PHYS 1303 Final Exam Example Problems

Chapter 1: 1, 34, 35

Chapter 2: 2, 3, 4, 36, 37, 38

Chapter 4: 5, 6, 39, 40, 41, 42, 43

Chapter 5: 7, 8, 44, 45, 46

Chapter 6: 9, 10, 11, 47, 48, 49

Chapter 7: 14, 30, 31, 50, 51, 52

Chapter 8: 12, 13, 53, 54

Chapter 9: 15, 16, 17, 18, 55, 56

Chapter 10: 19, 20, 23, 24, 57, 58, 59

Chapter 11: 21, 22, 60, 61

Chapter 12: 25, 27, 62

Chapter 13: 26, 28, 29, 63, 64

Chapter 15: 32, 33, 65, 66

Note: Problems in a given chapter may also need the use of ideas from prior chapters

1.Which quantity can be converted from the English system to the metric system by the conversion factor

$$\frac{5280\ \text{f}}{\text{mi}} \cdot \frac{12\ \text{in}}{\text{f}} \cdot \frac{2.54\ \text{cm}}{1\ \text{in}} \cdot \frac{1\ \text{m}}{100\ \text{cm}} \cdot \frac{1\ \text{h}}{3600\ \text{s}}\ ?$$

a. feet per second
b. feet per hour
c. miles per second
d. miles per hour
e. miles per minute

2.A particle moving with a constant acceleration has a velocity of 20 cm/s when its position is x = 10 cm. Its position 7.0 s later is x = –30 cm. What is the acceleration of the particle?

a. –7.3 cm/s^2
b. –8.9 cm/s^2
c. –11 cm/s^2
d. –15 cm/s^2
e. –13 cm/s^2

3.A rocket, initially at rest, is fired vertically with an upward acceleration of 10 m/s^2. At an altitude of 0.50 km, the engine of the rocket cuts off. What is the maximum altitude it achieves?

a. 1.9 km
b. 1.3 km
c. 1.6 km
d. 1.0 km
e. 2.1 km

4.In a location where the train tracks run parallel to a road, a high speed train traveling at 60 m/s passes a car traveling at 30 m/s in the opposite direction. How long does it take for the train to be 180 m away from the car?

a. 2.0 s
b. 3.0 s
c. 6.0 s
d. 9.0 s
e. 18.0 s

5.At t = 0, a particle leaves the origin with a velocity of 12 m/s in the positive x direction and moves in the xy plane with a constant acceleration of $\left(-2.0\hat{\mathbf{i}} + 4.0\hat{\mathbf{j}}\right)$m/s^2. At the instant the y coordinate of the particle is 18 m, what is the x coordinate of the particle?

a. 30 m
b. 21 m
c. 27 m
d. 24 m
e. 45 m

6.The site from which an airplane takes off is the origin. The x-axis points east; the y-axis points straight up. The position and velocity vectors of the plane at a later time are given by

$$\vec{\mathbf{r}} = (1.61\times10^4\,\hat{\mathbf{i}} + 9.00\times10^3\,\hat{\mathbf{j}})\text{ m and }\vec{\mathbf{v}} = (150\hat{\mathbf{i}} - 21\hat{\mathbf{j}})\ \frac{\text{m}}{\text{s}}.$$

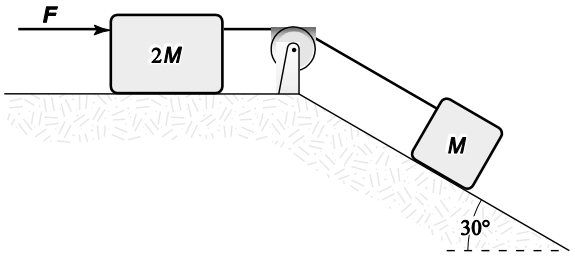
The magnitude, in meters, of the plane's displacement from the origin is

a. 9.14×10^3.
b. 1.61×10^4.
c. 1.84×10^4.
d. $9.14\times10^3 t$.
e. $1.61\times10^4 t$.

7.A 3.0-kg block slides on a frictionless 20° inclined plane. A force of 16 N acting parallel to the incline and up the incline is applied to the block. What is the acceleration of the block?

a. 2.0 m/s^2 down the incline
b. 5.3 m/s^2 up the incline
c. 2.0 m/s^2 up the incline
d. 3.9 m/s^2 down the incline
e. 3.9 m/s^2 up the incline

8.In the figure, if F = 2.0 N and M = 1.0 kg, what is the tension in the connecting string? The pulley and all surfaces are frictionless.



a. 2.6 N
b. 1.1 N
c. 2.1 N
d. 1.6 N
e. 3.7 N

9.A 1.0-kg block is pushed up a rough 22° inclined plane by a force of 7.0 N acting parallel to the incline. The acceleration of the block is 1.4 m/s^2 up the incline. Determine the magnitude of the force of friction acting on the block.

a. 1.9 N
b. 2.2 N
c. 1.3 N
d. 1.6 N
e. 3.3 N

10.A race car travels 40 m/s around a banked (45° with the horizontal) circular (radius = 0.20 km) track. What is the magnitude of the resultant force on the 80-kg driver of this car?

a. 0.68 kN
b. 0.64 kN
c. 0.72 kN
d. 0.76 kN
e. 0.52 kN

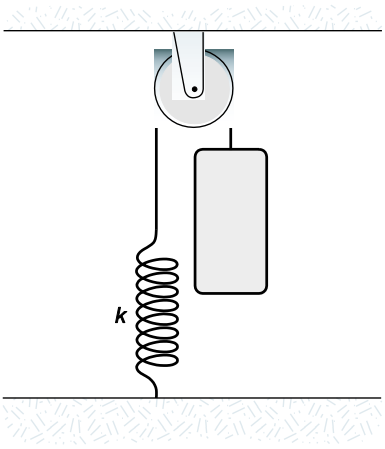
11.A 30-kg child rides on a circus Ferris wheel that takes her around a vertical circular path with a radius of 20 m every 22 s. What is the magnitude of the resultant force on the child at the highest point on this trajectory?

a. 49 N
b. 0.29 kN
c. 0.34 kN
d. 0.25 kN
e. 0.76 kN

12.A 0.60-kg object is suspended from the ceiling at the end of a 2.0-m string. When pulled to the side and released, it has a speed of 4.0 m/s at the lowest point of its path. What maximum angle does the string make with the vertical as the object swings up?

a. 61°
b. 54°
c. 69°
d. 77°
e. 47°

13. A 20-kg mass is fastened to a light spring (k = 380 N/m) that passes over a pulley as shown. The pulley is frictionless, and the mass is released from rest when the spring is unstretched. After the mass has dropped 0.40 m, what is its speed?



a. 2.2 m/s
b. 2.5 m/s
c. 1.9 m/s
d. 1.5 m/s
e. 3.6 m/s

14. The only force acting on a 2.0-kg body moving along the x axis is given by $F_x = (2.0x)$ N, where x is in m. If the velocity of the object at x = 0 is +3.0 m/s, how fast is it moving at x = 2.0 m?

a. 4.2 m/s
b. 3.6 m/s
c. 5.0 m/s
d. 5.8 m/s
e. 2.8 m/s

15. An 80-g particle moving with an initial speed of 50 m/s in the positive x direction strikes and sticks to a 60-g particle moving 50 m/s in the positive y direction. How much kinetic energy is lost in this collision?

a. 96 J
b. 89 J
c. 175 J
d. 86 J
e. 110 J

16. A 3.0-kg ball with an initial velocity of (4**i** + 3**j**) m/s collides with a wall and rebounds with a velocity of (–4**i** + 3**j**) m/s. What is the impulse exerted on the ball by the wall?

a. +24**i** N s
b. –24**i** N s
c. +18**j** N s
d. –18**j** N s
e. +8.0**i** N s

17. At the instant a 2.0-kg particle has a velocity of 4.0 m/s in the positive x direction, a 3.0-kg particle has a velocity of 5.0 m/s in the positive y direction. What is the speed of the center of mass of the two-particle system?

a. 3.8 m/s
b. 3.4 m/s
c. 5.0 m/s
d. 4.4 m/s
e. 4.6 m/s

18. A 4.2-kg object, initially at rest, "explodes" into three objects of equal mass. Two of these are determined to have velocities of equal magnitudes (5.0 m/s) with directions that differ by 90°. How much kinetic energy was released in the explosion?

a. 70 J
b. 53 J
c. 60 J
d. 64 J
e. 35 J

19. A wheel rotates about a fixed axis with an initial angular velocity of 20 rad/s. During a 5.0-s interval the angular velocity increases to 40 rad/s. Assume that the angular acceleration was constant during the 5.0-s interval. How many revolutions does the wheel turn through during the 5.0-s interval?

a. 20 rev
b. 24 rev
c. 32 rev
d. 28 rev
e. 39 rev

20. A wheel rotating about a fixed axis with a constant angular acceleration of 2.0 rad/s^2 starts from rest at t = 0. The wheel has a diameter of 20 cm. What is the magnitude of the total linear acceleration of a point on the outer edge of the wheel at t = 0.60 s?

a. 0.25 m/s^2
b. 0.50 m/s^2
c. 0.14 m/s^2
d. 0.34 m/s^2
e. 0.20 m/s^2

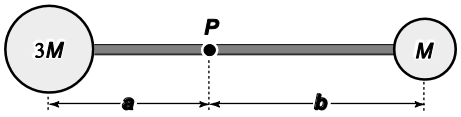
21.A particle whose mass is 2 kg moves in the *xy* plane with a constant speed of 3 m/s in the *x*-direction along the line $y = 5$. What is its angular momentum (in kg $\cdot$ m^2/s) relative to the origin?

a. $-30\,\hat{\mathbf{k}}$
b. $30\,\hat{\mathbf{k}}$
c. $-15\,\hat{\mathbf{k}}$
d. $15\,\hat{\mathbf{k}}$
e. $45\,\hat{\mathbf{k}}$

22.A merry-go-round of radius $R = 2.0$ m has a moment of inertia $I = 250$ kg $\cdot$ m^2, and is rotating at 10 rpm. A child whose mass is 25 kg jumps onto the edge of the merry-go-round, heading directly toward the center at 6.0 m/s. The new angular speed (in rpm) of the merry-go-round is approximately

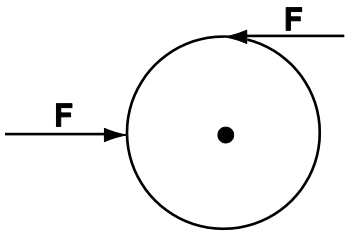
a. 10
b. 9.2
c. 8.5
d. 7.1
e. 6.4

23.The rigid body shown is rotated about an axis perpendicular to the paper and through the point P. If $M = 0.40$ kg, $a = 30$ cm, and $b = 50$ cm, how much work is required to take the body from rest to an angular speed of 5.0 rad/s? Neglect the mass of the connecting rods and treat the masses as particles.



a. 2.9 J
b. 2.6 J
c. 3.1 J
d. 3.4 J
e. 1.6 J

24.Two forces of magnitude 50 N, as shown in the figure below, act on a cylinder of radius 4 m and mass 6.25 kg. The cylinder, which is initially at rest, sits on a frictionless surface. After 1 second, the velocity and angular velocity of the cylinder in m/s and rad/s are respectively



a. $v = 0$; $\omega = 0$.
b. $v = 0$; $\omega = 4$.
c. $v = 0$; $\omega = 8$.
d. $v = 8$; $\omega = 8$.
e. $v = 16$; $\omega = 8$.

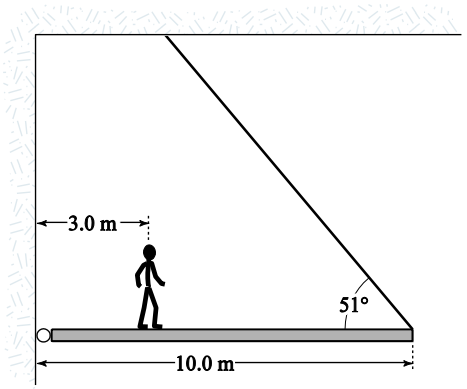
25.A horizontal meter stick supported at the 50-cm mark has a mass of 0.50 kg hanging from it at the 20-cm mark and a 0.30 kg mass hanging from it at the 60-cm mark. Determine the position on the meter stick at which one would hang a third mass of 0.60 kg to keep the meter stick balanced.

a. 74 cm
b. 70 cm
c. 65 cm
d. 86 cm
e. 62 cm

26.The period of a satellite circling planet Nutron is observed to be 84 s when it is in a circular orbit with a radius of 8.0×10^6 m. What is the mass of planet Nutron?

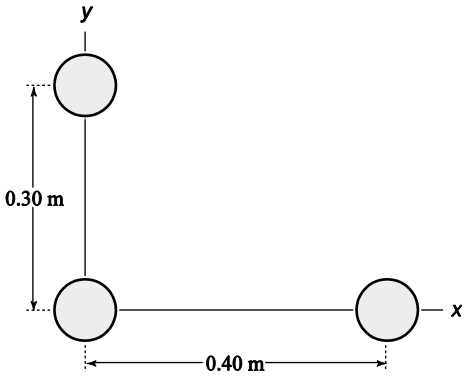
a. 6.2×10^{28} kg
b. 5.0×10^{28} kg
c. 5.5×10^{28} kg
d. 4.3×10^{28} kg
e. 3.7×10^{28} kg

27. The figure shows a uniform, horizontal beam (length = 10 m, mass = 25 kg) that is pivoted at the wall, with its far end supported by a cable that makes an angle of 51° with the horizontal. If a person (mass = 60 kg) stands 3.0 m from the pivot, what is the tension in the cable?



a. 0.83 kN
b. 0.30 kN
c. 0.39 kN
d. 0.42 kN
e. 3.0 kN

28. Three 5.0-kg masses are located at points in the *xy* plane, as shown. What is the magnitude of the resultant force (caused by the other two masses) on the mass at $x = 0$, $y = 0.30$ m?



a. 2.6×10^{-8} N
b. 2.0×10^{-8} N
c. 2.9×10^{-8} N
d. 2.3×10^{-8} N
e. 2.1×10^{-8} N

29. A 50-kg satellite circles the Earth in an orbit with a period of 120 min. What minimum energy is required to change the orbit to another circular orbit with a period of 180 min? (Earth: radius = 6.4×10^6 m, mass = 6.0×10^{24} kg)

a. 2.9×10^8 J
b. 3.5×10^8 J
c. 4.1×10^8 J
d. 4.7 10^8 J
e. 5.9 10^8 J

30. A 2.0-kg projectile moves from its initial position to a point that is displaced 20 m horizontally and 15 m above its initial position. How much work is done by the gravitational force on the projectile?

a. +0.29 kJ
b. –0.29 kJ
c. +30 J
d. –30 J
e. –50 J

31. As a 2.0-kg object moves from $(2\hat{\mathbf{i}}+5\hat{\mathbf{j}})$ m to $(6\hat{\mathbf{i}}-2\hat{\mathbf{j}})$ m, the constant resultant force acting on it is equal to $(4\hat{\mathbf{i}}-3\hat{\mathbf{j}})$ N. If the speed of the object at the initial position is 4.0 m/s, what is its kinetic energy at its final position?

a. 62 J
b. 53 J
c. 73 J
d. 86 J
e. 24 J

32. The motion of a particle connected to a spring is described by $x = 10 \sin(\pi t)$. At what time (in s) is the potential energy equal to the kinetic energy?

a. 0
b. 0.25
c. 0.50
d. 0.79
e. 1.0

33. A body oscillates with simple harmonic motion along the x axis. Its displacement varies with time according to the equation $x = 5 \sin(\pi t + \pi/3)$. The phase (in rad) of the motion at t = 2 s is

a. $7\pi/3$
b. $\pi/3$
c. π
d. $5\pi/3$
e. 2π

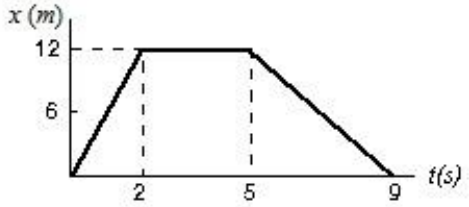
34. 1 m is equivalent to 3.281 ft. A cube with an edge of 1.5 ft has a volume of:
A) 1.2×10^2 m^3
B) 9.6×10^{-2} m^3
C) 10.5 m^3
D) 9.5×10^{-2} m^3
E) 0.21 m^3

35. During a short interval of time the speed v in m/s of an automobile is given by $v = at^2 + bt^3$, where the time t is in seconds. The units of a and b are respectively:
A) m·s^2; m·s^4
B) s^3/m; s^4/m
C) m/s^2; m/s^3
D) m/s^3; m/s^4
E) m/s^4; m/s^5

36. A stone is released from rest from the edge of a building roof 190 m above the ground. Neglecting air resistance, the speed of the stone, just before striking the ground, is:
A) 43 m/s
B) 61 m/s
C) 120 m/s
D) 190 m/s
E) 1400 m/s

37. The position of an object is given as a function of time by $x = 2t^2 - t^3 + c$, where x is in m, t is in seconds, and c is a constant. Its average velocity over the interval from $t = 0$ s to $t = 2$ s:
A) is 0
B) is –2 m/s
C) is 2 m/s
D) is –4 m/s
E) cannot be calculated unless the initial position c is given

38. This graph shows the position of a particle as a function of time. What is its instantaneous velocity at $t = 7$s?



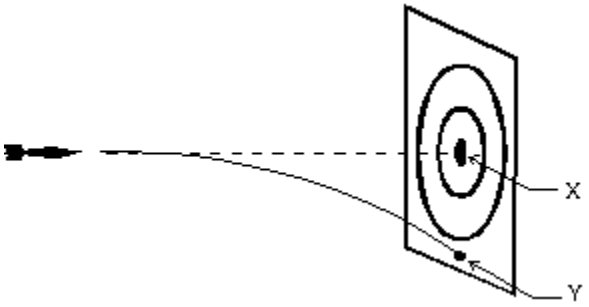
A) 3 m/s
B) -3 m/s
C) 12 m/s
D) -12 m/s
E) Need additional information.

39. A boat is traveling upstream at 14 mph with respect to a river that is flowing at 6 mph (with respect to the ground). A woman runs directly across the boat, from one side to the other, at 6 mph (with respect to the boat). The speed of the woman with respect to the ground is:
A) 10 mph
B) 14 mph
C) 18.5 mph
D) 21 mph
E) 26 mph

40. A stone is tied to a 0.50-m string and whirled at a constant speed of 4.0 m/s in a vertical circle. The acceleration at the bottom of the circle is:
A) 9.8 m/s^2, up
B) 9.8 m/s^2, down
C) 8.0 m/s^2, up
D) 32 m/s^2, up
E) 32 m/s^2, down

41. An airplane flying at a speed of 200 m/s enters a gradual 90° turn, emerging at the same speed it entered the turn, 200 m/s. The turn takes 20.0 seconds to complete. For this turn the magnitude of the average acceleration of the plane is:
A) 0 m/s^2
B) 40 m/s^2
C) 20 m/s^2
D) 14 m/s^2
E) 10 m/s^2

42. A dart is thrown horizontally toward X at 20 m/s as shown. It hits Y 0.1 s later. The distance XY is:



A) 2 m
B) 1 m
C) 0.5 m
D) 0.1 m
E) 0.05 m

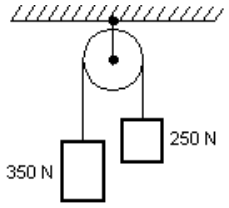
43. An object has a velocity of (5.4 m/s)$\hat{\imath}$ − (4.8 m/s)$\hat{\jmath}$. Over a period of 1.3 s, its velocity changes under constant acceleration to (1.7 m/s)$\hat{\imath}$ + (5.9 m/s)$\hat{\jmath}$. What is this acceleration?

A) −(3.7 m/s)$\hat{\imath}$ + (11 m/s)$\hat{\jmath}$
B) −(2.8 m/s)$\hat{\imath}$ + (8.2 m/s)$\hat{\jmath}$
C) (3.7 m/s)$\hat{\imath}$ + (11 m/s)$\hat{\jmath}$
D) (2.8 m/s)$\hat{\imath}$ + (8.2 m/s)$\hat{\jmath}$
E) −(2.8 m/s)$\hat{\imath}$ + (1.1 m/s)$\hat{\jmath}$

44. When a 40-N force, parallel to the incline and directed up the incline, is applied to a crate on a frictionless incline that is 30° above the horizontal, the acceleration of the crate is 2.0 m/s^2, up the incline. The mass of the crate is:

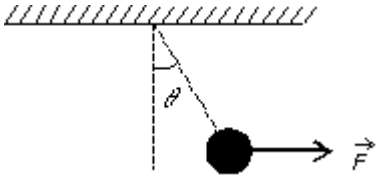
A) 3.8 kg
B) 4.1 kg
C) 5.8 kg
D) 6.2 kg
E) 10 kg

45. Two blocks weighing 250 N and 350 N respectively, are connected by a massless string that passes over a massless, frictionless pulley as shown. The tension in the string is:



A) 210 N
B) 290 N
C) 410 N
D) 500 N
E) 4900 N

46. A ball of weight 1-N on the end of a string is held by a 2-N horizontal force *F*, as shown, so that the string makes an angle θ from the vertical. The tension in the string is:

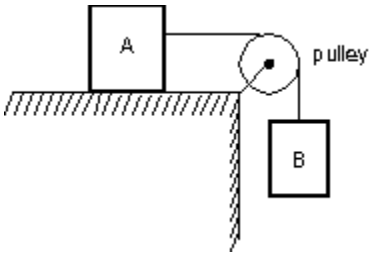


A) $2/\sqrt{5}$ N
B) $2\sqrt{5}$ N
C) $\sqrt{5}$ N
D) 1 N
E) none of these

47. A 24-N horizontal force is applied to a 40-N block initially at rest on a rough horizontal surface. If the coefficients of friction are $\mu_s = 0.5$ and $\mu_k = 0.4$, the magnitude of the frictional force on the block is:

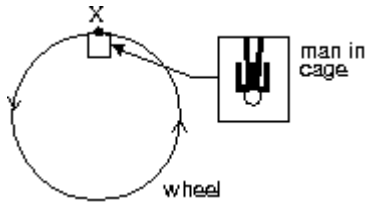
A) 12 N
B) 16 N
C) 20 N
D) 24 N
E) 40 N

48. Block A, with a mass of 50 kg, rests on a horizontal table top. The coefficient of static friction is 0.40. A horizontal string is attached to A and passes over a massless, frictionless pulley as shown. The smallest mass m_B of block B, attached to the dangling end, that will start A moving when it is attached to the other end of the string is:



A) 20 kg
B) 30 kg
C) 40 kg
D) 50 kg
E) 70 kg

49. A giant wheel, 40 m in diameter, is fitted with a cage and platform on which a man can stand. The wheel rotates at such a speed that when the cage is at X (as shown) the force exerted by the man on the platform is equal to his weight. The speed of the man is:



A) 14 m/s
B) 20 m/s
C) 28 m/s
D) 80 m/s
E) 120 m/s

50. At time t = 0 a 2-kg particle has a velocity of (4 m/s) $\hat{\imath}$ – (3 m/s) $\hat{\jmath}$. At t = 3 s its velocity is (2 m/s) $\hat{\imath}$ + (3 m/s) $\hat{\jmath}$. During this time the work done on it was:

A) 4 J
B) –4 J
C) –12 J
D) –40 J
E) (4 J) $\hat{\imath}$ + (36 J) $\hat{\jmath}$

51. When a certain rubber band is stretched a distance x, it exerts a restoring force $F = ax + bx^2$, where a and b are constants. The work done in stretching this rubber band from x = 0 to $x = L$ is:

A) $aL^2 + bLx^3$
B) $aL + 2bL^2$
C) $a + 2bL$
D) bL
E) $aL^2/2 + bL^3/3$

52. A 50-N force is the only force on a 2-kg crate that starts from rest. At the instant the crate has gone 2 m the rate at which the force is doing work is:

A) 2.5 W
B) 25 W
C) 75 W
D) 100 W
E) 500 W

53. A 0.50-kg block attached to an ideal spring with a spring constant of 80 N/m oscillates on a horizontal frictionless surface. When the spring is 4.0 cm longer than its equilibrium length, the speed of the block is 0.50 m/s. The greatest speed of the block is:

A) 0.32 m/s
B) 0.55 m/s
C) 0.71 m/s
D) 0.87 m/s
E) 0.93 m/s

54. A 2.2-kg block starts from rest on a rough inclined plane that makes an angle of 25° with the horizontal. The coefficient of kinetic friction is 0.25. As the block goes 2.0 m down the plane, the mechanical energy of the Earth-block system changes by:

A) 0 J
B) –9.8 J
C) 9.8 J
D) –18 J
E) 18 J

55. Two 4.0-kg blocks are tied together with a short compressed spring between them and thrown into the air. At the highest point of the trajectory they become untied and spring apart. About how far below the highest point is the center of mass of the two-block system 2.0 s later, before either fragment has hit the ground? (Neglect air resistance)
A) 1.2 m
B) 20 m
C) 31 m
D) Can't tell because the velocities of the fragments are not given.
E) Can't tell because the coordinates of the highest point are not given.

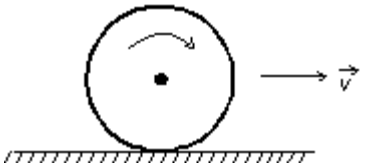
56. A 3.0-kg cart and a 2.0-kg cart approach each other on a horizontal air track. They collide and stick together. After the collision their total kinetic energy is 40 J. The speed of their center of mass is:
A) 0 m/s
B) 2.8 m/s
C) 4.0 m/s
D) 5.2 m/s
E) 8.0 m/s

57. The coordinate of an object is given as a function of time by $\theta = 7t - 3t^2$, where θ is in radians and t is in seconds. Its angular velocity at $t = 3$ s is:
A) −11 rad/s
B) −3.7 rad/s
C) 1.0 rad/s
D) 3.7 rad/s
E) 11 rad/s

58. A pulley with a radius of 3.0 cm and a rotational inertia of 4.5×10^{-3} kg·m^2 is suspended from the ceiling. A rope passes over it with a 2.0-kg block attached to one end and a 4.0-kg block attached to the other. The rope does not slip on the pulley. When the velocity of the heavier block is 2.0 m/s the total kinetic energy of the pulley and blocks is:
A) 2.0 J
B) 12 J
C) 14 J
D) 22 J
E) 28 J

59. A disk with a rotational inertia of 5.0 kg · m^2 and a radius of 0.25 m rotates on a frictionless fixed axis perpendicular to the disk and through its center. A force of 8.0 N is applied tangentially to the rim. If the disk starts at rest, then after it has turned through half a revolution its angular velocity is:
A) 0.57 rad/s
B) 0.64 rad/s
C) 0.80 rad/s
D) 1.6 rad/s
E) 3.2 rad/s

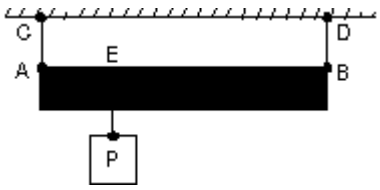
60. A wheel of radius 0.5 m rolls without sliding on a horizontal surface as shown. Starting from rest, the wheel moves with constant angular acceleration 6 rad/s^2. The distance in traveled by the center of the wheel from t = 0 to t = 3 s is:



A) 0 m
B) 27 m
C) 13.5 m
D) 18 m
E) none of these

61. A playground merry-go-round has a radius of 3.0 m and a rotational inertia of 600 kg·m^2. It is initially spinning at 0.80 rad/s when a 20-kg child crawls from the center to the rim. When the child reaches the rim the angular velocity of the merry-go-round is:
A) 0.62 rad/s
B) 0.73 rad/s
C) 0.77 rad/s
D) 0.91 rad/s
E) 1.1 rad/s

62. A uniform rod AB is 1.2 m long and weighs 16 N. It is suspended by strings AC and BD as shown. A block P weighing 96 N is attached at E, 0.30 m from A. The magnitude of the tension force in the string BD is:



A) 8.0 N
B) 24 N
C) 32 N
D) 48 N
E) 80 N

63. Mars has a mass of about 0.1075 times the mass of Earth and a diameter of about 0.533 times the diameter of Earth. The acceleration of a body falling near the surface of Mars is about:
A) 0.30 m/s^2
B) 1.4 m/s^2
C) 2.0 m/s^2
D) 3.7 m/s^2
E) 26 m/s^2

64. A projectile is fired straight upward from Earth's surface with a speed that is half the escape speed. If R is the radius of Earth, the highest altitude reached, measured from the surface, is:
A) $R/4$
B) $R/3$
C) $R/2$
D) R
E) $2R$

65. A particle moves in simple harmonic motion according to $x = 2\cos(50t)$, where x is in meters and t is in seconds. Its maximum velocity is:
A) $100 \sin(50t)$ m/s
B) $100 \cos(50t)$ m/s
C) 100 m/s
D) 200 m/s
E) none of these

66. A block attached to a spring undergoes simple harmonic motion on a horizontal frictionless surface. Its total energy is 50 J. When the displacement is half the amplitude, the kinetic energy is:
A) 0 J
B) 12.5 J
C) 25 J
D) 37.5 J
E) 50 J

KEY

1 D	2 A	3 D	4 A	5 C	6 C	7 C	8 A	9 A	10 B	11 A	12 B	13 A
14 B	15 D	16 B	17 B	18 A	19 B	20 A	21 A	22 D	23 B	24 B	25 B	26 D
27 C	28 D	29 A	30 B	31 B	32 B	33 A	34 B	35 D	36 B	37 A	38 B	39 A
40 D	41 D	42 E	43 B	44 C	145 B	46 C	47 B	48 A	49 B	50 C	51 E	52 E
53 C	54 B	55 B	56 C	57 A	58 D	59 D	60 C	61 A	62 C	63 D	64 B	65 C
66 D												