

Name__Prof. S.K. Sinha_____

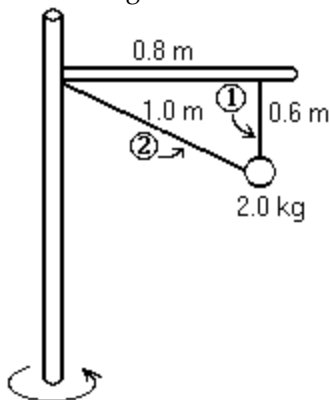
Values of all required constants will be provided on final exam.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) Two particles, A and B, are in uniform circular motion about a common center. The acceleration of particle A is 3.2 times that of particle B. The period of particle B is 2.0 times the period of particle A. The ratio of the radius of the motion of particle A to that of particle B is closest to:

- A) 1.60 B) 0.64 C) 0.80 D) 0.625 E) 1.25

Figure 5.12

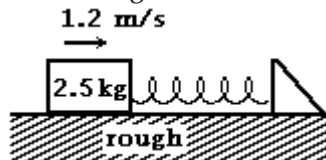


A 2.0 kg ball is suspended by two wires from a horizontal arm, which is attached to a vertical shaft, as shown. The shaft is in uniform rotation about its axis such that the linear speed of the ball equals 2.4 m/s.

- 2) In Figure 5.12, the tension in wire 2 is closest to:

- A) 18 N B) 21 N C) 27 N D) 24 N E) 15 N

Figure 7.9

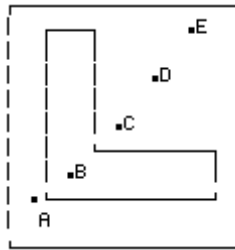


A 2.5 kg, sliding on a rough surface, has a speed of 1.2 m/s when it makes contact with a spring. The block comes to a momentary halt when the compression of the spring is 5.0 cm. The work done by the friction, from the instant the block makes contact with the spring until it comes to a momentary halt, is -0.50 J.

- 3) In Figure 7.9, the force constant of the spring is closest to:

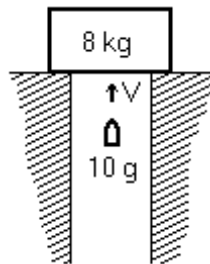
- A) 890 N/m B) 1040 N/m C) 990 N/m D) 940 N/m E) 840 N/m

Figure 8.9



- 4) In Figure 8.9, an L-shaped piece is cut from a uniform sheet of metal. Which of the points indicated is closest to the center of mass of the object?
- A) A B) C C) E D) B E) D

Figure 8.4



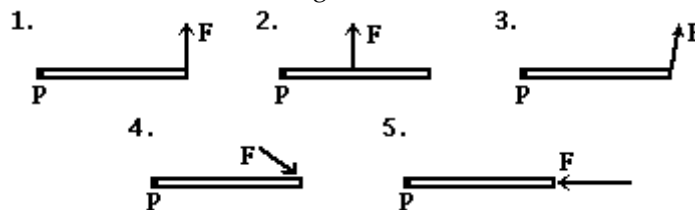
A 10 g bullet is shot vertically into an 8 kg block. The block lifts upward 3 mm. The bullet penetrates the block in a time interval of 0.001 s. Assume the force on the bullet is constant during penetration.

- 5) In Figure 8.4, the impulse on the block due to capture of the bullet is closest to:
- A) 3.0 N · s B) 1.5 N · s C) 3.5 N · s D) 2.0 N · s E) 2.5 N · s

A machinist turns the power on to a grinding wheel, at rest, at time $t = 0$ s. The wheel accelerates uniformly for 10 s and reaches the operating angular velocity of 50 rad/s. The wheel is run at that angular velocity for 30 s and then power is shut off. The wheel decelerates uniformly at 1.2 rad/s^2 until the wheel stops.

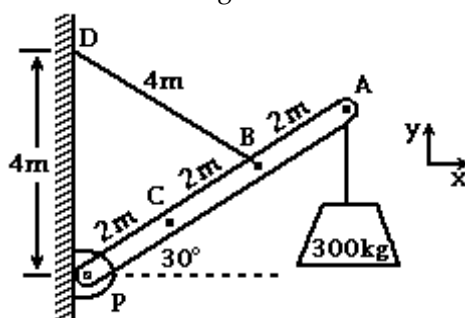
- 6) The total number of revolutions made by the wheel is closest to:
- A) 520 B) 560 C) 440 D) 400 E) 480

Figure 10.3



- 7) In Figure 10.3, a given force F is applied to a rod in several different ways. In which case is the torque due to F about the pivot P greatest?
- A) 1 B) 5 C) 4 D) 2 E) 3

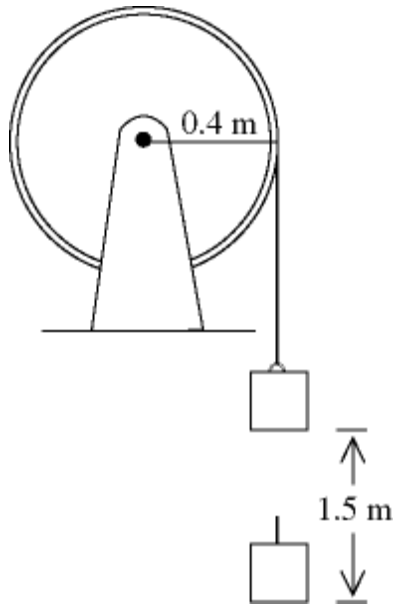
Figure 5



A 200 kg nonuniform beam, 6.0 m long, is loosely pinned at the pivot at P. A 300 kg block is suspended from the end of the boom at A. The boom forms a 30° angle with the horizontal, and is supported by a cable, 4.0 m long, between points D and B. Point B is 4.0 m from P, and point D is 4.0 m above P. The center of mass of the boom is at point C, which is 2.0 m from P.

- 8) In Figure 5, the x-component of the pivot force on the boom is closest to:
 A) 4700 N B) 4100 N C) 4900 N D) 4300 N E) 4500 N
- 9) A theoretical physicist consulting for NASA pointed out early in the space program that the effect of friction on an orbiting satellite would result in its speeding up. Is this true?
 A) No, this is not true because satellites orbit in a perfect vacuum where there is no friction.
 B) Yes, this is true. The force of friction reduces the total energy of the satellite, but as the satellite spirals in toward the earth the kinetic energy increases 1 Joule for every 2 Joule decrease in potential energy, so kinetic energy increases while total energy decreases.
 C) No, this is not true because friction is inherently a dissipative force which reduces the kinetic energy and hence, speed of an object.
 D) Yes, this is true because for a satellite friction acts in the forward direction, unlike the situation in an inertial frame of reference where friction acts to oppose motion.
 E) No, this is not true because conservation of angular momentum requires that a satellite maintain a constant speed in a circular orbit whether or not friction acts.
- 10) Consider an object that drops a distance h in a time of 63 s on the surface of the earth (neglecting air effects). How long would it take the same object to drop the same distance on the surface of Pluto? The mass of Pluto is 1.1×10^{22} kg and its radius is 4.0×10^5 m.
 A) 120 s B) 63 s C) 33 s D) 52 s E) 92 s
- 11) An object is subject to a restoring force $F = 8x^3$, where x is the displacement of the object from its equilibrium position. How much work must be done to move the object from $x = 0$ to $x = 0.27$ m?
 A) 3.94×10^{-2} J
 B) 1.06×10^{-2} J
 C) 4.25×10^{-2} J
 D) 1.57×10^{-1} J
 E) 4.72×10^{-1} J

Figure 10.2



A wheel has a radius of 0.40 m and is mounted on frictionless bearings. A block is suspended from a rope that is wound on the wheel and attached to it. The wheel is released from rest and the block descends 1.5 m in 2.00 s. The tension in the rope during the descent of the block is 20 N.

12) In Fig. 10.2, the mass of the block is closest to:

A) 2.3 kg

B) 1.9 kg

C) 2.1 kg

D) 2.0 kg

E) 2.2 kg

Answer Key

Testname: PHYSICS4A_2015_MAKEUPFINAL

- 1) C
- 2) A
- 3) B
- 4) B
- 5) D
- 6) C
- 7) A
- 8) A
- 9) B
- 10) E
- 11) B
- 12) E