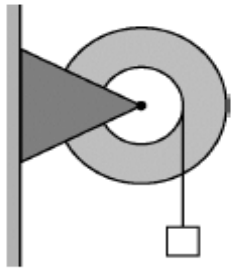


AP Physics 1 Multiple Choice Questions - Chapter 8

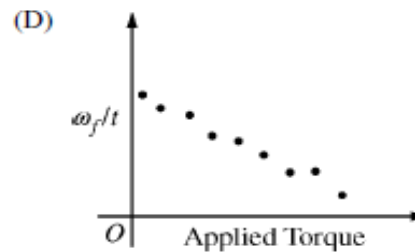
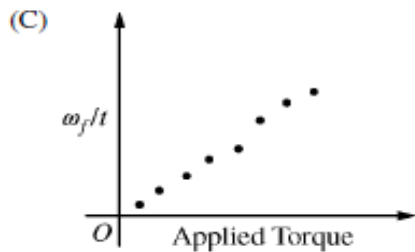
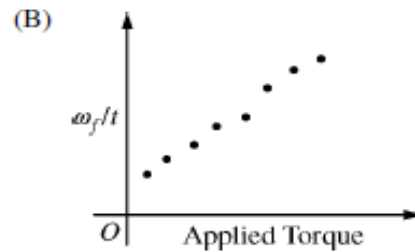
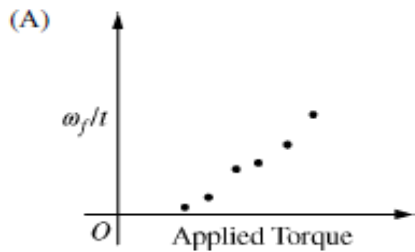


8.1



- 1 A student conducts an experiment to determine the relationship between applied torque and change in angular velocity. The student uses the apparatus shown in the figure above, consisting of two disks that are glued together and mounted on a horizontal axle. Blocks of varying mass are hung from a string wound around the smaller disk. The blocks are released from rest, exerting different torques on the disks, and are allowed to fall a fixed distance. For each block, the time of the fall t and the final angular velocity ω_f of the disks are measured.

There is considerable friction between the disks and the axle. Which of the following best represents a plot that can be obtained from the student's data?



AP Physics 1 Multiple Choice Questions - Chapter 8

1 An ice-skater is moving at a constant velocity across an icy pond. The skater throws a snowball directly overhead. Which of the following correctly describes the velocity of the center of mass of the skater-snowball system immediately after the snowball is thrown? Assume friction and air resistance are negligible.

8.2

- a It is equal to the velocity of the snowball
- b It is equal to the new velocity of the skater
- c It is equal to half the original velocity of the skater
- d It is equal to the original velocity of the skater

2 Two identical blocks with mass 5.0 kg each are connected to the opposite ends of a compressed spring. The blocks initially slide together on a frictionless surface with velocity 2 m/s to the right. The spring is then released by remote control. At some instant later, the left block is moving at 1 m/s to the left, and the other block is moving to the right. What is the speed of the center of mass of the system at that instant?

8.2

- a 4 m/s
- b 3 m/s
- c 2 m/s
- d 0 m/s

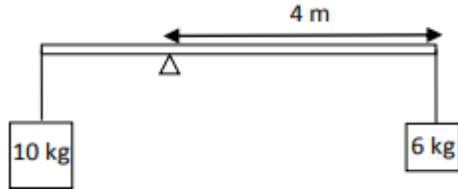
3 Two forces are acting on an object. Which of the following statements is correct?

- a The object is in equilibrium if the forces are equal in magnitude and opposite in direction
- b The object is in equilibrium if the net torque on the object is zero
- c The object is in equilibrium if the forces act on the same point on the object
- d The object is in equilibrium if the net force and the net torque on the object are both zero
- e The object cannot be in equilibrium because more than one force acts on it

8.2

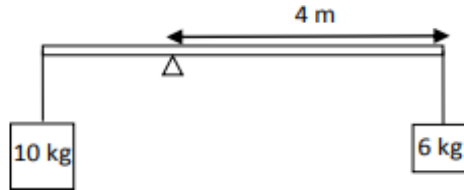
AP Physics 1 Multiple Choice Questions - Chapter 8

- 1 Two forces are acting on an object. Which of the following statements is correct?
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 - e The object cannot be in equilibrium because more than one force acts on it.



- 2 Two masses of 10 kg and 6 kg are hung from massless strings at the end of a light rod. The rod itself is virtually massless. A pivot is placed off center and the system is allowed to rotate. If the 6 kg mass is 4 m away from the pivot point, how far away is the 10 kg mass?

- a 0.42 m
- b 2.4 m
- c 4.8 m
- d 6.3 m
- e 9.8 m



- 3 Two masses of 10 kg and 6 kg are hung from massless strings at the end of a light rod. The rod itself is virtually massless. A pivot is placed off center and the system is allowed to rotate. If the string supporting the 6 kg block is cut, calculate the torque of the system.

- a 60 kg m
- b 120 kg m
- c 240 kg m
- d 480 kg m
- e 0 kg m

AP Physics 1 Multiple Choice Questions - Chapter 8

1 A solid disk and a hoop are simultaneously released from rest at the top of an incline and roll down without slipping. Which object reaches the bottom first?

- a The one that has the largest mass is first
- b The one with the largest radius is first
- c The hoop arrives first
- d The disk arrives first
- e The hoop and the disk arrive at the same time

2 A block slides down a frictionless ramp, while a hollow sphere and a solid ball roll without slipping down a second ramp with the same height and slope. Rank the arrival times at the bottom from shortest to longest.

- a sphere, ball, block
- b ball, block, sphere
- c ball, sphere, block
- d block, sphere, ball
- e block, ball, sphere

3 Estimate the rotational kinetic energy of Earth by treating it as a solid sphere with uniform density.

- a 3×10^{29} J
- b 5×10^{27} J
- c 7×10^{30} J
- d 4×10^{28} J
- e 2×10^{25} J

AP Physics 1 Multiple Choice Questions - Chapter 8

1 A disk of known radius and rotational inertia can rotate without friction in a horizontal plane around its fixed central axis. The disk has a cord of negligible mass wrapped around its edge. The disk is initially at rest, and the cord can be pulled to make the disk rotate. Which of the following procedures would best determine the relationship between applied torque and the resulting change in angular momentum of the disk?

8.7

- a Pulling on the cord, exerting a force of 15 N for 2 s and then 25 N for 3 s, and measuring the final angular velocity of the disk
- b For five different time intervals, pulling on the cord, exerting a force of 15 N, and then measuring the angle through which the disk rotates in each case.
- c For five different time intervals, pulling on the cord, exerting a force of 15 N, and then measuring the final angular velocity of the disk
- d For five forces of different magnitude, pulling on the cord for 5 s, and then measuring the final angular velocity of the disk

2 Halley's comet moves about the Sun in an elliptical orbit, with its closest approach to the sun being 0.59 AU and its greatest distance being 35 AU (one AU is the Earth-Sun distance). If the comet's speed at closest approach is 54 km/sec, what is its speed when it is farthest from the Sun? You may neglect any change in the comet's mass and assume that its angular momentum about the sun is conserved.

8.7

- a 0.91 km/sec
- b 1.79 km/sec
- c 1.58 km/sec
- d 2.01 km/sec

3 Calculate the angular momentum of Earth that arises from its spinning motion on its axis, treating Earth as a uniform solid sphere.

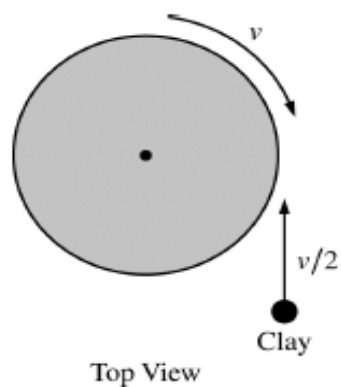
8.7

- a $1.25 \times 10^{35} \text{ J s}$
- b $8.25 \times 10^{30} \text{ J s}$
- c $7.08 \times 10^{33} \text{ J s}$
- d $4.55 \times 10^{27} \text{ J s}$

AP Physics 1 Multiple Choice Questions - Chapter 8

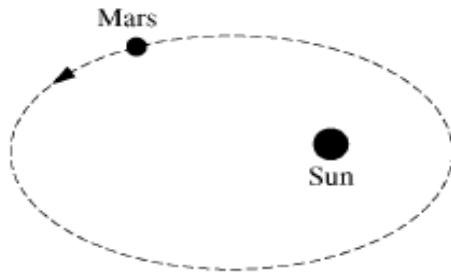


8.8



- 1** A system consists of a disk rotating on a frictionless axle and a piece of clay moving toward it, as shown in the figure above. The outside edge of the disk is moving at a linear speed v , and the clay is moving at speed $v/2$. The clay sticks to the outside edge of the disk. How does the angular momentum of the system after the clay sticks compare to the angular momentum of the system before the clay sticks, and what is an explanation for the comparison?
- a** It is the same because there is no external torque acting on the system
 - b** It is greater because the rotating mass increases, which increases the rotational inertia
 - c** It is less because the speed of the disk decreases when the clay sticks to it
 - d** It is less because the angular momentum of the clay opposes that of the disk.

AP Physics 1 Multiple Choice Questions - Chapter 8



Note: Figure not drawn to scale.

- 2 Mars moves in an elliptical orbit around the sun, and the mass of Mars is much less than the mass of the Sun. At the instant shown above, Mars is getting farther away from the Sun. How does this affect the potential energy of the Mars-Sun system and the magnitude of Mars's angular momentum with respect to the Sun?

System PE

Mars AM

- | | | |
|---|-----------|--------------|
| a | Increases | Increases |
| b | Increases | Remains Same |
| c | Decreases | Decreases |
| d | Decreases | Remains Same |

- 3 A mouse is initially at rest on a horizontal turntable mounted on a frictionless, vertical axle. As the mouse begins to walk clockwise around the perimeter, which of the following statements must be true of the turntable?

- a It also turns clockwise
- b It turns counterclockwise with the same angular velocity as the mouse
- c It remains stationary
- d It turns counterclockwise because angular momentum is conserved
- e It turns counterclockwise because mechanical energy is conserved