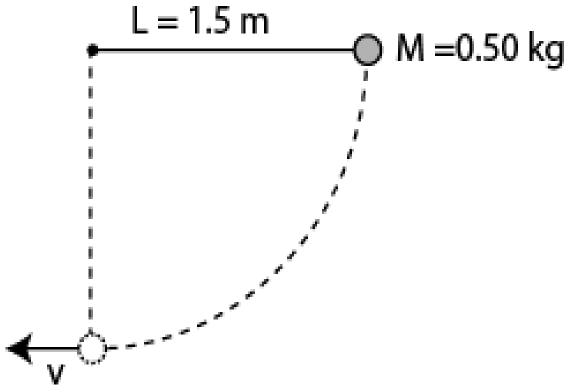
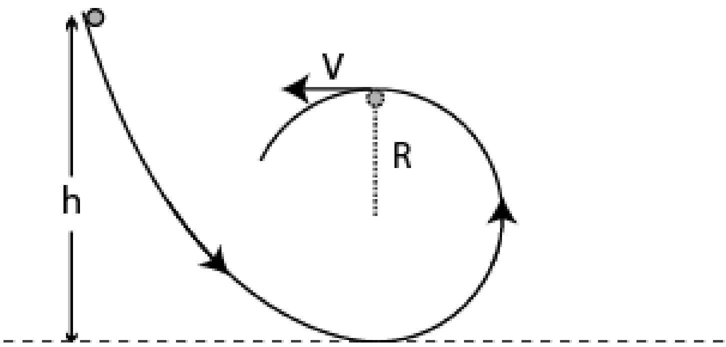
Old Exam. Question Chapter 7

072

Q1.Fig 1 shows a simple pendulum, consisting of a ball of mass M = 0.50 kg, attached to one end of a massless string of length L = 1.5 m. The other end is fixed. If the ball is initially released from rest with the string horizontal, then its speed at the lowest point is: (5.4 m/s)



Q2. A ball slides without friction around a loop-the-loop (see Fig 2). A ball is released, from rest, at a height *h* from the left side of the loop of radius *R*. What is the ratio (*h/R*) so that the ball has a speed *VR*= at the highest point of the loop? (g = acceleration due to gravity) (5/2)



Q3. A person pushes horizontally a 10 kg box at a constant velocity 1.5 m/s. The coefficient of kinetic friction between the box and the horizontal floor is 0.30. What is the rate of work that the person does in pushing the box? (44W)

Q4. A worker does 500 J of work in moving a 20 kg box a distance *D* on a rough horizontal floor. The box starts from rest and its final velocity after moving the distance *D* is 4.0 m/s. Find the work done by the friction between the box and the floor in moving the distance *D*. (-340 J)

Q5. A 2.0 kg block is released from rest 60 m above the ground. Take the gravitational potential energy of the block to be zero at the ground. At what height above the ground is the kinetic energy of the block equal to half its gravitational potential energy? (Ignore air resistance). (40 m)

071

Q1. An 800 kg car is traveling at velocity 12 *i* m/s. When the brakes are applied, the car changes its velocity to 12 *j* m/s in 4.0 s. What is the change in kinetic energy of the car in this time period? (0 J)

Q2. An ideal spring is hung vertically from the ceiling. When a 2.0 kg mass hangs at rest from it, the spring is extended 6.0 cm from its relaxed length. A downward external force is now applied to the mass to extend the spring an additional 10 cm. While the spring is being extended by the external force, the work done by the spring is: (−3.6 J)

Q3. A single force acts on a 5.0 kg object in such a way that the position of the object as a function of time is given by $x=10.0\,t - 5.0\,t^2$ with x is in meters and t is in seconds. Find the work done on the object from $t = 0$ to $t = 4.0$ s. (2000 J)

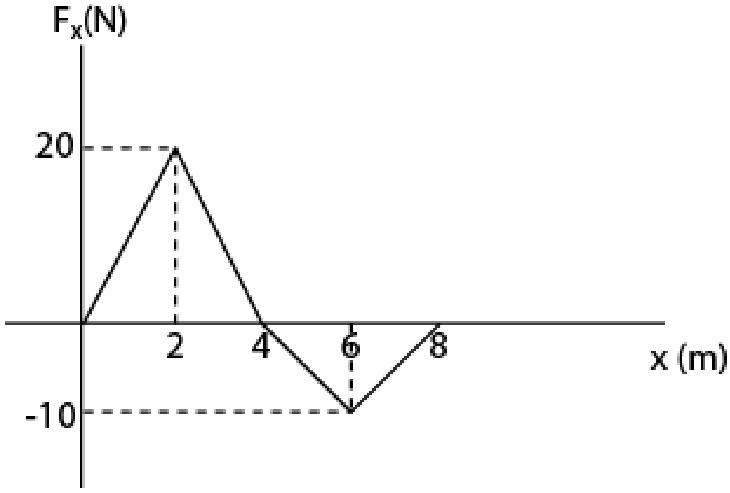
Q4. A 2000 kg elevator moves 20 m upward in 4.9 sec at a constant speed. At what average rate does the force from the cable do the work on the elevator? (80000 W)

062:

Q1. A 10.0 kg box slides with a constant speed a distance of 5.00 m downward along a rough slope that makes an angle of 30.0° with the horizontal. The work done by the force of gravity is: (245 J)

Q2. A block is attached to the end of an ideal spring and moved from coordinate x_i to coordinate x_f . The relaxed position is at $x = 0$. For which values of x_i and x_f that are given below, the work done by spring is positive? (x_i = -4 cm and x_f = -2 cm)

Q3. Fig. 1 gives the only force F_x that can act on a particle. If the particle has a kinetic energy of 10 J at x = 0, find the kinetic energy of the particle when it is at x = 8.0 m. (30 J)



<u>061:</u>

Q1. A 16 *kg* crate falls from rest from a height of 1.0 *m* onto a spring scale with a spring constant of 2.74 × 10^3 *N/m*. Find the maximum distance the spring is compressed. (40 cm)

Q2. A 4.0 *kg* cart starts up an incline with a speed of 3.0 *m/s* and comes to rest 2.0 *m* up the incline. The net work done on the cart is: (-18 J)

Q3. A net horizontal force of 50 *N* is acting on a 2.0 *kg* crate that starts from rest on a horizontal frictionless surface. At the instant the object has traveled 2.0 *m*, the rate at which this net force doing work is: (500 W)

Q4. At time t = 0 a single force F acts on a 2.0 kg particle and changes its velocity from at t = 0 to vi. During this time the work done by v_i = (4.0i -3.0 j) m/s to v_f = (4.0i +3.0 j) m/s at t = 3.0 s. During this time the work done by F on the particle is: (0)

<u>052:</u>

Q2 An object of mass 1.0 kg is whirled in a horizontal circle of radius 0.50 m at a constant speed of 2.0 m/s. The work done on the object during one revolution is: (Zero).

Q3 A boy holds a 40-N weight at arm's length for 10 s. His arm is 1.5 m above the ground. The work done by the force of the boy on the weight while he is holding it is : (Zero)

Q4 A 40-N force is the only force applied on a 2.0-kg crate which is originally at rest. At the instant the object has traveled 2.5 m, the rate at which the force is doing work is: (400 W)

Q6 A ball of mass 2.0-kg is kicked with an initial speed of (5 m/s)***i*** +(5 m/s)***j*** . The ratio of the potential energy (relative to ground level) to the kinetic energy of the projectile at its highest point is: (1.0 J)

<u>**051:**</u>

Q1. A 0.50 kg block slides down a frictionless 30° incline, starting from rest. The work done by the net force on this block after sliding for 4.0 s is: (96 J)

Q2. A person lifts a 0.40 kg cup of water 0.64 m vertically up at constant velocity of 1.2 m/s. The work done on the cup of water by him is: (2.5 J)

Q3. A man pushes a 50 kg crate a distance of 5.0 m upward along a frictionless slope that makes an angle of 30° with the horizontal. His force is parallel to the slope. The acceleration of the crate is 1.5 m/s 2 and is directed up the slope. The work done by the man is: (1600 J)

Q4. A 20 N force acts horizontally on a 2.0 kg box initially (t = 0) resting on a frictionless floor. The rate at which this force is doing work at t = 2.0 s is: (400 W)

Q6. A varying force Fx acts on a particle of mass m = 2.0 kg as shown in Figure 1. Find the speed of the particle at x = 8.0 m, if the kinetic energy at x = 0 is 9.0 J. (7.0 m/s)

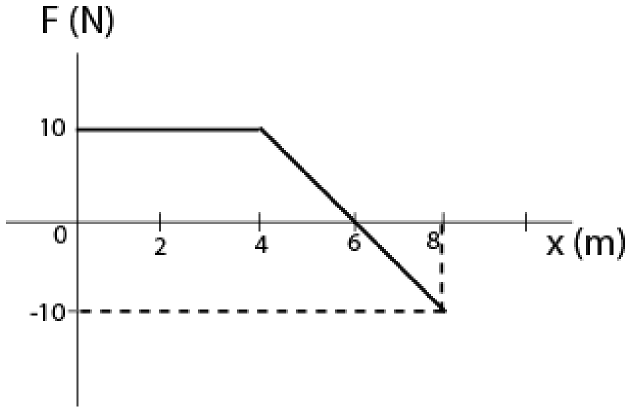


Figure 1

Q7. A 0.50 kg block is attached to an ideal spring with a spring constant of 80 N/m rests on a horizontal frictionless surface. The spring is stretched 4.0 cm longer than its equilibrium length and then released. The speed of the block when it passes through the equilibrium point is (0.51 m/s).

042:

Q1 A helicopter lifts an 80 kg man vertically from the ground by means of a cable. The upward acceleration of the man is 2.0 m/s**2. Find the rate at which the work is being done on the man by the tension of the cable when the speed of the man is 1.5 m/s. (1.4 x 103 W)

Q2 A force F = (3.00 i +7.00 j) N acts on a 2.00 kg object that moves from an initial position r1=(3.00i - 2.00j) m to a final position r2 = (5.00 i + 4.00 j) m in 4.00 s . What is the average power due to the force during that time interval? (12.0 W)

Q3 A 5.0-kg block is moving horizontally at 6.0 m/s. In order to change its speed to 10.0 m/s, the net work done on the block must be (160 J)

Q4 A 3.00 kg block is dropped from a height of 40 cm onto a spring of spring constant k (see Fig 2). If the maximum distance the spring is compressed = 0.130 m, find k. (1840 N/m)

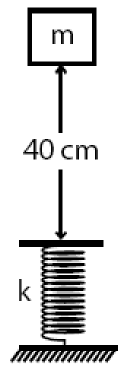


Figure 2

T041:

Q1. A particle moves in the x-y plane from the point (0,1) m to point (3,5) m while being acted upon by a constant force F = 4i + 2j +4k (N). The work done on the particle by this force is: (20 J)

Q2. Which of the following statements is CORRECT?

A1 The centripetal force acting on a particle rotating in a circle does no work on the particle.
A2 The work done by a force is always equal to the product of the force and the distance travelled.
A3 When an object is displaced horizontally, the gravitational force does work on it.
A4 When an object is displaced horizontally on a table, the normal force does work on it.
A5 If a person lifts a heavy block a vertical distance, then his work is zero.

Q3. A car accelerates from zero to 30 m/s in 1.5 s. Assuming the same average power is delivered by the car, how long does it take to accelerate it from zero to 60 m/s. (Ignore friction). (6.0 s)

Q4. A 3.0 kg block is released from a compressed spring (k=120 N/m). It travels over a horizontal surface (μk =0.20) for a distance of 2.0 m before coming to rest, Fig 1. How far was the spring compressed before being released ? (0.44 m)

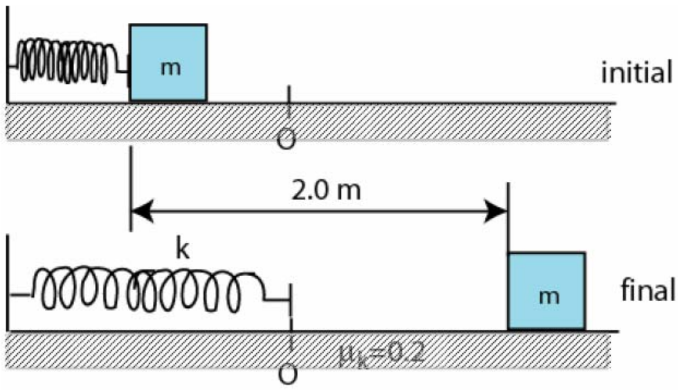


Figure 1