

PHYS101 Second Major Exam Term-031

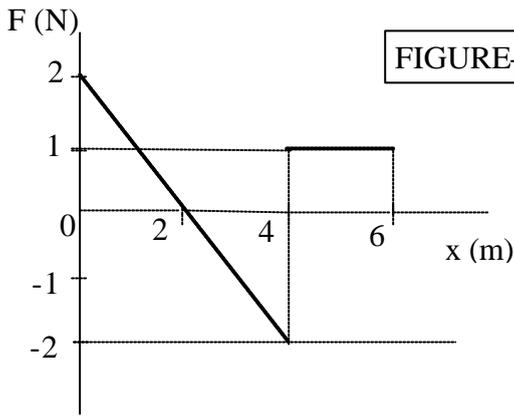


FIGURE-1

FIGURE-2

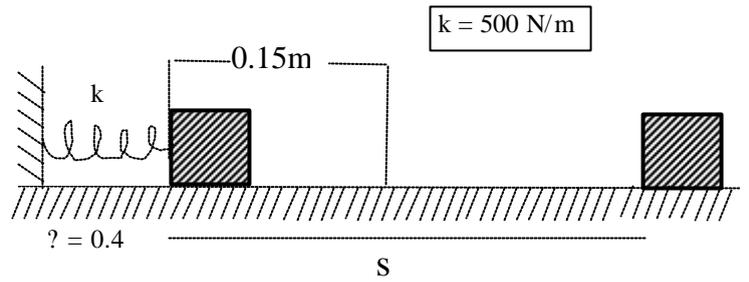
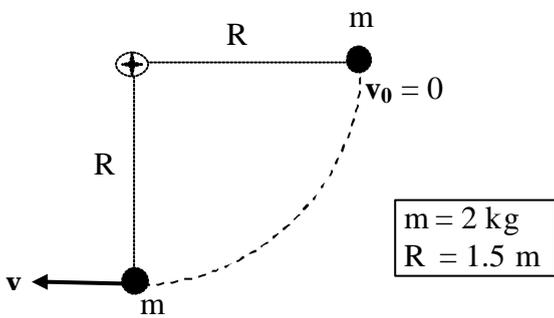
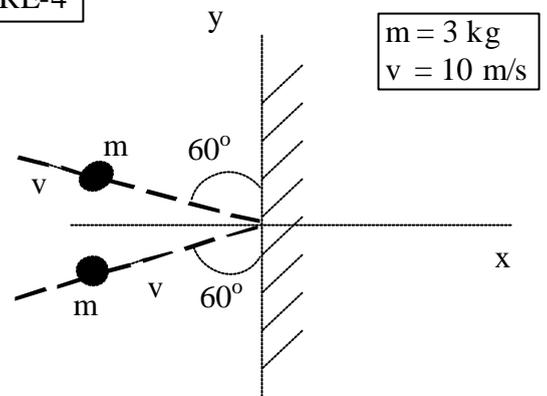


FIGURE-3



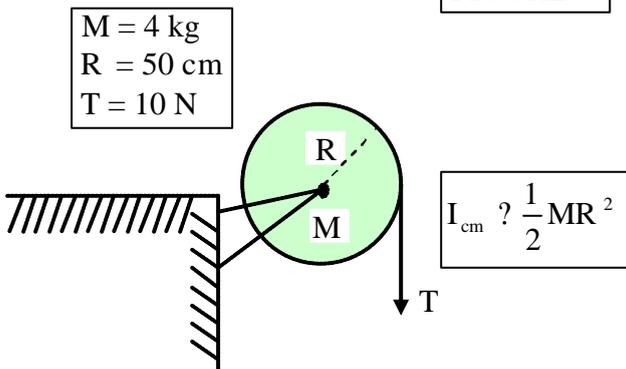
$m = 2$ kg
 $R = 1.5$ m

FIGURE-4



$m = 3$ kg
 $v = 10$ m/s

FIGURE-5



$M = 4$ kg
 $R = 50$ cm
 $T = 10$ N

$I_{cm} = \frac{1}{2} MR^2$

FIGURE-6

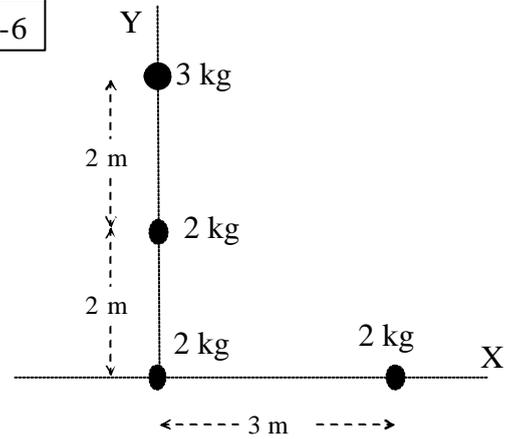
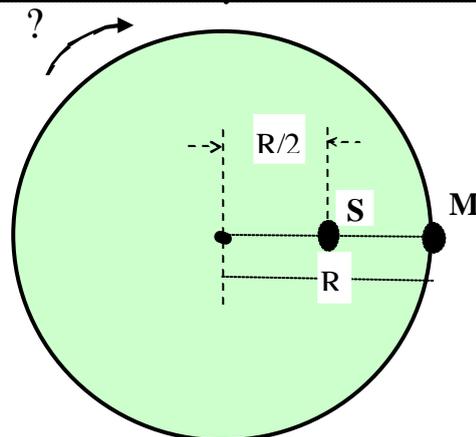


FIGURE-7



M and S have the same mass

- 1 Q0 Two balls, with masses m and $2m$, are dropped
Q0 to the ground from the roof of a building. (Assume no air
Q0 resistance.) Just before hitting the ground, the heavier
Q0 ball has:
- A1 two times as much kinetic energy as the lighter one.
A2 as much kinetic energy as the lighter one.
A3 half as much kinetic energy as the lighter one.
A4 four times as much kinetic energy as the lighter one.
A5 a kinetic energy that is impossible to determine.
- Q0
- Q2 Q0 An object is pushed by a variable force, plotted in Fig 1,
Q0 as a function of position, x .
Q0 How much work has the force done on the object when it
Q0 has moved from $x=0$ to $x=+6$ m?
- Q0
- A1 2 J
A2 10 J
A3 -6 J
A4 0 J
A5 12 J
- Q0
- Q3 Q0 A helicopter lifts a 72 kg man 15 m vertically
Q0 by means of a cable. The acceleration of the man is
Q0 1.20 m/s^2 . How much work is done on the man by
Q0 the tension of the cable?
- Q0
- A1 12 kJ
A2 10 kJ
A3 0 kJ
A4 14 kJ
A5 16 kJ
- Q0
- Q4 Q0 A force acting on a particle is conservative if
Q0
- A1 its work is zero when the particle moves
A1 around any closed path.
A2 its work depends on the path between the end
A2 points of the motion.
A3 its work equals the change in linear momentum of
A3 the particle.
A4 it must be perpendicular to the velocity of the particle
A4 on which it acts.
A5 it is a frictional force.
- Q0
- Q5 Q0 A simple pendulum consists of a 2.0 kg mass attached
Q0 to a string of length $R=1.5$ m. It is pulled up until
Q0 the string is horizontal, and then released from rest
Q0 (see Fig 3). Its speed (v) at the lowest point is
Q0
- A1 5.4 m/s
A2 4.1 m/s
A3 9.8 m/s
A4 8.5 m/s

A5 2.0 m/s

Q0

Q6 Q0 A block of mass $m=3.0$ kg is kept at rest after it has compressed a horizontal massless spring ($k=500$ N/m) by 0.15 m, as shown in Fig. 2. When the block is released, it travels a distance S on a horizontal rough surface ($\mu=0.4$) before stopping. Calculate the distance S .

Q0

A1 0.48 m

A2 2.1 m

A3 3.2 m

A4 1.9 m

A5 0.15 m

Q0

Q7 Q0 Three particles are placed in the xy plane. A 40-g particle is located at (4,3) m, and a 50-g particle is located at (-2,-2) m. Where must a 20-g particle be placed so that the center of mass of the three-particle system is at the origin (0,0)?

Q0

A1 (-3, -1) m

A2 (+3, -1) m

A3 (+1, +3) m

A4 (+1, -3) m

A5 (-1, -1.5) m

Q0

Q8 Q0 A 2000-kg truck traveling at a speed of 6.0 m/s makes a 90 deg. turn in a time of 4.0 s and emerges from this turn with a speed of 4.0 m/s. What is the magnitude of the average resultant force on the truck during this turn?

Q0

A1 3.6 kN

A2 4.0 kN

A3 5.0 kN

A4 6.4 kN

A5 1.0 kN

Q0

Q9 Q0 An 8.0 kg object moving at 4.0 m/s in the positive x direction makes a one-dimensional collision with a 2.0 kg object moving at 3.0 m/s in the opposite direction. The final velocity of the 8.0 kg object is 2.0 m/s in the positive x direction. What is the total kinetic energy of the two objects after the collision?

Q0

A1 41 J

A2 32 J

A3 52 J

A4 25 J

A5 29 J

Q0

Q10 Q0 A 4.0 kg mass has a velocity of $(4.0 \mathbf{i})$ m/s, when it explodes into two 2.0 kg masses. After the explosion, one of the masses has a velocity of 3.0 m/s making an angle of 60 degrees with the $+x$ axis. What is the magnitude of the velocity of the other mass after the explosion?

Q0

A1 7.0 m/s

A2 7.9 m/s

A3 8.9 m/s

A4 6.1 m/s

A5 6.7 m/s

Q0

Q11Q0 A 3.0 kg steel ball strikes a wall with a speed of 10 m/s at an angle of 60 degrees with the surface. It bounces off with the same speed and angle (see Fig. 4). If the ball is in contact with the wall for 0.20 s, what is the average force exerted on the ball by the wall?

Q0

A1 (-260 i) N

A2 (-780 i) N

A3 (150 i) N

A4 (780 i) N

A5 zero

Q0

Q12Q0 A 3.0 kg object with an initial velocity of (5 i) m/s collides with and sticks to a 2.0 kg object moving with an initial velocity of (-3 j) m/s. Find the final velocity of the composite body.

Q0

A1 (3.0 i - 1.2 j) m/s

A2 (15 i - 6.0 j) m/s

A3 (-3.0 i + 1.2 j) m/s

A4 (-15 i + 6.0 j) m/s

A5 (1.2 i - 3.0 j) m/s

Q0

Q13Q0 Which of the following statements is TRUE for a collision of an isolated system of two particles:

Q0

A1 In any kind of collision linear momentum is conserved.

A2 In an elastic collision linear momentum is conserved

A2 but kinetic energy is not conserved.

A3 In a completely inelastic collision both linear momentum and

A3 kinetic energy are conserved.

A4 Momentum is not conserved in a completely inelastic collision.

A5 Kinetic energy is conserved in an inelastic collision.

Q0

Q14Q0 A uniform disk of radius 50 cm and mass 4 kg is mounted on a frictionless axle, as shown in Fig 5. A light cord is wrapped around the rim of the disk and a steady downward pull of 10 N is exerted on the cord. Find the tangential acceleration of a point on the rim of the disk.

Q0

A1 5.0 m/s**2

A2 4.0 m/s**2

A3 3.0 m/s**2

A4 2.0 m/s**2

A5 1.0 m/s**2

Q0

Q15Q0 At t=0, the motor of a turntable (radius = 10 cm) rotating

Q0 at 33.33 rev/ min is turned off. It slows down uniformly and Q0 stops at $t=2$ min. What is the magnitude of the angular Q0 acceleration of the turntable?

Q0

A1 0.029 rad/s^2

A2 0.123 rad/s^2

A3 0

A4 0.107 rad/s^2

A5 0.003 rad/s^2

Q0

Q16Q0 The angular position of a point on the rim of a rotating wheel Q0 is given by $\text{THETA} = 4.0t - 3.0t^2 + t^3$, where THETA is in Q0 radians and t is in seconds. What is the average angular Q0 acceleration for the time interval that begins at $t = 0$ s and Q0 ends at $t = 1.0$ s?

Q0

A1 -3.0 rad/s^2

A2 $+3.0 \text{ rad/s}^2$

A3 $+2.5 \text{ rad/s}^2$

A4 -2.5 rad/s^2

A5 $+1.4 \text{ rad/s}^2$

Q0

Q17Q0 The four particles in Fig. 6 are connected by rigid rods of Q0 negligible mass. Find the rotational inertia of the four Q0 particles about the y-axis.

Q0

A1 $18 \text{ kg}\cdot\text{m}^2$

A2 $20 \text{ kg}\cdot\text{m}^2$

A3 $38 \text{ kg}\cdot\text{m}^2$

A4 $12 \text{ kg}\cdot\text{m}^2$

A5 $45 \text{ kg}\cdot\text{m}^2$

Q0

Q18Q0 A star of radius R is spinning with an angular velocity ω . If Q0 it shrinks till its radius becomes $R/2$, find the ratio of the Q0 final angular momentum to its initial angular momentum.

Q0

A1 1

A2 2

A3 4

A4 $1/2$

A5 $1/4$

Q0

Q19Q0 Mohammed (M) and Salim (S) (have the same mass) are riding on Q0 a merry-go-round rotating at a constant rate. Salem is half way Q0 in from the edge, as shown in Fig 7. The angular momenta of Q0 Salem and Mohammed about the axis of rotation are L_s and L_m Q0 respectively. Which of the following relations is correct?

Q0

A1 $L_m = 4 L_s$

A2 $L_m = L_s$

A3 $L_m = L_s/4$

A4 $L_m = 2 L_s$

A5 $L_m = L_s/2$

Q0

Q20Q0 A particle located at the position vector $r=(1.2 \mathbf{i}+ 1.2 \mathbf{j})$ m has

Q0 a force $F=(150 \mathbf{i})$ N acting on it. The torque (in N.m)

Q0 of the force about the origin is:

Q0

A1 -180 k

A2 180 k

A3 180 i

A4 180 (i+j)

A5 -180 j