Exam 2-021

Q1 As a 2.0 kg object moves along the x axis, the only force acting on it is given by F = (4 X) N where X is measured in m. What is the work done by this force as the object moves from X = 1.0 m to X = 3.0 m?

A1: 16 J
A2: 8 J
A3: 12 J
A4: 32 J
A5: 28 J

Q2 In Fig (1), a block (M = 2.0 kg) slides on a frictionless horizontal surface towards a spring with a spring constant k = 2000 N/m. The speed of the block just before it hits the spring is 6.0 m/s. How fast is the block moving at the Q0 instant the spring has been compressed 15 cm?

A1: 3.7 m/s
A2: 4.4 m/s
A3: 4.9 m/s
A4: 5.4 m/s
A5: 14 m/s

Q3 In Fig (2), a 2.0 kg block slides down a 30 deg frictionless incline from point A to point B. A force (magnitude F = 3.0 N) acts on the block between A and B. Points A and B are 2.0 m apart. If the kinetic energy of the block at A is 10 J, what is the kinetic energy of the block at B?

A1: 24 J
A2: 20 J
A3: 27 J
A4: 17 J
A5: 37 J

Q4 A 2.0 kg block is pulled at a constant speed of 1.1 m/s across a horizontal rough surface by an applied force of 12 N directed 30 degrees above the horizontal. At what rate is the frictional force doing work on the block?

A1: -11.4 W
A2: +5.8 W
A3: -13.2 W
A4: +13.2 W
A5: -4.9 W

Q5 An object moves from point A to point B. Only two forces act on it: one force is non-conservative and does - 40 J of work, and the other force is conservative and does +60 J of work. Between points A and B, K is the kinetic energy of object, and E is its mechanical energy. Which of the following statements is correct?

A1: K increases, E decreases.
A2: K decreases, E decreases.
A3: K decreases, E increases.
A4: K increases, E increases.
A5: None of the other answers.

Q6 A 10 kg object is dropped vertically from rest. After falling a distance of 50 m, it has a speed of 26 m/s. How much work is done by the air resistance on the object during this descent?

A1: -1500 J
A2: -1300 J
A3: -1800 J
A4: -2000 J
A5: -2300 J

Q7 A 3.0 kg particle is moving along the +x direction at 30 m/s toward a stationary 7.0 kg particle. What is the velocity of the center of mass of the two particles?

A1: 9.0 m/s
A2: 0 m/s
A3: 19 m/s
A4: 30 m/s
A5: 15 m/s

Q8 A 3.0 kg object, initially at rest explodes into three pieces of equal mass. Two pieces move perpendicular to each other, each with a speed of 10 m/s. What is the speed of the third piece?

A1: 14 m/s
A2: 10 m/s
A3: 5.0 m/s
A4: 20 m/s
A5: 0 m/s

Q9 A uniform plate is shaped as in Fig (3). Find the coordinates of the center of mass of the plate?

A1: (0,1.67) m
A2: (0,0) m
A3: (0,1.5) m
A4: (1.5,0) m
A5: (0,2) m

Q10 In Fig (4), a dog stands at the edge (A) of a uniform sled of length L which lies on frictionless ice. The sled and the dog have equal mass. The center of mass of the dog-sled system is at a distance X cm from the fixed point O. As the dog walks toward edge (B), which of the following statements is correct?

A1: The center of mass remains at the same distance from point O.
A2: The center of mass moves away from point O.
A3: The center of mass moves toward point O.
A4: The sled does not move.
A5: The sled moves away from point O.

Q11 A 0.2 kg ball drops vertically onto a floor, hitting with a speed of 30 m/s. The ball rebounds up with a speed of 20 m/s. The ball is in contact with the floor for 0.01 s. The magnitude of the average force of the floor on the ball during this time is:

A1: 1000 N
A2: 600 N
A3: 2000 N
A4: 1600 N
A5: 1800 N

Q12 A particle (A) has a mass m and is moving with a velocity v. It makes a head-on elastic collision with a particle (B) of mass 2m at rest. After the collision, their velocities (vA, and vB) are:

A1: -v/3, 2v/3
A2: 0 , v/2
A3: -v, v
A4: -2v/3, v/3
A5: none of these

Q13 Block A (mass = 2.0 kg, velocity = 50 m/s) and block B (mass = 5 kg, velocity= -20 m/s) are moving towards each other along the x axis. They collide and stick together after collision. The kinetic energy lost during the collision is:

A1: 3500 J
A2: 5000 J
A3: 5600 J
A4: 0 J
A5: 1200 J

Q14 A disk has a rotational inertia of 6.0 kg.m**2 and a constant angular acceleration of 2.0 rad/s**2. If it starts from rest, the work done by the net torque on it during the first 5.0 seconds is:

A1: 300 J
A2: 0 J
A3: 60 J
A4: 600 J
A5: 30 J

Q15 If the net external torque acting on an object rotating about a fixed axis is zero, which of the following statements is correct?

A1: The angular momentum of the object will not change.
A2: The angular momentum of the object will change.
A3: The angular acceleration of the object is not zero.
A4: The rotational kinetic energy of the object will change.
A5: The angular velocity of the object will change.

Q16 A 2.0 kg mass is attached to a string and fixed to a vertical rod Fig (5). The mass is initially orbiting with a speed of 5.0 m/s in a circle of radius 0.75 m. The string is then slowly winding around the vertical rod. What is the Q0 speed of the mass at the moment the string reaches a length of 0.25 m?

A1: 15 m/s
A2: 3.9 m/s
A3: 45 m/s
A4: 75 m/s
A5: 12 m/s

Q17 A mass (m1 = 5.0 kg) which slides on a frictionless surface is connected by a light cord to a mass (m2 = 4.0 kg), as shown in Fig (6). The pulley (radius = 0.20 m) rotates about a frictionless axle. The acceleration of m2 is 3.5 m/s**2. What is the rotational inertia of the pulley?

A1: 0.088 kg.m**2
A2: 0.029 kg.m**2
A3: 0.044 kg.m**2
A4: 0.062 kg.m**2
A5: 0.060 kg.m**2

Q18 A solid ball, whose radius R is 10 cm and whose mass M is 8.5 kg, rolls smoothly from rest down a 25 deg inclined plane whose length L is 5.0 m. What is the speed of the center of mass of the ball when it reaches the bottom of the inclined plane?

A1: 5.4 m/s
A2: 0.98 m/s
A3: 5.1 m/s
A4: 4.6 m/s
A5: 4.2 m/s

Q19 A 2.5 kg block travels around a 0.50 m radius circle with an angular velocity of 12 rad/s. Find the magnitude of the angular momentum of the block about the center of the circle.

A1: 7.5 kg.m**2/s
A2: 1.5 kg.m**2/s
A3: 6.0 kg.m**2/s
A4: 9.0 kg.m**2/s
A5: 12 kg.m**2/s

Q20 Fig (7) shows an object of mass m=100 g and velocity =Vo is fired onto one end of a uniform thin rod (L=0.4 m, M = 1.0 kg) initially at rest. The rod can rotate freely about an axis through its center (O). The object sticks to the rod after collision. The angular velocity of the system (rod + object) is 10 rad/s immediately after the collision. Calculate Vo.

A1: 8.7 m/s
A2: 4.0 m/s
A3: 1.8 m/s
A4: 2.2 m/s
A5: 9.5 m/s

PHYS101 - SECOND MAJOR EXAM – FIGURES

Term-021

FIGURE-1

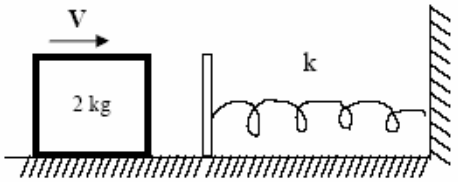


FIGURE-2

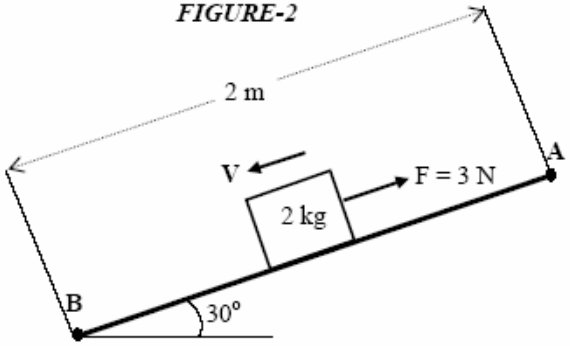


FIGURE-3

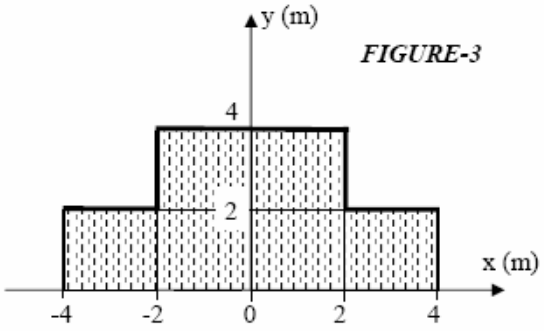


FIGURE-4

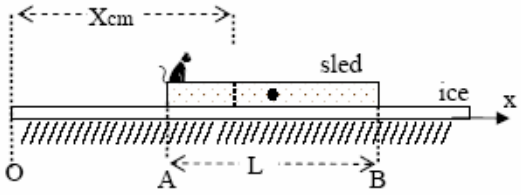
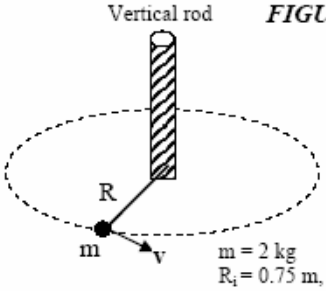


FIGURE-5



m = 2 kg
R_i = 0.75 m, R_f = 0.25 m

FIGURE-6

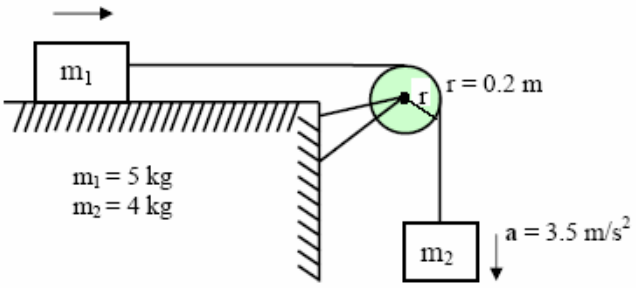


FIGURE-7