Physics 1 Final Exam Worksheet

Organic Chemistry Tutor

1. A car travels 200. miles east in 4 hours and then 300. miles west in 5 hours. What is the average speed of the car for the entire trip?

A. 54.0 mph
B. 54.5 mph
C. 55.0 mph
D. 55.6 mph
E. 56.0 mph

2. A car travels 200 miles east in 4 hours and then 300 miles west in 5 hours. What is the average velocity of the car for the entire trip?

A. 54.5 mph
B. 55.6 mph
C. -55.0 mph
D. -11.1 mph
E. -55.6 mph

3. A car accelerates from 15 m/s to 45 m/s in 9 seconds. How far does the car travel during this time period?

A. 150 m
B. 215 m
C. 270 m
D. 325 m
E. 384 m

4. Which of the following statements is not true concerning a ball in projectile motion that was kicked horizontally off a 200 m cliff at an initial speed of 15 m/s?

A. The initial velocity is zero.

B. The horizontal acceleration is -9.8 m/s^2.

C. The horizontal speed is 15 m/s when it hits the ground.

D. The vertical velocity decreases by 9.8 m/s every second.

E. The horizontal speed is constant.

5. A ball is released from rest at the top of a 450 m cliff. How long will it take the ball to hit the ground?

A. 4.72 s
B. 6.35 s
C. 7.48 s
D. 8.29 s
E. 9.58 s

6. A ball is thrown downward with an initial speed of 25 m/s from the top of a 500 m building. How long will it take the ball to hit the ground?

A. 4.56 s
B. 5.37 s
C. 6.91 s
D. 7.87 s
E. 8.43 s

7. The velocity of a rock in component form is V = -12i + 5j. What is the speed of the rock and its direction with respect to the +x-axis?

A. -7 m/s at 22.6^0
B. 17 m/s at 157.4^0
C. 13 m/s at 202.6^0
D. 13 m/s at -22.6^0
E. 13 m/s at 157.4^0

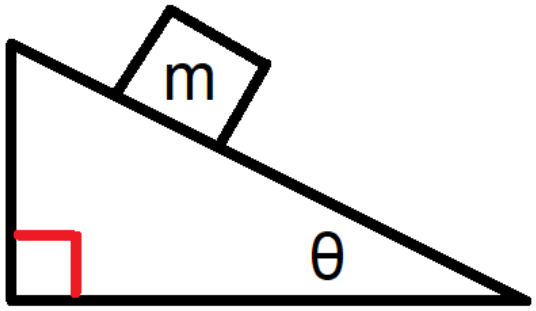
8. A ball rolls horizontally off a cliff at 23 m/s. The range of the ball is 184 m. How high is the cliff?

A. 256 m
B. 314 m
C. 375 m
D. 445 m
E. 522 m

9. A truck slowly speeds up from 15 km/h to 95 km/h in 2 minutes. What is the average acceleration of the truck in m/s^2.

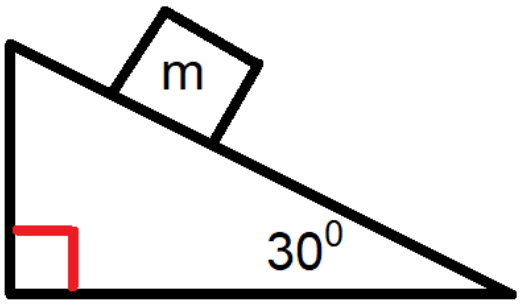
A. 0.185 m/s^2
B. 0.425 m/s^2
C. 0.750 m/s^2
D. 1.15 m/s^2
E. 1.64 m/s^2

10. Which of the following expressions can be used to calculate the acceleration of the block on the inclined plane shown below



A. $a = \frac{1}{2} g$
B. $a = g / \tan \theta$
C. $a = g \cos \theta$
D. $a = g \sin \theta$

11. An 8 kg box lies on a 30^0 frictionless inclined plane as shown below. What is the final speed of the block as it slides down the inclined plane starting from rest for a distance of 200 m?



A. 25 m/s
B. 33 m/s
C. 38 m/s
D. 44 m/s
E. 50 m/s

12. A tension force of 500 N acts on a 20 kg block pulling it to the right across a horizontal surface. A constant kinetic frictional force of 140 N acts on the block. What is the acceleration of the block?

A. 15 m/s^2
B. 18 m/s^2
C. 22 m/s^2
D. 26 m/s^2
E. 30 m/s^2

13. Which of the following statements is true concerning an object moving in a straight line in the +x direction with constant speed?

A. The net force acting on the object is zero.
B. The kinetic frictional force is zero.
C. The horizontal acceleration is zero.
D. The normal force is zero.
E. Two of the statements above are true.

14. A 25.0 kg block rests on a horizontal surface. A tension force of 135 N is applied on the block in the +y direction to pull it up. What is the normal force acting on the block?

A. 110. N
B. 135 N
C. 245 N
D. 355 N
E. 380. N

15. A car is currently located 350 m west of town XYZ. At this instant, it is traveling east at 25 m/s with a constant acceleration of 3 m/s^2 in the +x direction. What will be the position of the car relative to town XYZ after 12 seconds?

A. -227 m
B. -104 m
C. +115 m
D. +166 m
E. + 317 m

16. A ball is kicked at 25 m/s from the ground at a launch angle of 20^0. What other launch angle will yield the same range at 25 m/s?

A. 50^0
B. 60^0
C. 70^0
D. 80^0

17. How much work is required to speed up a 10 kg block from rest to 16 m/s?

A. 450 J
B. 790 J
C. 940 J
D. 1050 J
E. 1280 J

18. How much work is required to lift a 15 kg rock 12 meters above the ground?

A. 1325 J
B. 1764 J
C. 2150 J
D. 2783 J
E. 3540 J

19. Which of the following statements is associated with Newton's 3rd law of translational motion?

A. An object at rest will remain at rest unless acted on by a net force.

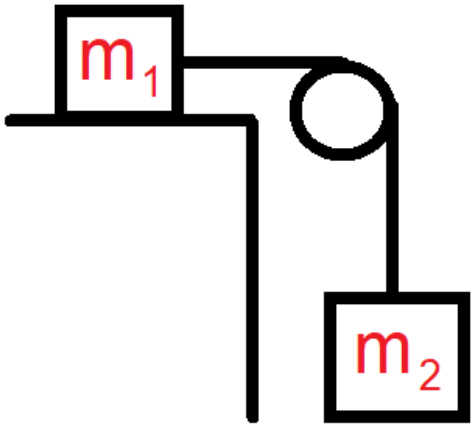
B. The acceleration of an object is directly proportional to the net force acting on it.

C. The net force acting on an object is equal to the rate of change of the momentum of the object.

D. An object in motion will continue in motion unless acted on by a net force.

E. For every action force, there is an equal and opposite reaction force which acts on different objects.

20. Which of the following equations represents the acceleration of the two blocks in the system shown below? (Ignore friction and the inertia of the pulley)



A. $\frac{m_1 g}{m_1+m_2}$

B. $\frac{m_2 g}{m_1+m_2}$

C. $\frac{m_2 g-m_1 g}{m_1+m_2}$

D. $\frac{(m_2+m_1)g}{m_2-m_1}$

21. A car travels around a curve of radius 500. m at a speed of 15 m/s. Calculate the centripetal acceleration of the car.

A. 0.25 m/s^2
B. 0.45 m/s^2
C. 0.72 m/s^2
D. 1.05 m/s^2
E. 1.44 m/s^2

22. A 5 kg box slides on a horizontal surface with a coefficient of kinetic friction of 0.15 at an initial speed of 12 m/s. How far will the box travel before coming to rest?

A. 35 m
B. 49 m
C. 75 m
D. 112 m
E. 173 m

23. A 2 kg ball attached to a 1.5 m long string moves in a horizontal circle at 15 m/s. What is the tension in the string?

A. 137 N
B. 199 N
C. 246 N
D. 301 N
E. 375 N

24. What is the maximum speed at which a car can safely round a curve of radius 400 m? (The coefficient of static friction between the road and the tires is 0.20)

A. 15 m/s
B. 22 m/s
C. 28 m/s
D. 33 m/s
E. 40 m/s

25. Which of the following statements is not true concerning a ball that is thrown straight upward into the air?

A. The speed of the ball is decreasing as the ball travels upward.

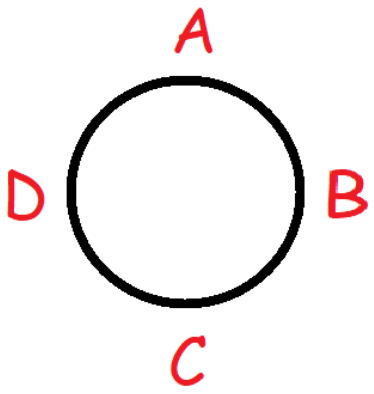
B. The speed of the ball is increasing as the ball travels downward.

C. The velocity of the ball is zero at the maximum height.

D. The velocity of the ball is decreasing as the ball travels upward.

E. The velocity of the ball is increasing as the ball travels downward.

26. What is the direction of the centripetal force at point D in the circle shown below?



A. East
B. West
C. North
D. South
E. Out of the page

27. What is the effect on the kinetic energy of an object if the speed doubles?

A. The kinetic energy increases by a factor of 2.
B. The kinetic energy increases by a factor of 4.
C. The kinetic energy will be ½ of its original value.
D. The kinetic energy will be ¼ of its original value.
E. The kinetic energy will not change.

28. Two objects with masses m are separated by a distance R and the gravitational force between them is F. Which expression represents the gravitational force acting on each object if the masses are now 3m and 4m separated by a distance of ½ R?

A. 1/24 F
B. 1/6 F
C. 6 F
D. 12 F
E. 48 F

29. An object with mass M and speed V travels around a circle of radius R. The centripetal force acting on this object is 500 N. What is the new centripetal force acting on the object if the speed is doubled, the mass is tripled, and the radius of curvature is reduced to ½ of its original value?

A. 2,000 N
B. 3,000 N
C. 6,000 N
D. 12,000 N
E. 24,000 N

30. A satellite orbits the earth at 4,500 km above the surface of the planet. The mass of the earth is 5.98×10^{24} kg and the radius of the earth is 6.38×10^{6} m. What is the speed of the satellite?

A. 3,570 m/s
B. 4,390 m/s
C. 5,210 m/s
D. 6,050 m/s
E. 6,930 m/s

31. A horizontal spring (k = 500 N/m) is compressed 45 cm by a 12 kg block. How fast will the block travel as soon as it is released by the spring?

A. 1.4 m/s
B. 2.1 m/s
C. 2.9 m/s
D. 3.6 m/s
E. 4.2 m/s

32. A ball is kicked with a speed of 40 m/s at an angle of 30^{0} from a 500 m cliff. How fast is the ball moving just before it hits the ground?

A. 101 m/s
B. 107 m/s
C. 119 m/s
D. 132 m/s
E. 149 m/s

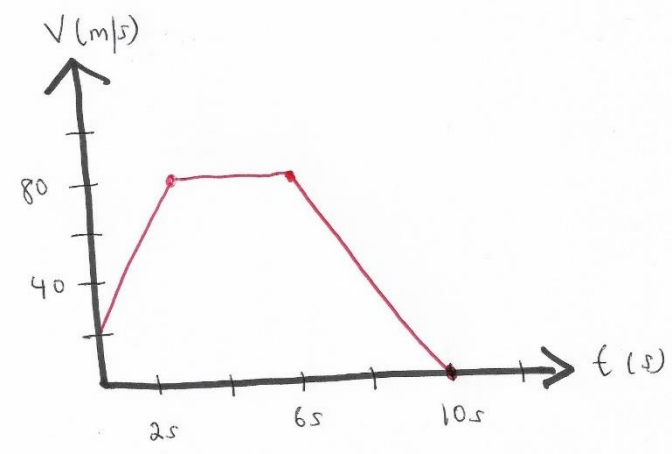
33. What is the power exerted by the engine of a 1500 kg car moving at a constant speed of 25 m/s with a constant retarding force of 1,200 N working against it?

A. 14,500 W
B. 18,300 W
C. 22,500 W
D. 26,000 W
E. 30,000 W

34. A certain laptop uses 150 W of power. If the cost of electricity is $0.06 per kWh in town XYZ, what is the cost of running the laptop 4 hours per day for an entire month (30 days)?

A. $0.72
B. $1.08
C. $1.69
D. $2.25
E. $3.01

35. The graph below shows the velocity of the object with respect to time. What is the instantaneous acceleration of the object at t = 2 seconds?



A. +10 m/s^2
B. -15 m/s^2
C. +20 m/s^2
D. -25 m/s^2
E. +30 m/s^2

36. A force of 30 N was applied to a 15 kg block initially at rest for 8 seconds. What is the final speed of the block?

A. 11 m/s
B. 14 m/s
C. 16 m/s
D. 19 m/s
E. 23 m/s

37. A 10 kg block moving east at 15 m/s strikes a 20 kg block initially at rest. What is the final speed of the two blocks if they stick together?

A. 2.0 m/s
B. 3.8 m/s
C. 4.4 m/s
D. 5.0 m/s
E. 7.0 m/s

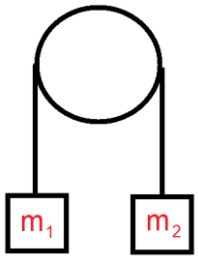
38. A force of 50 N is applied to a 10 kg solid disk with a radius of 65 cm. What is the angular acceleration of the disk?

A. 15.4 rad/s^2
B. 16.9 rad/s^2
C. 17.8 rad/s^2
D. 19.4 rad/s^2
E. 22.1 rad/s^2

39. A merry-go-round moving with an angular speed of 1.8 rad/s has a rotational inertia of 100 kg*m^2. A child jumps on it and the rotational inertia of the child and the merry-go-round is now 110 kg*m^2. What is the new angular speed of the child on the merry-go-round?

A. 1.2 rad/s
B. 1.5 rad/s
C. 1.6 rad/s
D. 1.7 rad/s
E. 1.9 rad/s

40. In the figure below, $m_2 > m_1$. Which of the following equations can be used to calculate the magnitude of the acceleration of the two blocks?



A. $\frac{m_2 g}{m_1+m_2}$

B. $\frac{m_1 g}{m_1+m_2}$

C. $\frac{(m_2-m_1)g}{m_1+m_2}$

D. $\frac{(m_1+m_2)g}{m_2-m_1}$

41. A 20 kg mass is placed 5 m away from the fulcrum of a seesaw. What mass should be placed 4 m away from the fulcrum on the other side of the seesaw so that it remains balanced?

A. 15 kg
B. 18 kg
C. 22 kg
D. 25 kg
E. 30 kg

42. A force of 200 N is applied 2 m to the left of the fulcrum. What output force will be exerted by the seesaw at a distance of 0.50 m to the right of the fulcrum? What is the mechanical advantage of this simple machine?

A. 400 N, MA = 2
B. 600 N, MA = 3
C. 800 N, MA = 4
D. 1000 N, MA = 5
E. 1600 N, MA = 8

43. A wheel accelerates from 15 rad/s to 85 rad/s in 6 seconds. How many complete rotations does the wheel make during this time period?

A. 15
B. 24
C. 31
D. 39
E. 48

44. A wheel with a radius of 0.75 m is spinning at an angular speed of 90 rpm. What is the linear speed of this wheel in mph?

A. 12 mph
B. 16 mph
C. 19 mph
D. 24 mph
E. 27 mph

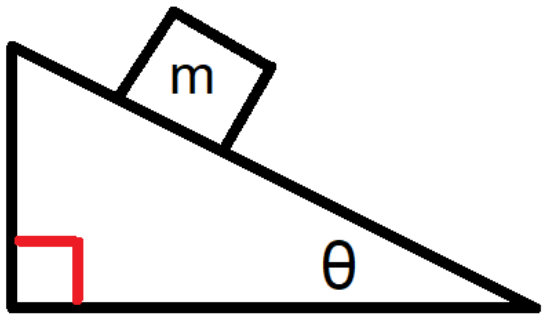
45. A ball is kicked from the ground at an angle of 30^0 with an initial speed of 45 m/s. Calculate the maximum height and the range of the ball rounded to the nearest integer.

A. R = 179 m, H = 26 m
B. R = 193 m, H = 31 m
C. R = 206 m, H = 35 m
D. R = 217 m, H = 39 m

46. The momentum of an object changes from 25 kg*m/s to 60 kg*m/s in 5 seconds. What is the net force acting on this object?

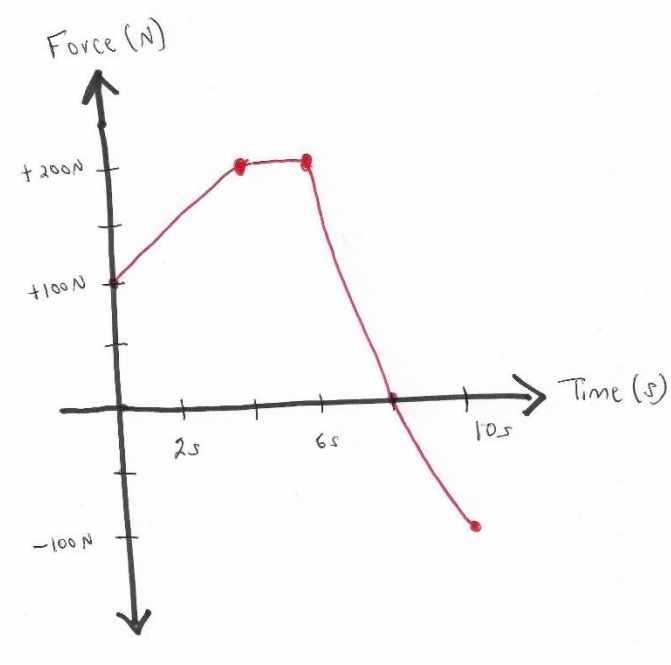
A. 3 N
B. 5 N
C. 7 N
D. 12 N
E. 17 N

47. A block rests on an inclined plane as shown below. The coefficient of static friction between the block and the surface is 0.25. What is the maximum angle at which the block will not slide down the inclined plane?



A. 11^0
B. 14^0
C. 17^0
D. 19^0
E. 22^0

48. The graph below shows the force acting on an object as a function of the displacement of the object. Calculate the work done by this force during the first 10 seconds?



A. 600 J
B. 800 J
C. 900 J
D. 1100 J
E. 1300 J

49. Which of the following is equivalent to a force vector with a magnitude of 500 N directed 150^0 counterclockwise from the positive x-axis?

A. F = -433i + 250j
B. F = 250i – 433j
C. F = -250i + 433j
D. F = -433i – 250j
E. F = -250i – 433j

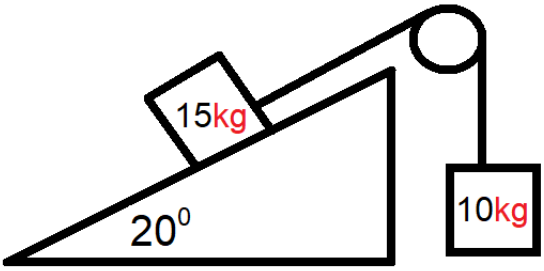
50. A tension force of 300 N applied at 20^0 above the horizontal is used to pull a 15 kg block for a displacement of 20 m east. How much work was done by the force?

A. 1475 J
B. 2052 J
C. 3783 J
D. 5638 J
E. 6000 J

51. A 20 kg block is pulled upward with an acceleration of 1.8 m/s^2 using a rope. What is the tension force in the rope?

A. 115 N
B. 160 N
C. 196 N
D. 212 N
E. 232 N

52. A 15 kg mass rests on a 20^0 inclined plane attached to a massless pulley which is attached to a hanging 10 kg mass. The coefficient of kinetic friction between the block and the inclined plane is 0.10. What is the acceleration of the system when it is released from rest?



A. 0.79 m/s^2
B. 1.36 m/s^2
C. 1.94 m/s^2
D. 2.52 m/s^2
E. 3.17 m/s^2

53. Which of the following compounds is false?

A. The momentum of an inelastic collision is always conserved.

B. The momentum of an elastic collision is always conserved.

C. The kinetic energy of an inelastic collision is always conserved.

D. The kinetic energy of an elastic collision is always conserved.

E. Angular momentum is always conserved during a collision.

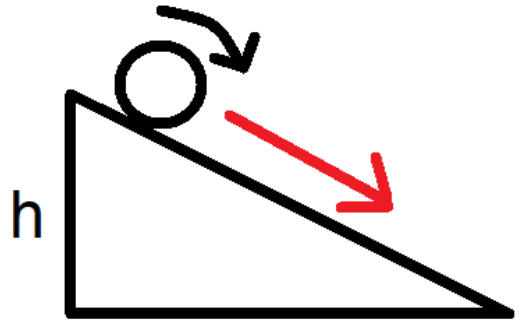
54. A 3 kg ball moving east at 5 m/s collides elastically with a 4 kg ball at rest. What are the velocities of the two objects after the collision?

A. 1.25 m/s, -3.46 m/s
B. -0.71 m/s, 4.29 m/s
C. 2.15 m/s, -1.85 m/s
D. 3.42 m/s, 1.73 m/s

55. An 80 kg astronaut in space throws a 5 kg ball east at 20 m/s. What is the velocity of the astronaut?

A. -1.25 m/s
B. +1.25 m/s
C. +1.75 m/s
D. -1.75 m/s
E. -2.45 m/s

56. Which of the following equations represents the velocity of the sphere at the bottom of the inclined plane shown below when placed at an initial height h?



A. $\sqrt{gh}$

B. $\sqrt{\frac{10gh}{7}}$

C. $\sqrt{\frac{4gh}{3}}$

D. $\sqrt{\frac{3gh}{2}}$

E. $\sqrt{\frac{2gh}{3}}$

57. What is the gravitational force that exists between the Earth and a 70 kg man who stands on it? (The mass of the Earth is 5.98 x 10^{24} kg and the radius is 6.38 x 10^{6} m)

A. 452 N
B. 531 N
C. 609 N
D. 686 N
E. 754 N

58. What is the gravitational acceleration at the surface of the Sun? (The mass of the Sun is 1.99 x 10^{30} kg and the radius is 6.96 x 10^{8} m)

A. 9.81 m/s^2
B. 21.7 m/s^2
C. 74.3 m/s^2
D. 156 m/s^2
E. 274 m/s^2

59. The force applied to an object increased from 100 N to 500 N at a constant rate over a time period of 12 seconds. What is the total impulse applied to the object during the 12 seconds?

A. 1800 N*s
B. 2900 N*s
C. 3600 N*s
D. 4800 N*s
E. 6000 N*s

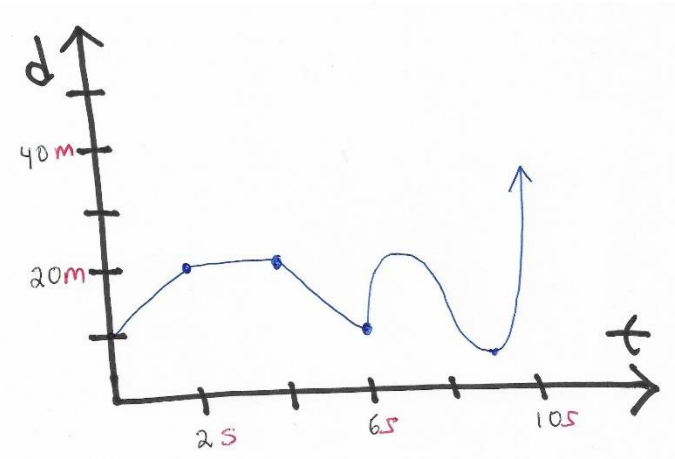
60. A constant torque of 150 N*m was applied to a wheel causing the angular speed to increase from rest to 25 rad/s at a constant rate. What is the average power applied to the wheel during this period?

A. 1250 W
B. 1475 W
C. 1625 W
D. 1875 W
E. 2100 W

61. A 10 kg solid disk with a radius of 0.5 m accelerates at a constant rate from rest to 40 rad/s in 8 seconds. What is the average power exerted on the disk during this time period?

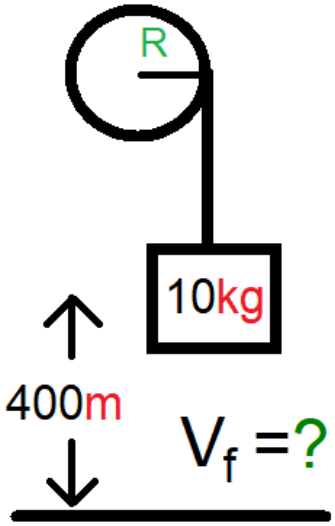
A. 125 W
B. 175 W
C. 200 W
D. 250 W
E. 340 W

62. Which of the following statements is false?



A. The velocity of the object at t = 1s is +5 m/s.
B. The velocity of the object at t = 3s is 0 m/s.
C. The acceleration of the object at t = 5s is 0 m/s^2.
D. The velocity of the object is increasing at t=6.5s.
E. The velocity of the object is decreasing at t = 9s.

63. A 20 kg frictionless solid disk with a radius of 0.5 m is attached to a 10 kg hanging mass which is 400 m above the floor as shown below. What is the speed of the block just before it hits the ground?



A. 37.5 m/s
B. 43.9 m/s
C. 51.4 m/s
D. 57.8 m/s
E. 62.6 m/s

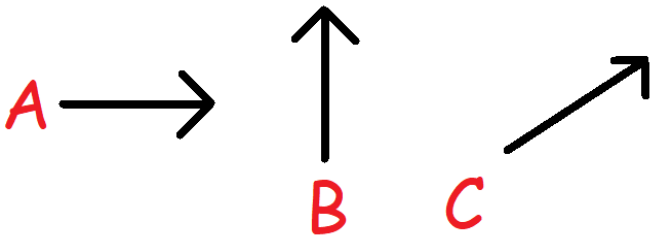
64. The angular momentum of an object decreases from 60 to 12 kg*m^2 rad/s in 4 seconds. What is the net torque acting on this object?

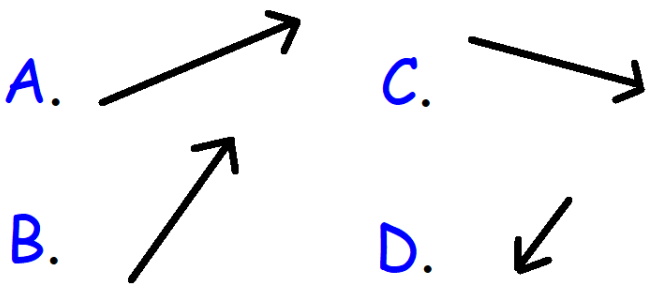
A. -8 N*m
B. +16 N*m
C. -12 N*m
D. +10 N*m
E. +17 N*m

65. A bus travels east at a constant speed of 25 m/s. A car moving east initially at 15 m/s is accelerating at a constant rate of 4 m/s^2 in order to catch up to the bus. The car is currently 500 m west of the bus. How long will it take the car to catch up to the bus? How far will the bus travel during this time period?

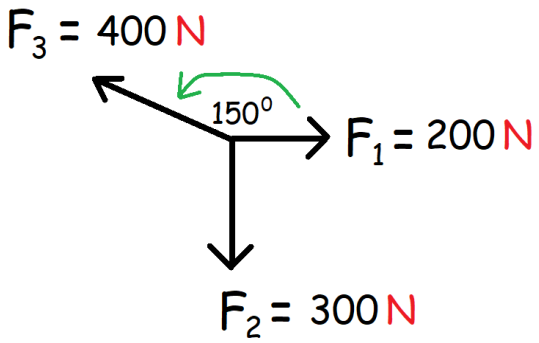
A. 14.5 s, 650 m
B. 16.1 s, 825 m
C. 18.5 s, 463 m
D. 20.4 s, 1130 m
E. 23.7 s, 1420 m

66. Consider vectors A, B, and C shown below. Which of the following answer choices represents the vector sum of A – B + C?



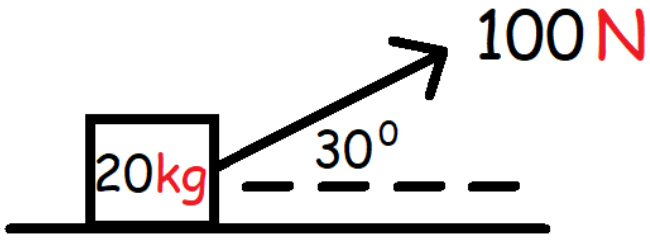


67. Calculate the magnitude and direction (relative to the +x-axis) of the resultant force vector of the three forces shown below.



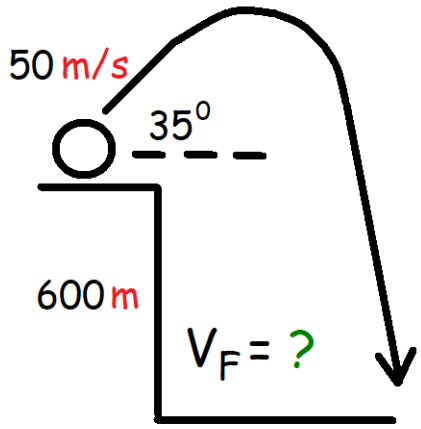
A. 177 N at 214^0
B. 225 N at 34^0
C. 145 N at 125^0
D. 246 N at 312^0
E. 315 N at 61^0

68. A tension force of 100 N is used to pull a 20 kg block across a horizontal surface with a coefficient of kinetic friction of 0.20 as shown below. What is the acceleration of the block in the x-direction?



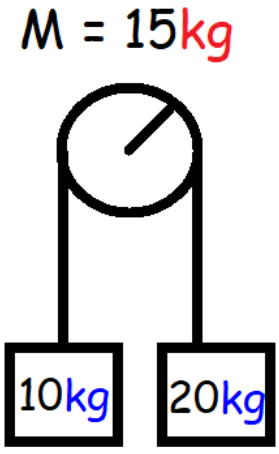
A. 1.45 m/s^2
B. 1.79 m/s^2
C. 2.28 m/s^2
D. 2.87 m/s^2
E. 3.09 m/s^2

69. A ball is kicked from a 600 m cliff with an initial speed of 50 m/s at 35^0 above the horizontal. How long will it take for the ball to hit the ground?



A. 7.42 s
B. 11.3 s
C. 14.4 s
D. 17.1 s
E. 19.9 s

70. Two blocks with masses of 10 kg and 20 kg are attached to a 15 kg solid disk with a radius of 0.75 m.



A. 1.73 m/s^2
B. 2.61 m/s^2
C. 3.14 m/s^2
D. 3.59 m/s^2
E. 4.25 m/s^2

71. The period of a ball moving in a horizontal circle is 0.25s. What is the angular frequency of the ball in rad/s?

A. 14.6 rad/s
B. 21.3 rad/s
C. 25.1 rad/s
D. 33.2 rad/s
E. 39.4 rad/s

72. The distance between the center of the Earth and the center of the Sun is 1.5×10^{11} m. Calculate the linear speed of the Earth as it travels around the Sun.

A. 1,450 m/s
B. 4,700 m/s
C. 7,900 m/s
D. 15,300 m/s
E. 29,900 m/s

73. Water flows out of a hose at a speed of 25 m/s and strikes a block. The mass flow rate of the water is 2.3 kg/s. Calculate the amount of force exerted by the flow of the water on the block.

A. 46.1 N
B. 57.5 N
C. 84.2 N
D. 112 N
E. 137 N

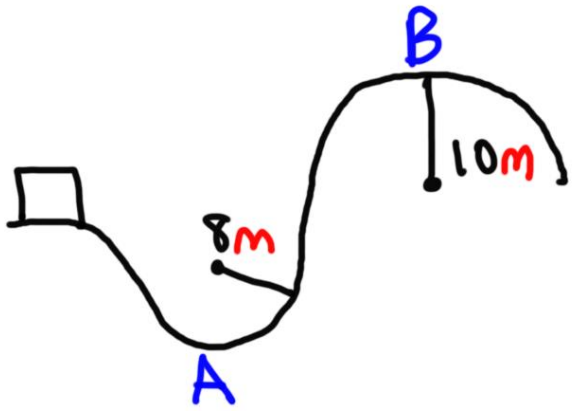
74. A 75 kg man stands on a scale inside the elevator. What force does the scale read when the elevator descends with an acceleration of -1.5 m/s^2?

A. 622.5 N
B. 693.4 N
C. 735.0 N
D. 792.0 N
E. 847.5 N

75. A 0.75 kg ball attached to a 1.25 m rope swings in a vertical circle at a speed of 12 m/s. Calculate the tension force at the bottom and at the top of the circle.

A. 56 N, 64 N
B. 67 N, 82 N
C. 79 N, 94 N
D. 86 N, 99 N
E. 97 N, 112 N

76. Calculate the normal force exerted by the road on the 20 kg block at points A and B as shown below. The speeds of the block at points A and B are 15 m/s and 8 m/s.

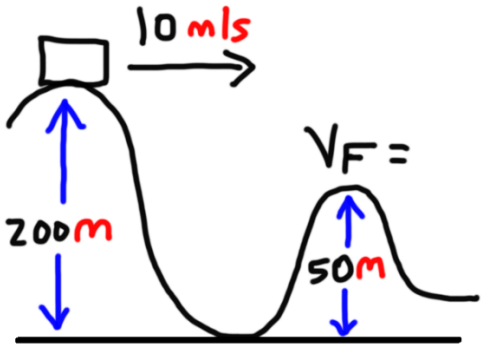


A. 68.0 N, 759 N
B. 128 N, 196 N
C. 324 N, 366 N
D. 196 N, 563 N
E. 759 N, 563 N

77. What is the maximum speed at which a block can safely travel on top of a hill with a radius of curvature of 15 m without losing contact with the road?

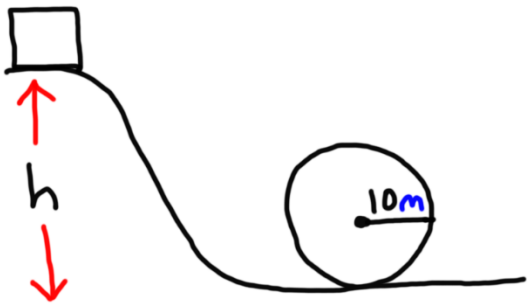
A. 8.46 m/s
B. 12.1 m/s
C. 15.7 m/s
D. 19.2 m/s
E. 22.8 m/s

78. If the speed of the block at a height of 200 m is 10 m/s, then what is the speed of the block at a height of 50 m? (Ignore kinetic friction)



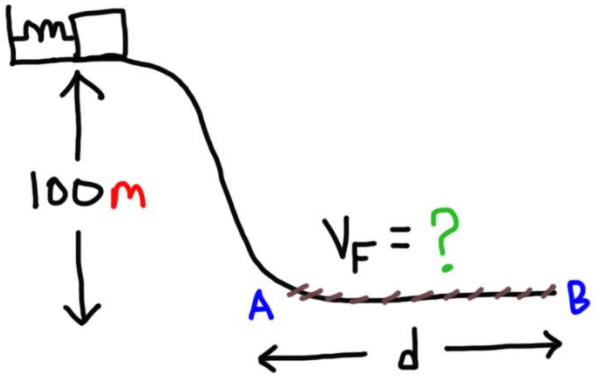
A. 24 m/s
B. 29 m/s
C. 36 m/s
D. 45 m/s
E. 55 m/s

79. A block slides down a hill starting from rest as shown in the figure below. What is the minimum height 'h' at which the block should be released from rest so that it can travel through the loop without losing contact and falling off at the top of the loop?



A. 25 m
B. 28 m
C. 30 m
D. 34 m
E. 39 m

80. A spring (K = 3000 N/m) is compressed 2 m by a 5 kg block on a hill as shown in the figure below. The block encounters a horizontal surface between points A and B with a coefficient of kinetic friction of 0.15. (a) What will be the speed of the block at the base of the hill at point A? (b) How far will the block travel between points A and B before it comes to rest?

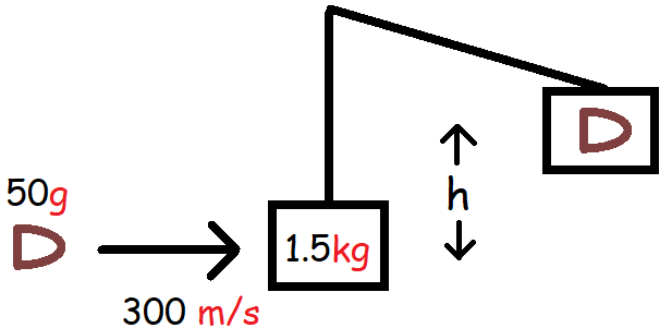


A. 35 m/s, 765 m
B. 44 m/s, 983 m
C. 57 m/s, 1230 m
D. 66 m/s, 1480 m
E. 75 m/s, 1750 m

81. A 500. kg railroad car is moving at a speed of 15.0 m/s. A 100. kg box is dropped directly into it. What is the final speed of the railroad car with the box inside it?

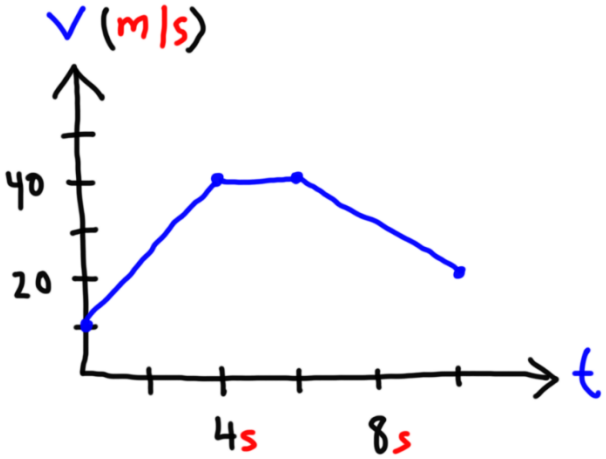
A. 5.80 m/s
B. 8.00 m/s
C. 10.0 m/s
D. 12.5 m/s
E. 14.0 m/s

82. A 50g bullet moving at a speed of 300 m/s strikes a 1.5 kg block as shown below. The bullet becomes embedded in the block. How high will the bullet-block system travel above its original height?



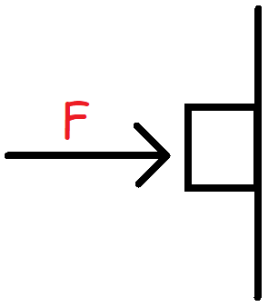
A. 3.7 m
B. 4.8 m
C. 5.6 m
D. 6.3 m
E. 7.1 m

83. The graph below shows the velocity (m/s) of an object with respect to time (s). What is the final position of the object after 10 seconds if the initial position is -40 m?



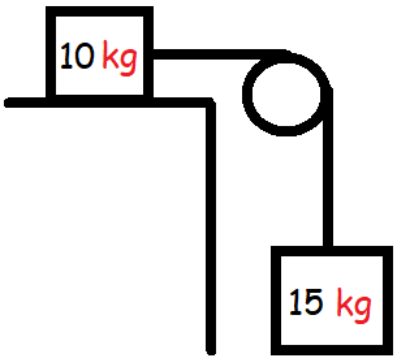
A. 120 m
B. 190 m
C. 260 m
D. 300 m
E. 340 m

84. What minimum horizontal force should be applied to a 5 kg book pressed against a wall for the book not to fall? (The coefficient of static friction between the wall and the book is 0.25)



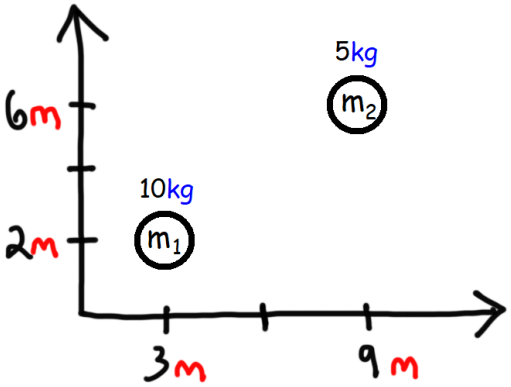
A. 49 N
B. 98 N
C. 147 N
D. 196 N
E. 245 N

85. A 10 kg mass is attached to a 20 kg solid disk (R = 0.5 m) which is attached to a hanging mass of 15 kg. The coefficient of kinetic friction between the horizontal surface and the 10 kg mass is 0.20. What is the acceleration of the system and the tension force that acts on the 10 kg mass?



A. 1.25 m/s^2, 35 N
B. 2.43 m/s^2, 44 N
C. 3.64 m/s^2, 56 N
D. 4.25 m/s^2, 62 N
E. 5.76 m/s^2, 70 N

86. What is the position of the center of mass of the system shown below?



A. (4.0, 2.5)
B. (3.5, 4.7)
C. (5.0, 3.3)
D. (5.8, 2.9)
E. (6.5, 4.2)

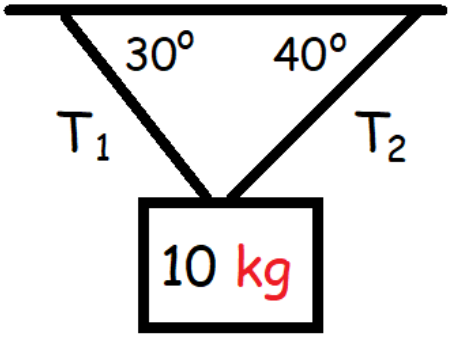
87. Which of the following unit expressions is not equivalent to the joule?

A. N*m
B. W*s
C. $Kg*m^2/s^2$
D. Kg*m/s

88. The mean distance between the Earth and the Sun is 1.496×10^{11} m and the mean distance between the Sun and Venus is 1.082×10^{11} m. How many Earth days does it take Venus to orbit the Sun?

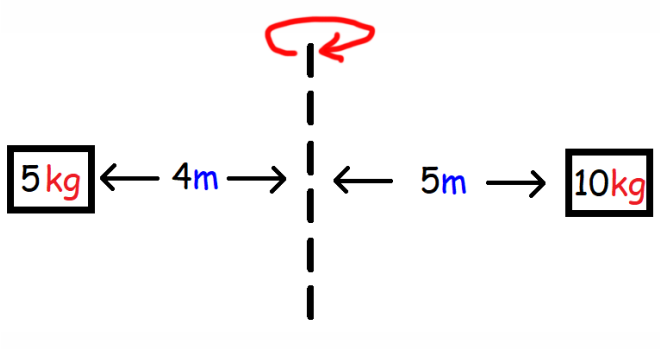
A. 125 days
B. 176 days
C. 225 days
D. 283 days
E. 324 days

89. Calculate the tension force in the two ropes shown below.



A. 56 N, 62 N
B. 61 N, 69 N
C. 70 N, 82 N
D. 80 N, 90 N
E. 87 N, 98 N

90. What is the total inertia of the system with respect to the indicated axis of rotation shown below?



A. 150 $kg*m^2$
B. 225 $kg*m^2$
C. 280 $kg*m^2$
D. 330 $kg*m^2$
E. 395 $kg*m^2$

91. Which of the following statements is true?

A. Mechanical energy is conserved when only nonconservative forces are present in a system.

B. The tension force that acts through a rope is a conservative force.

C. Gravity is a nonconservative force.

D. The work done by a conservative force is independent of the path of the object.

E. The work done by a nonconservative force is independent of the path of the object.

92. A 20 kg ball rolls off a 200 m cliff at an initial speed of 15 m/s. A 5 kg ball is released from rest at the top of the same cliff. A 15 kg ball is kicked from the same cliff at an initial speed of 20 m/s at 30 degrees from the horizontal. Which of the following statements is true?

A. The 20 kg ball will hit the ground first because it has the greatest amount of mass.

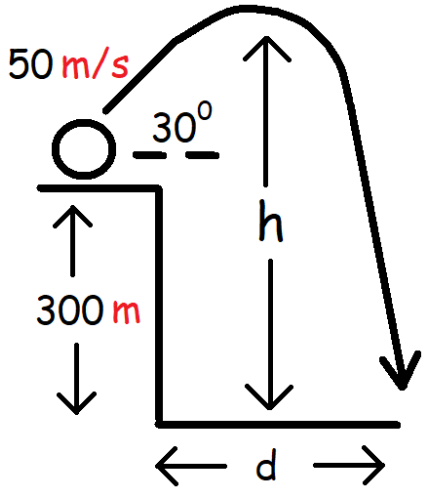
B. The 15 kg ball will hit the ground first because it has the greatest initial speed.

C. The 5 kg ball will hit the ground first because it has the shortest distance to travel.

D. The 20 kg ball and the 5 kg ball will hit the ground at the same time because they have the same vertical displacement.

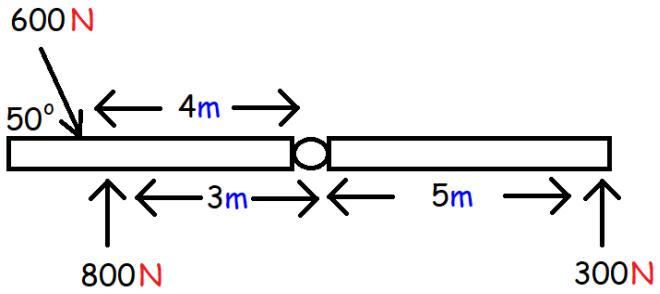
E. All 3 objects will hit the ground at the same time since they have the same final position and gravitational acceleration.

93. A ball is kicked off a 300 m cliff at an initial speed of 50 m/s at a 30^0 angle above the horizontal. What is the maximum height attained by the ball above the ground and the horizontal displacement of the ball?



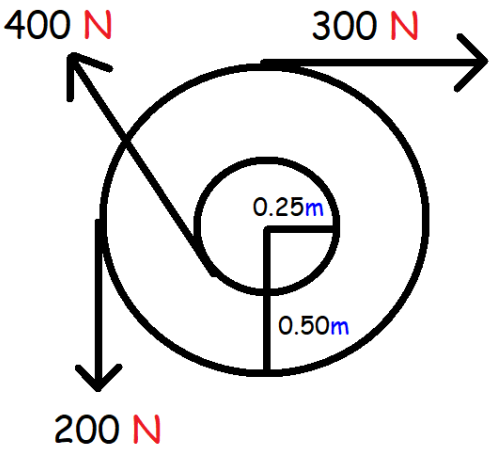
A. 332 m, 467 m
B. 365 m, 499 m
C. 382 m, 524 m
D. 401 m, 563 m
E. 445 m, 601 m

94. Calculate the net torque acting on the system shown below.



A. -254 N*m
B. -115 N*m
C. +275 N*m
D. +583 N*m
E. +939 N*m

95. Calculate the net torque acting on the wheel shown below. A frictional torque of 80 N*m opposes the motion. (The outer radius is 0.50m)



A. -240 N*m
B. -150 N*m
C. -70 N*m
D. +230 N*m
E. +340 N*m

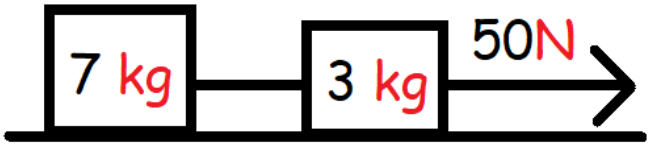
96. Calculate the force that each block exerts on the other in the figure shown below across the frictionless horizontal surface.

A. 10 N
B. 20 N
C. 30 N
D. 40 N
E. 50 N

97. Calculate the contact force that each block exerts on the other in the figure shown below. The coefficient of kinetic friction between the horizontal surface and the two blocks is 0.20.

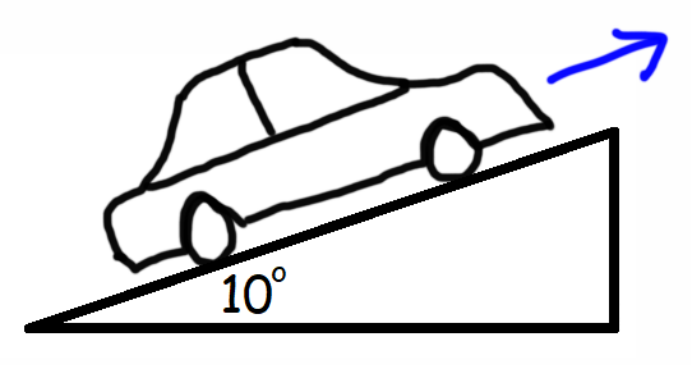
A. 15 N
B. 30 N
C. 45 N
D. 60 N
E. 75 N

98. Two blocks connected by a massless rope is pulled to the right by a force of 50 N. What is the tension force in the rope connecting the two blocks together?



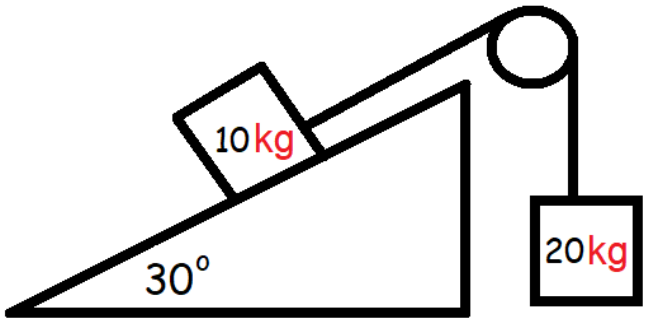
A. 15 N
B. 25 N
C. 30 N
D. 35 N
E. 40 N

99. A 1500 kg car accelerates up a 10^0 inclined plane from 10 m/s to 25 m/s in 5 seconds. A constant retarding force of 1800 N works against the car. What is the average power exerted by the engine of the car during this time?



A. 105 hp
B. 146 hp
C. 179 hp
D. 208 hp
E. 265 hp

100. A 10 kg block which rests on a 30^0 inclined plane is attached to a 30 kg solid disk (R = 0.5m) that is attached to a hanging mass of 20 kg as shown below. The coefficient of kinetic friction between the 10 kg block and the inclined plane is 0.15. Calculate the acceleration of the two blocks when the system is released from rest.



A. 1.45 m/s^2
B. 1.81 m/s^2
C. 2.21 m/s^2
D. 2.67 m/s^2
E. 2.98 m/s^2

Answers:

1. D
2. D
3. C
4. B
5. E
6. D
7. E
8. B
9. A
10. D
11. D
12. B
13. E
14. A
15. D
16. C
17. E
18. B
19. E
20. B
21. B
22. B
23. D
24. C
25. E
26. A
27. B
28. E
29. D
30. D
31. C
32. B
33. E
34. B
35. C
36. C
37. D
38. A
39. C
40. C
41. D
42. C
43. E

44. B
45. A
46. C
47. B
48. D
49. A
50. D
51. E
52. B
53. C
54. B
55. A
56. B
57. D
58. E
59. C
60. D
61. B
62. D and E are false statements
63. E
64. B
65. C. The car travels 963m and the bus travels 463 m.
66. C
67. A
68. D
69. C
70. B
71. C
72. E
73. B
74. A
75. C
76. A
77. B
78. E
79. A
80. D
81. D
82. B
83. C
84. D
85. C
86. C
87. D
88. C

89. D
90. D
91. D
92. D
93. A
94. E
95. C
96. C
97. D
98. D
99. D
100. E