be:
(A) 10.5N (B) 21N (C) 1.05×10^4 (D) N

20. A boy of mass 40kg runs up a flight of 50 steps, each 10cm high in 14s. So, work done by the boy is:
(A) 1960J (B) 19.6J (C) 980J (D) 9.8J

21. A bomb of mass 1kg is thrown vertically upwards with a speed of 100m/s. After 5 seconds, it explodes into two fragments. One fragment of mass 400 gm is found to go down with a speed of 25m/s. What will happen to second fragment just after explosion? ($g = 10m/s^2$).

(A) It will go upwards with speed 100m/s. (B) It will go upwards with speed 40m/s. (C) It will go upwards with speed 60m/s. (D) It will go downwards with speed 40m/s.

22. A body of mass 2Kg moving (initially) with 10m/ s is acting upon by a resultant constar which is opposite to its initial velocity. Its speed decreases to 4m/ s in 1s. Then the force:

(A) 12N (B) 28N (C) 8N (D) None

23. Two bodies of masses m, and m, have same momentum. The ratio of their KE is:

(A) $\sqrt{\frac{m_2}{m_1}}$ (B) $\sqrt{\frac{m_1}{m_2}}$ (C) $\frac{m_1}{m_2}$ (D) $\frac{m_2}{m_1}$

24. A heavy steel ball of mass greater than 1kg moving with a speed of 2m/ s collides head on with a stationary ping pong ball of mass less than 0.1 g. The collision is elastic. After the collision the ping pong ball moves approximately with a speed.

(A) 2m/ s (B) 4m/ s (C) 2 × 104m/ s (D) 2 × 103m/ s

25. A pump is used to lift 500kg of water from a depth of 80m in 10s . (Take $g = 10m\ s^{-2}$). Calculate the work done by the pump.

(A) 16×10^5J (B) 4×10^5J (C) 4×10^8J (D) 2×10^5J

26. What will be the potential energy of a body of mass 5kg kept at a height of 10m ?

(A) 50J (B) 0.5J (C) 500J (D) 25J

27. Two masses of 1gm and of 4gm are moving with equal linear momenta. The ratio of their kinetic energies is:

(A) 4 : 1 (B) $\sqrt{2} : 1$ (C) 1 : 2 (D) 1 : 16

28. A certain force acting on a body of mass 2kg increase its velocity from 6m/ s to 15m/ s in 2s. The work done by the force during this interval is ?

(A) 27J (B) 3J (C) 94.5J (D) 189J

29. In daily life, intake of a human adult is 10^7J, then average human consumption in a day is:

(A) 2400kcal. (B) 1000kcal. (C) 1200kcal. (D) 700kcal.

30. A girl weighing 50kg makes a high jump of 1.2m. What is her kinetic energy at the highest point? ($g = 10ms^{-2}$)

(A) 6000J (B) 600J (C) 60J (D) Zero

31. A force of 10N is applied on an object of mass 2kg placed on a rough surface having coefficient of friction equal to 0.2. Work done by applied force in 4s is:

(A) 120J. (B) 240J. (C) 250J. (D) 100J.

32. A force $\mathrm{F} = 5\hat{\mathrm{i}} + 6\hat{\mathrm{j}} - 4\hat{\mathrm{k}}$ acting on a body produces a displacement $\mathrm{s} = 6\hat{\mathrm{i}} + 5\hat{\mathrm{k}}$ The work done by the force is:

(A) 18 units. (B) 15 units. (C) 12 units. (D) 10 units.

33. A body of mass 2kg makes an elastic collision with another body at rest and comes to rest. The mass of the second body which collides with the first body is:

(A) 2kg (B) 1. 2kg (C) 3kg (D) 1kg

34. A particle is pushed by forces $2\hat{i} + 3\hat{j} - 2\hat{k}$ and $5\hat{i} + \hat{j} - 2\hat{k}$ simultaneously and it is displaced from point $\hat{i} + \hat{j} + \hat{k}$ to point $2\hat{i} - \hat{j} - 2\hat{k}$. The work done is:

(A) 7 units. (B) -7 units. (C) 10 units. (D) -10 units.

35. A man raises a box of mass 50kg to a height of 2m in 2minthes, while another man raises the same box to the same height in 5minthes. What is the ratio of work done by them?

(A) 1 : 1 (B) 2 : 1 (C) 1 : 2 (D) 4 : 1

36. A force $F = -kx^2 (x \neq 0)$ acts on a particle in X-direction. Find the work done by the force in displacing the particle from x = -a to x = 2a.

(A) $\frac{3k}{2a}$ (B) $\frac{4k}{a^2}$ (C) $\frac{-3k}{2a^2}$ (D) $\frac{-9k}{a^2}$

37. A car is accelerated on a levelled road and attains a velocity 4 times of its initial velocity. In this process, the potential energy of the car?

(A) Does not change. (B) Becomes twice of initial. (C) Becomes 4 times of initial. (D) Becomes 16 times of initial.

38. A body of mass 5kg is thrown vertically up with a kinetic energy of 490J. The height at which the kinetic energy of the body becomes half of the original value is:

(A) 12.5m (B) 10m (C) 2.5m (D) 5m

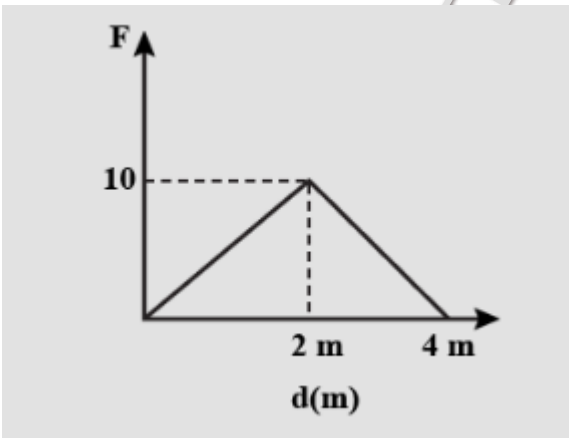
39. What is the dimensions of power:

(A) $[MLT^{-2}]$ (B) $[ML^2T]$ (C) $[ML^2T^2]$ (D) $[MLT^{-3}]$

40. (i) What is the work done by the porter when he climbs up a height of 10m (g = 10 ms^{-2})?

(A) $5kJ^2$ (B) 50kJ (C) $100kJ^2$ (D) 5kJ

41. Work done from d = 0m to d = 4m



(A) 12.5J (B) 15D (C) 17.5J (D) 20D

42. The K.E. of a body can be increased maximum by doubling its:

(A) Mass (B) Weight (C) Speed (D) Density

43. If the linear momentum is increased by 50%, then kinetic energy will be increased by:

(A) 50% (B) 100% (C) 125% (D) 25%

44. The velocity of a bus, moving on a smooth road, is increased from 8m/ s to 32m/ s in 120s. During this process, the potential energy of the bus:

(A) Does not change. (B) Becomes twice that of initial potential energy. (C) Becomes four times that of initial potential energy. (D) Becomes sixteen times that of initial potential energy.

45. A crane pulls up a car of mass 500kg to a vertical height of 4m. So, work done by the crane is:

(A) 19.6J (B) 19.6kJ (C) 19600kJ (D) 4900J

46. Two masses of 1g and 4g are moving with equal kinetic energy. The ratio of the magnitudes of their momentum is:

(A) 4 : 1 (B) 2 : 1 (C) 1 : 2 (D) 1 : 1

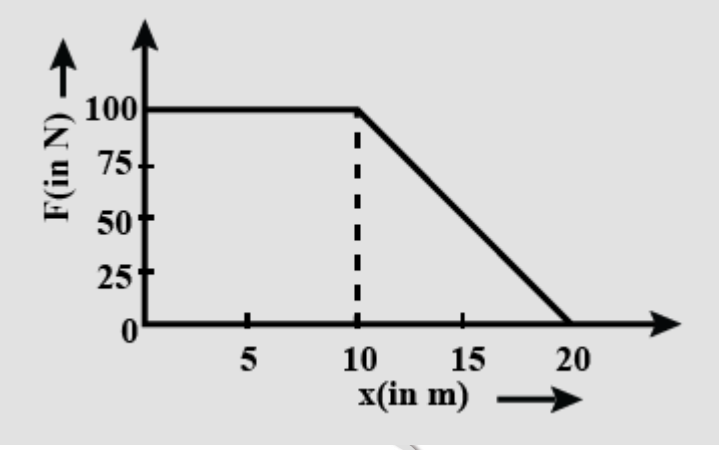
47. A molecule in a gas container hits a horizontal wall with speed $200ms^{-2}$ and angle 30° with the normal and rebounds with the same speed. Which statement is true?

(A) Momentum is conserved. (B) Elastic collision. (C) Inelastic collision. (D) Both (a) and (b).

48. A body of mass 1kg is rotating in a vertical circle of radius 1m. What will be the difference in its kinetic energy at the top and bottom of the circle?
Take g = 10m/ s2

(A) 50D (B) 30J (C) 20D (D) 10D

49. A force F acting on an object varies with distance x as shown in the figure. The work done by the force in moving the object from x = 0 and x = 20m is:



(A) 500J (B) 1000D (C) 1500J (D) 2000D

50. In a shotput event an athlete throws the shotput of mass 10kg with an initial speed of 1m s^{-1} at 45° from a height 1.5m above ground. Assuming air resistance to be negligible and acceleration due to gravity to be 10m s^{-2}, the kinetic energy of the shotput when it just reaches the ground will be:

(A) 20.5J (B) 5.0J (C) 52.5J (D) 155.0J

51. A mass of 5kg is moving along a circular path of radius 1m. If the mass moves with 300 revolutions per minute, its kinetic energy would be:

(A) $250\pi^2$ (B) $100\pi^2$ (C) $5\pi^2$ (D) 0

52. A body of mass 'M' collides against a wall with a velocity v and retraces its path with the same speed. the change in momentum is ..... (take initial direction of velocity as

positive)

(A) Zero (B) 2Mv (C) Mv (D) -2 Mv

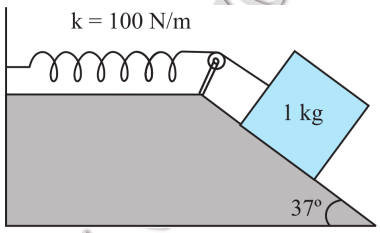
53. If the linear momentum is increased by 50%, then K.E. will be increased by:

(A) 50% (B) 100% (C) 125% (D) 25%

*** Answer The Following Questions In One Sentence.[1 Marks Each]** **[10]**

54. A body of mass 2kg initially at rest moves under the action of an applied horizontal force of 7N on a table with coefficient of kinetic friction = 0.1. Compute the: Change in kinetic energy of the body in 10s.

55. A 1kg block situated on a rough incline is connected to a spring of spring constant $100Nm^{-1}$ as shown in. The block is released from rest with the spring in the unstretched position. The block moves 10cm down the incline before coming to rest. Find the coefficient of friction between the block and the incline. Assume that the spring has a negligible mass and the pulley is frictionless.



56. A body of mass 2kg initially at rest moves under the action of an applied horizontal force of 7N on a table with coefficient of kinetic friction = 0.1. Compute the: Work done by the applied force in 10s.

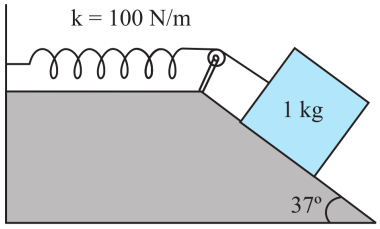
57. How many ergs make one joule?

58. A body of mass 2kg initially at rest moves under the action of an applied horizontal force of 7N on a table with coefficient of kinetic friction = 0.1. Compute the: Change in kinetic energy of the body in 10s.

59. Two blocks of masses 10kg and 20kg moving at speeds of $10ms^{-1}$ and $20ms^{-1}$ respectively in opposite directions, approach each other and collide. If the collision is completely inelastic, find the thermal energy developed in the process.

60. A body falling from a height of 10m rebounds from a hard floor. It loses 20% of its energy in impact. What is the height to which it would rise after the impact?

61. A 1kg block situated on a rough incline is connected to a spring of spring constant $100Nm^{-1}$ as shown in. The block is released from rest with the spring in the unstretched position. The block moves 10cm down the incline before coming to rest. Find the coefficient of friction between the block and the incline. Assume that the spring has a negligible mass and the pulley is frictionless.



62. A bolt of mass 0.3kg falls from the ceiling of an elevator moving down with an uniform speed of $7ms^{-1}$. It hits the floor of the elevator (length of the elevator = 3m) and does not rebound. What is the heat produced by the impact? Would your answer be different if the elevator were stationary?

63. A box is pushed through 4.0m across a floor offering 100N resistance. How much work is done by the resisting force?

*** Given Section consists of questions of 2 marks each. [38]**

64. Find the angle between force $F = (3\hat{i} + 4\hat{j} - 5\hat{k})$ unit and displacement $d = (5\hat{i} + 4\hat{j} + 3\hat{k})$ unit. Also find the projection of F on d.

65. A cyclist comes to a skidding stop in 10 m. During this process, the force on the cycle due to the road is 200 N and is directly opposed to the motion. (a) How much work does the road do on the cycle ? (b) How much work does the cycle do on the road ?

66. Example 5.4 In a ballistics demonstration a police officer fires a bullet of mass $50.0g$ with speed $200ms^{-1}$ (see Table 5.2) on soft plywood of thickness $2.00cm$. The bullet emerges with only 10% of its initial kinetic energy. What is the emergent speed of the bullet?

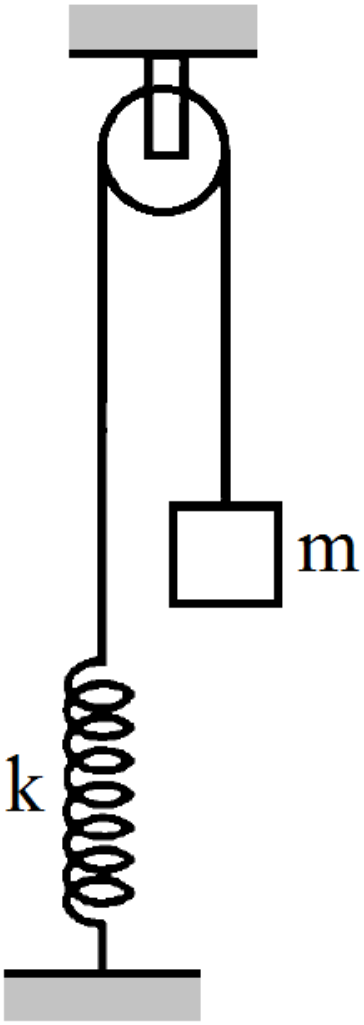
67. A car weighing 1400kg is moving at a speed of 54km/h up a hill when the motor stops. If it is just able to reach the destination which is at a height of 10m above the point, calculate the work done against friction (negative of the work done by the friction).

68. The displacement (in metre) of a particle moving along X-axis is given by x(m) = 18t + $5t^2$. Calculate:
    a. The instantaneous velocity.
    b. Instantaneous acceleration.

    At = 2 second.

69. An unruly demonstrator lifts a stone of mass 200g from the ground and throws it at his opponent. At the time of projection, the stone is 150cm above the ground and has a speed of 3.00m/s. Calculate the work done by the demonstrator during the process. If it takes one second for the demonstrator to lift the stone and throw, what horsepower does he use?

70. Consider the situation shown in figure. Initially the spring is unstretched when the system is released from rest. Assuming no friction in the pulley, find the maximum



elongation of the spring.

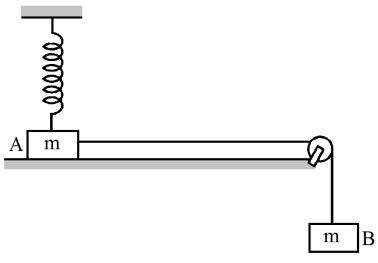
71. The mass of cyclist together with the bike is 90kg. Calculate the increase in kinetic energy if the speed increases from 6.0km/h to 12km/h.

72. An aeroplane's velocity is doubled. What happens to its momentum and kinetic energy?

73. A block of mass 5.0kg slides down an incline of inclination 30° and length 10m. Find the work done by the force of gravity.

74. Find the average force needed to accelerate a car weighing 500kg from rest to 72km/h in a distance of 25m.

75. A small heavy block is attached to the lower end of a light rod of length l which can be rotated about its clamped upper end. What minimum horizontal velocity should the



block be given so that it moves in a complete vertical circle?

76. The average work done by a human heart while it beats once is 0.5J. Calculate the power used by heart if it beats 72 times in a minute.

77. Calculate the work done by a car against gravity in moving along a straight horizontal road. The mass of the car is 400kg and the distance moved is 2m.

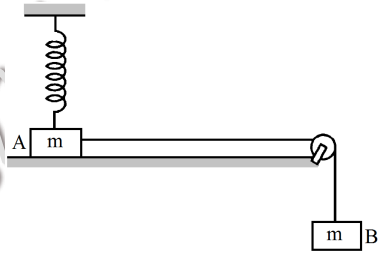
78. A man moves on a straight horizontal road with a block of mass 2kg in his hand. If he covers a distance of 40m with an acceleration of 0.5m/s^2, find the work done by the man on the block during the motion.

79. One person says that the potential energy of a particular book kept in an almirah is 20J and the other says it is 30J. Is one of them necessarily wrong?

80. The mass of cyclist together with the bike is 90kg. Calculate the increase in kinetic energy if the speed increases from 6.0km/h to 12km/h.

81. A block of mass 250g slides down an incline of inclination 37° with a uniform speed. Find the work done against the friction as the block slides through 1.0m.

82. A small heavy block is attached to the lower end of a light rod of length l which can be rotated about its clamped upper end. What minimum horizontal velocity should the block be given so that it moves in a complete vertical circle?



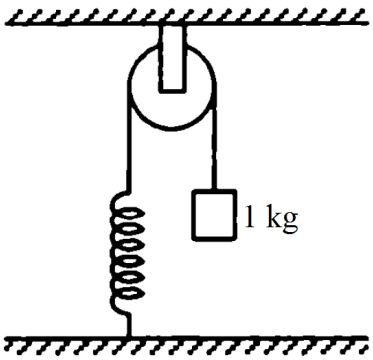
*** Given Section consists of questions of 3 marks each. [69]**

83. A trolley of mass 300kg carrying a sandbag of 25kg is moving uniformly with a speed of 27km/h on a frictionless track. After a while, sand starts leaking out of a hole on the floor of the trolley at the rate of 0.05 kgs^{-1}. What is the speed of the trolley after the entire sand bag is empty?

84. A body of mass 2kg is initially at rest. A constant force of 5 N acts on it for 10s. Calculate the average power of the force.

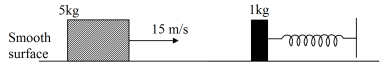
85. A particle of mass 4m which is at rest explodes into three fragments. Two of these fragments each of mass m, are found to move with a speed of v, each in mutually perpendicular direction. What is the total energy released in this process?

86. The pulley shown in figure has a radius of 20cm and moment of inertia 0.2kg-m^2. The string going over it is attached at one end to a vertical spring of spring constant 50N/m fixed from below, and supports a 1kg mass at the other end. The system is released from rest with the spring at its natural length. Find the speed of the block when it has descended through 10cm. Take g = 10m/s^2.



87. A uniform chain of mass m and length l overhangs a table with its two third part on the table. Find the work to be done by a person to put the hanging part back on the table.

88. Calculate the power of a motor which is capable of raising of water in 5 min from a well 120m deep.

89. The spring constant of the spring shown in figure is 250N/m. Find the maximum compression of the spring. 

90. The potential energy function for a particle executing linear simple harmonic motion is given by $V(x) = \frac{kx^2}{2}$, where k is the force constant of the oscillator. For k = 0.5Nm^{-1}, the graph of V(x) versus x is shown in Show that a particle of total energy 1J moving under this potential must 'turn back' when it reaches $x = \pm 2m$.

91. A body of mass 1.0kg initially at rest is moved by a horizontal force of 0.5N on a smooth frictionless table. Calculate the work done by the force in 10s and show that this is equal to the change in kinetic energy of the body.

92. A 60kg man skating with a speed of 10m/s collides with a 40kg skater at rest and they cling to each other. Find the loss of kinetic energy during the collision.

93. Two masses 10kg and 20kg are connected by a massless spring. A force of 200 N acts on 20 kg mass. At the instant when the 10kg mass has an acceleration 12m/ s^2, what will be the energy stored in the spring? (Given k = 2400N/ m).

94. A car of mass 1000kg travels up an incline of 1 in 25 at a constant velocity of 50km/ h. What power does the car engine have to develop if there is a resistive force of 300 N opposing the motion?

95. A block of mass 250g is kept on a vertical spring of spring constant 100N/m fixed from below. The spring is now compressed to have a length 10cm shorter than its natural length and the system is released from this position. How high does the block rise? Take g =10m/s^2.

96. A trolley of mass 300kg carrying a sandbag of 25kg is moving uniformly with a speed of 27km/h on a frictionless track. After a while, sand starts leaking out of a hole on the floor of the trolley at the rate of 0.05 kgs^{-1}. What is the speed of the trolley after the entire sand bag is empty?

97. A body of mass 0.5kg travels in a straight line with velocity $v = ax^{3/2}$ where $a = 5m^{-1/2}s^{-1}$. What is the work done by the net force during its displacement from x = 0 to x = 2m?

98. A ball falls on the ground from a height of 2.0m and rebounds up to a height of 1.5m. Find the coefficient of restitution.

99. A ball bounces to 80% of its original height. What fraction of its mechanical energy is lost in each bounce?

100. A block of mass 2kg is pulled up on a smooth incline of angle 30° with horizontal. If the block moves with an acceleration of 1m/ s^2, find the power delivered by the pulling force at a time 4 seconds after motion starts. What is the/ frac delivered during these four seconds after the motion starts?

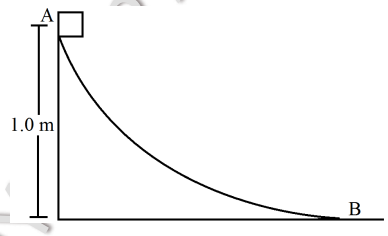
101. An adult weighing 600N raises the centre of gravity of his body by 0.25m while taking each step of 1m length in jogging. If he jogs for 6km, calculate the energy utilised by him in jogging assuming that there is no energy loss due to friction of ground and air.

Assuming that the body of the adult is capable of converting 10% of energy intake in the form of food, calculate the energy equivalents of food that would be required to compensate energy utilised for jogging.

102. An engine is attached to a wagon through a shock absorber of length 1.5m. The system with a total mass of 50,000kg is moving with a speed of 36km h^{-1} when the brakes are applied to bring it to rest. In the process of the system being brought to rest, the spring of the shock absorber gets compressed by 1.0m. If 90% of energy of the wagon is lost due to friction, calculate the spring constant.

103. Suppose the average mass of raindrops is 3.0×10^{-5}kg and their average terminal velocity 9m s^{-1}. Calculate the energy transferred by rain to each square metre of the surface at a place which receives 100 cm of rain in a year.

104. A block weighing 10N travels down a smooth curved track AB joined to a rough horizontal surface (figure). The rough surface has a friction coefficient of 0.20 with the block. If the block starts slipping on the track from a point 1.0m above the horizontal surface, how far will it move on the rough surface?



105. A simple pendulum consists of a 50cm long string connected to a 100g ball. The ball is pulled aside so that the string makes an angle of 37° with the vertical and is then released. Find the tension in the string when the bob is at its lowest position.

*** Given Section consists of questions of 5 marks each. [130]**

106. A bob of mass m is suspended by a light string of length L. It is imparted a horizontal velocity v_o at the lowest point A such that it completes a semi-circular trajectory in the vertical plane with the string becoming slack only on reaching the topmost point, C. This is shown in Fig. 5.6. Obtain an expression for (i) v_o; (ii) the speeds at points B and C; (iii) the ratio of the kinetic energies (K_B/K_C) at B and C. Comment on the nature of the trajectory of the bob after

it reaches the point C.

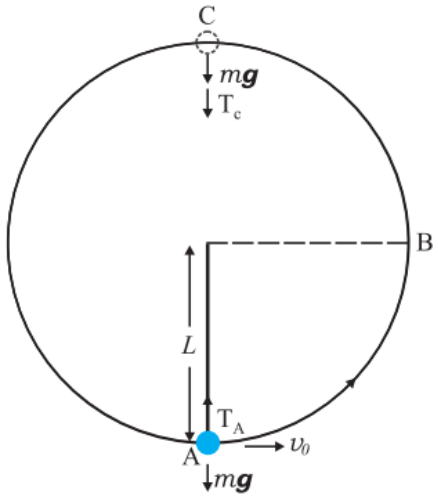


Fig. 5.6

107. A trolley of mass 200kg moves with a uniform speed of 36km/h on a frictionless track. A child of mass 20kg runs on the trolley from one end to the other (10m away) with a speed of 4ms^{-1} relative to the trolley in a direction opposite to the its motion, and jumps out of the trolley. What is the final speed of the trolley? How much has the trolley moved from the time the child begins to run?

108. A bullet of mass 0.012kg and horizontal speed 70ms^{-1} strikes a block of wood of mass 0.4kg and instantly comes to rest with respect to the block. The block is suspended from the ceiling by means of thin wires. Calculate the height to which the block rises. Also, estimate the amount of heat produced in the block.

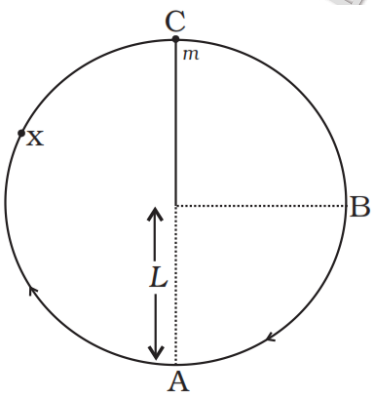
109. A pump on the ground floor of a building can pump up water to fill a tank of volume 30m^3 in 15min. If the tank is 40m above the ground, and the efficiency of the pump is 30%, how much electric power is consumed by the pump?

110. A person trying to lose weight (dieter) lifts a 10kg mass, one thousand times, to a height of 0.5m each time. Assume that the potential energy lost each time she lowers the mass is dissipated.

a. How much work does she do against the gravitational force?

b. Fat supplies 3.8 × 107J of energy per kilogram which is converted to mechanical energy with a 20% efficiency rate. How much fat will the dieter use up?

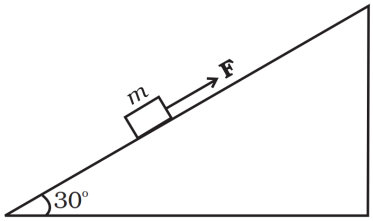
111. A bob of mass m suspended by a light string of length L is whirled into a vertical circle as shown in what will be the trajectory of the particle if the string is cut at:



a. Point B?
b. Point C?P
c. oint X?

112. A bullet of mass 0.012kg and horizontal speed 70ms^{-1} strikes a block of wood of mass 0.4kg and instantly comes to rest with respect to the block. The block is suspended from the ceiling by means of thin wires. Calculate the height to which the block rises. Also, estimate the amount of heat produced in the block.

113. A block of mass 1kg is pushed up a surface inclined to horizontal at an angle of 30º by a force of 10N parallel to the inclined surface. The coefficient of friction between block and the incline is 0.1. If the block is pushed up by 10m along the incline, calulate.



a. Work done against gravity.
b. Work done against force of friction.
c. Increase in potential energy.
d. Increase in kinetic energy.
e. Work done by applied force.

114. The linear momentum of a body is increased by 10%. What is the percentage change in kinetic energy?

115. If the linear momentum is increased by 50%, what is the change in its kinetic energy?

116. An elastic spring of spring constant ‘k’ is compressed by an amount x. Show that its potential energy is $\frac{1}{2}\mathrm{kx}^2$.

117. A car of mass 1000kg accelerstes uniformly from rest to I velocIty of 54km/ h in 5 seconds. Calculate:
a. Its acceleration.
b. Its gain in K.E.
c. Average power of the engine during this period Neglect friction.

118. A mass 1kg is thrown up with a K.E. of 50joules. If 10% of the energy is lost in overcoming air resistance, find the height to which it will rise?

119. An object of mass 0.4kg moving with a velocity of 4ms^{-1} collides with another object of mass 0.6kg moving in same direction with a velocity of 2ms^{-1}. If the collision is prefectly inelastic, what is the loss of K.E. due to impact?

120. A block of mass 2.0kg is pushed down an inclined plane of inclination 37° with a force of 20N acting parallel to the incline. It is found that the block moves on the incline with an acceleration of 10m/s^2. If the block started from rest, find the work done.
a. By the applied force in the first second.
b. By the weight of the block in the first second.
c. By the frictional force acting on the block in the first second. Take g = 10m/s^2.

121. If momentum of a body increased by 300%, then what will be percentage increase in momentum of a body?

122. A particle of mass 1kg moving with a velocity $\mathrm{V}_1 = (3\hat{\mathrm{i}} - 2\hat{\mathrm{J}})\mathrm{m/\ s}$ experience a perfectly inelastic collision with another particle of mass 2kg having velocity $\mathrm{v}_2 = 4\hat{\mathrm{j}} - 6\hat{\mathrm{k}}\mathrm{m/\ s}$. Find the velocity and speed of the particle formed.

123. A block of mass m moving at speed 'v' collides with another block of mass 2 m at rest. The lighter block comes to rest after the collision. Find the coefficient of restitution.

124. A particle moves along the x-axis from x = 0 to x = 5m under the influence of a force given by $f(x) = 7 - 2x + 3x^2$. Calculate the work done.

125. A long spring of spring constant 500N/ m is attached to a wall horizontally and surface below the spring is rough with coefficient of friction 0.75. A 100kg mass block moving with a speed $10\sqrt{2}\mathrm{ms}^{-2}$ strikes the spring. Find the maximum compression of the spring. ($g = 10\mathrm{ms}^{-2}$)

126. A body of mass 2kg is resting on a rough horizontal surface. A force of 20N is now applied to it for 10 seconds parallel to the surface. If the coefficient of kinetic friction between the surfaces in contact is 0.2, calculate.
    a. Work done by the applied force in 10 seconds.
    b. Change in kinetic energy of the object in 10 seconds.

    Take $g = 10\ \mathrm{m/\ s}^2$

127. A heavy particle is suspended by a 1.5m long string. It is given a horizontal velocity of $\sqrt{57}\mathrm{m/s}$.
    a. Find the angle made by the string with the upward vertical, when it becomes slack.
    b. Find the speed of the particle at this instant.
    c. Find the maximum height reached by the particle over the point of suspension. Take $g = 10\mathrm{m/s}^2$.

128. A box weighing 2000N is to be slowly slid through 20m on a straight track having friction coefficient 0.2 with the box.
    a. Find the work done by the person pulling the box with a chain at an angle θ with the horizontal.
    b. Find the work when the person has chosen a value of θ which ensures him the minimum magnitude of the force.

129. A uniform chain of length L and mass M overhangs a horizontal table with its two third part on the table. The friction coefficient between the table and the chain is μ. Find the work done by the friction during the period the chain slips off the table.

130. The bob of a stationary pendulum is given a sharp hit to impart it a horizontal speed of $\sqrt{3\mathrm{gl}}$. Find the angle rotated by the string before it becomes slack.

131. A block of mass 2.0kg kept at rest on an inclined plane of inclination 37° is pulled up the plane by applying a constant force of 20N parallel to the incline. The force acts for one second.
    a. Show that the work done by the applied force does not exceed 40J.
    b. Find the work done by the force of gravity in that one second if the work done by the applied force is 40J.
    c. Find the kinetic energy of the block at the instant the force ceases to act. Take $g = 10\mathrm{m/s}^2$.

----- ॐ भूर्भुवः स्वःतत्सवितुर्वरेण्यं भर्गोदेवस्य धीमहिधियो यो नः प्रचोदयात् ॥ॐ भूर्भुवः स्वःतत्सवितुर्वरेण्यं भर्गोदेवस्य धीमहिधियो यो नः प्रचोदयात् ॥ -----