Instructor(s): *Field/Furic*

PHYSICS DEPARTMENT

PHY 2053 Final Exam December 8, 2012

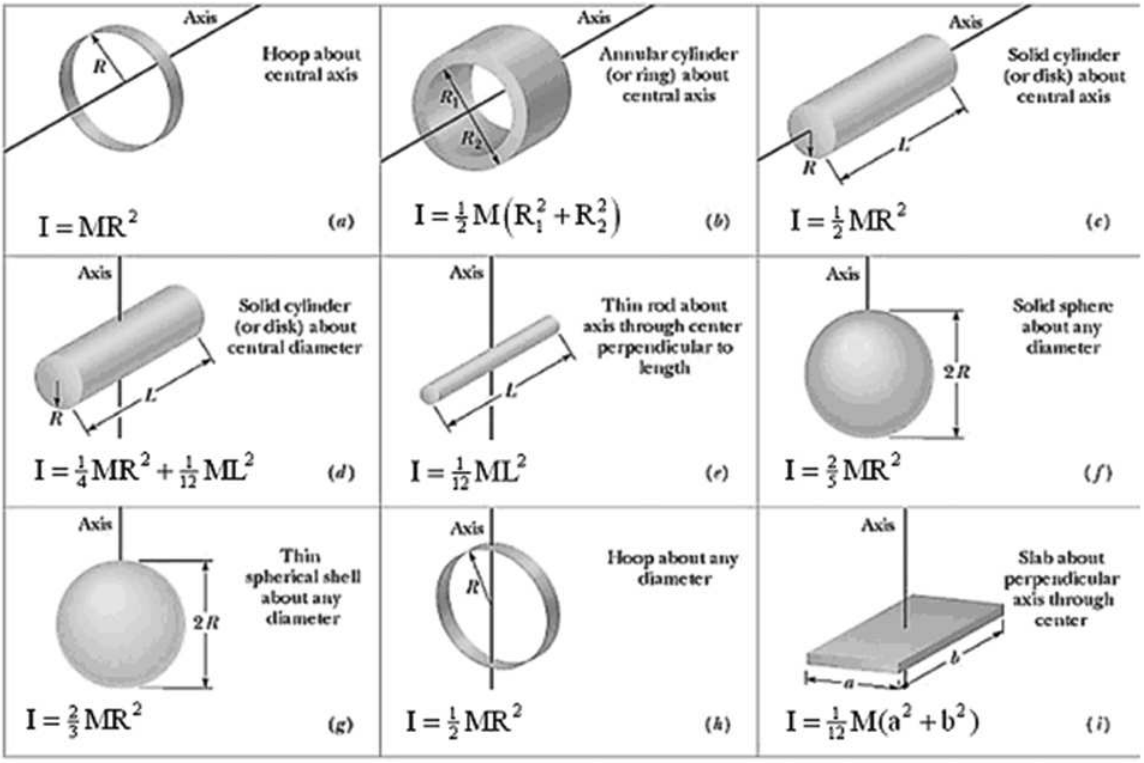
Name (print, last first): _____ Signature: _____

On my honor, I have neither given nor received unauthorized aid on this examination.

YOUR TEST NUMBER IS THE 5-DIGIT NUMBER AT THE TOP OF EACH PAGE.

(1) **Code your test number on your answer sheet (use lines 76–80 on the answer sheet for the 5-digit number)**. Code your name on your answer sheet. **DARKEN CIRCLES COMPLETELY**. Code your UFID number on your answer sheet.
(2) Print your name on this sheet and sign it also.
(3) Do all scratch work anywhere on this exam that you like. **Circle your answers on the test form.** At the end of the test, this exam printout is to be turned in. No credit will be given without both answer sheet and printout.
(4) **Blacken the circle of your intended answer completely, using a #2 pencil or blue or black ink**. Do not make any stray marks or some answers may be counted as incorrect.
(5) **The answers are rounded off. Choose the closest to exact. There is no penalty for guessing. If you believe that no listed answer is correct, leave the form blank.**
(6) Hand in the answer sheet separately.

Use $g = 9.80\ \text{m/s}^2$



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1. An object is released from rest at $t = 0$ near the surface of the Earth. If it falls through a distance of 10 m during the time interval from $t = 2$ s to time t, what is its speed (in m/s) at time t? Ignore air resistance.

   (1) 24.1 (2) 32.6 (3) 41.6 (4) 56.4 (5) 19.6

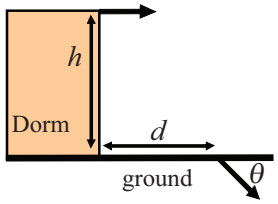
2. An object is released from rest at $t = 0$ near the surface of the Earth. If it falls through a distance of 10 m during the time interval from $t = 3$ s to time t, what is its speed (in m/s) at time t? Ignore air resistance.

   (1) 32.6 (2) 24.1 (3) 41.6 (4) 56.4 (5) 19.6

3. An object is released from rest at $t = 0$ near the surface of the Earth. If it falls through a distance of 10 m during the time interval from $t = 4$ s to time t, what is its speed (in m/s) at time t? Ignore air resistance.

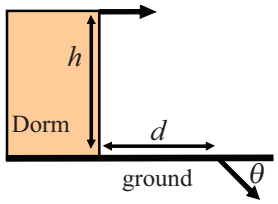
   (1) 41.6 (2) 24.1 (3) 32.6 (4) 56.4 (5) 19.6

4. A beanbag is thrown horizontally from a dorm room window a height $h = 10$ meters above the ground as shown in the figure. If the beanbag's velocity just before impact with the ground is $\theta = 30°$ below the horizontal, what was the initial speed of the beanbag (in m/s) when it was thrown? Ignore air resistance.



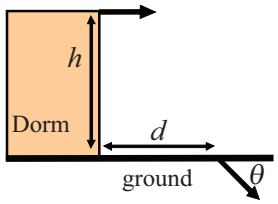
   (1) 24.2 (2) 11.7 (3) 16.7 (4) 28.5 (5) 9.2

5. A beanbag is thrown horizontally from a dorm room window a height $h = 10$ meters above the ground as shown in the figure. If the beanbag's velocity just before impact with the ground is $\theta = 40°$ below the horizontal, what was the initial speed of the beanbag (in m/s) when it was thrown? Ignore air resistance.



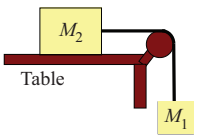
   (1) 16.7 (2) 24.2 (3) 11.7 (4) 28.5 (5) 9.2

6. A beanbag is thrown horizontally from a dorm room window a height $h = 10$ meters above the ground as shown in the figure. If the beanbag's velocity just before impact with the ground is $\theta = 50°$ below the horizontal, what was the initial speed of the beanbag (in m/s) when it was thrown? Ignore air resistance.



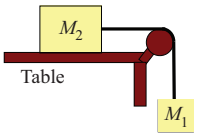
   (1) 11.7 (2) 24.2 (3) 16.7 (4) 28.5 (5) 9.2

7. A block of mass $M_2 = 1$ kg on a horizontal surface is connected by a cord over a massless, frictionless pulley to a second block of mass M_1. The static and kinetic coefficient of friction between the table and mass M_2 are $\mu_s = 0.5$ and $\mu_k = 0.2$, respectively. If after the blocks are released from rest the tension in the cord is 7.84 N, what is the mass M_1 (in kg)?



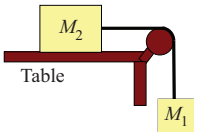
   (1) 2 (2) 3 (3) 4 (4) 1 (5) 0.5

8. A block of mass $M_2 = 1$ kg on a horizontal surface is connected by a cord over a massless, frictionless pulley to a second block of mass M_1. The static and kinetic coefficient of friction between the table and mass M_2 are $\mu_s = 0.5$ and $\mu_k = 0.2$, respectively. If after the blocks are released from rest the tension in the cord is 8.82 N, what is the mass M_1 (in kg)?



(1) 3 (2) 2 (3) 4 (4) 1 (5) 0.5

9. A block of mass $M_2 = 1$ kg on a horizontal surface is connected by a cord over a massless, frictionless pulley to a second block of mass M_1. The static and kinetic coefficient of friction between the table and mass M_2 are $\mu_s = 0.5$ and $\mu_k = 0.2$, respectively. If after the blocks are released from rest the tension in the cord is 9.408 N, what is the mass M_1 (in kg)?



(1) 4 (2) 2 (3) 3 (4) 1 (5) 0.5

10. Two point masses are located on the x-axis. Mass m_1 is at the origin (*i.e.*, $x = 0$) and mass m_2 is at $x = d$. If the *net* gravitational force from the two masses is equal to zero on a test mass m located on the x-axis at $x = d/4$, what is the mass m_2?

(1) $9m_1$ (2) $4m_1$ (3) $m_1/4$ (4) $2m_1$ (5) $3m_1$

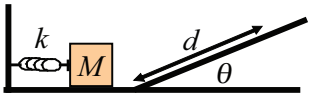
11. Two point masses are located on the x-axis. Mass m_1 is at the origin (*i.e.*, $x = 0$) and mass m_2 is at $x = d$. If the *net* gravitational force from the two masses is equal to zero on a test mass m located on the x-axis at $x = d/3$, what is the mass m_2?

(1) $4m_1$ (2) $9m_1$ (3) $m_1/4$ (4) $2m_1$ (5) $3m_1$

12. Two point masses are located on the x-axis. Mass m_1 is at the origin (*i.e.*, $x = 0$) and mass m_2 is at $x = d$. If the *net* gravitational force from the two masses is equal to zero on a test mass m located on the x-axis at $x = 2d/3$, what is the mass m_2?

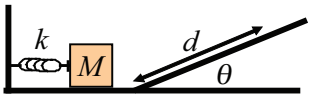
(1) $m_1/4$ (2) $9m_1$ (3) $4m_1$ (4) $2m_1$ (5) $3m_1$

13. Near the surface of the Earth, an ideal spring with spring constant k is on a frictionless horizontal surface at the base of a frictionless inclined plane as shown in the figure. A block with mass $M = 0.5$ kg is pressed against the spring, compressing it 5 cm from its equilibrium position. The block is then released and is not attached to the spring. If the block slides a distance $d = 2$ m up the inclined plane with $\theta = 30°$ before coming to rest and then sliding back down, what is the spring constant (in N/m)?



(1) 3,920 (2) 4,704 (3) 5,488 (4) 2,699 (5) 6,898

14. Near the surface of the Earth, an ideal spring with spring constant k is on a frictionless horizontal surface at the base of a frictionless inclined plane as shown in the figure. A block with mass $M = 0.6$ kg is pressed against the spring, compressing it 5 cm from its equilibrium position. The block is then released and is not attached to the spring. If the block slides a distance $d = 2$ m up the inclined plane with $\theta = 30°$ before coming to rest and then sliding back down, what is the spring constant (in N/m)?



(1) 4,704 (2) 3,920 (3) 5,488 (4) 2,699 (5) 6,898

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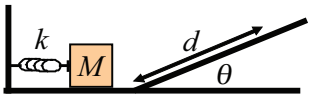
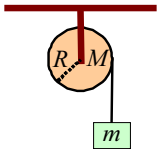
15. Near the surface of the Earth, an ideal spring with spring constant k is on a frictionless horizontal surface at the base of a frictionless inclined plane as shown in the figure. A block with mass $M = 0.7$ kg is pressed against the spring, compressing it 5 cm from its equilibrium position. The block is then released and is not attached to the spring. If the block slides a distance $d = 2$ m up the inclined plane with $\theta = 30°$ before coming to rest and then sliding back down, what is the spring constant (in N/m)?



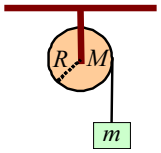
(1) 5,488 (2) 3,950 (3) 4,704 (4) 2,699 (5) 6,898

16. A block of mass $m = 1$ kg is attached to a cord that is wrapped around the rim of a flywheel of radius R, moment of inertia $I = MR^2/2$, and mass $M = 2$ kg, as shown. The block is released from rest and the cord unwinds. What is the speed of the block (in m/s) when it has dropped a distance of 2 m?



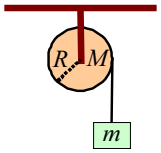
(1) 4.4 (2) 5.1 (3) 5.8 (4) 6.3 (5) 3.2

17. A block of mass $m = 2$ kg is attached to a cord that is wrapped around the rim of a flywheel of radius R, moment of inertia $I = MR^2/2$, and mass $M = 2$ kg, as shown. The block is released from rest and the cord unwinds. What is the speed of the block (in m/s) when it has dropped a distance of 2 m?



(1) 5.1 (2) 4.4 (3) 5.8 (4) 6.3 (5) 3.2

18. A block of mass $m = 6$ kg is attached to a cord that is wrapped around the rim of a flywheel of radius R, moment of inertia $I = MR^2/2$, and mass $M = 2$ kg, as shown. The block is released from rest and the cord unwinds. What is the speed of the block (in m/s) when it has dropped a distance of 2 m?



(1) 5.8 (2) 4.4 (3) 5.1 (4) 6.3 (5) 3.2

19. When a stone of weight $W = 24$ N is suspended from a scale and submerged in water, the scale reads 9 N. If the density of oil is 0.8 the density of the water (*i.e.*, $\rho_{\text{oil}} = 0.8\rho_{\text{water}}$), what does the scale read (in N) when the same stone is suspended from a scale and submerged in oil?

(1) 12 (2) 17 (3) 18 (4) 10 (5) 20

20. When a stone of weight $W = 32$ N is suspended from a scale and submerged in water, the scale reads 12 N. If the density of oil is 0.75 the density of the water (*i.e.*, $\rho_{\text{oil}} = 0.75\rho_{\text{water}}$), what does the scale read (in N) when the same stone is suspended from a scale and submerged in oil?

(1) 17 (2) 12 (3) 18 (4) 10 (5) 20

21. When a stone of weight $W = 45$ N is suspended from a scale and submerged in water, the scale reads 15 N. If the density of oil is 0.9 the density of the water (*i.e.*, $\rho_{\text{oil}} = 0.9\rho_{\text{water}}$), what does the scale read (in N) when the same stone is suspended from a scale and submerged in oil?

(1) 18 (2) 12 (3) 17 (4) 10 (5) 20

22. A marble statue of volume 2.5 m^3 is being transported from New York to England by ship. The statue falls into the ocean and ends up on the ocean floor, a distance d below the surface. If the bulk modulus of marble is 70×10^9 Pa and the density of sea water is 1,025 kg/m^3, and the decrease in volume of the statue due to the pressure of the water is 431 cm^3, what is the depth d of the statue below the surface (in km)?

(1) 1.2 (2) 1.4 (3) 1.6 (4) 1.0 (5) 1.8

23. A marble statue of volume 2.5 m^3 is being transported from New York to England by ship. The statue falls into the ocean and ends up on the ocean floor, a distance d below the surface. If the bulk modulus of marble is 70×10^9 Pa and the density of sea water is 1,025 kg/m^3, and the decrease in volume of the statue due to the pressure of the water is 502 cm^3, what is the depth d of the statue below the surface (in km)?

(1) 1.4 (2) 1.2 (3) 1.6 (4) 1.0 (5) 1.8

24. A marble statue of volume 2.5 m^3 is being transported from New York to England by ship. The statue falls into the ocean and ends up on the ocean floor, a distance d below the surface. If the bulk modulus of marble is 70×10^9 Pa and the density of sea water is 1,025 kg/m^3, and the decrease in volume of the statue due to the pressure of the water is 574 cm^3, what is the depth d of the statue below the surface (in km)?

(1) 1.6 (2) 1.2 (3) 1.4 (4) 1.0 (5) 1.8

25. A turntable must spin at 33.3 rpm to play an old-fashioned vinyl record. The turntable is a uniform disk of radius 15 cm and mass 0.16 kg. If starting from rest it takes 2 revolutions of the turntable to reach its final angular speed, what constant torque is delivered by the motor (in N·m)?

(1) 8.71×10^{-4} (2) 5.81×10^{-4} (3) 4.35×10^{-4} (4) 1.16×10^{-3} (5) 6.25×10^{-3}

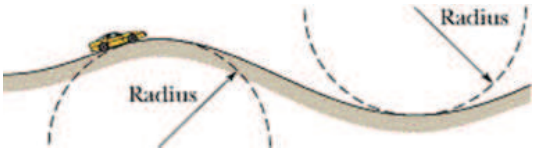
26. A turntable must spin at 33.3 rpm to play an old-fashioned vinyl record. The turntable is a uniform disk of radius 15 cm and mass 0.16 kg. If starting from rest it takes 3 revolutions of the turntable to reach its final angular speed, what constant torque is delivered by the motor (in N·m)?

(1) 5.81×10^{-4} (2) 8.71×10^{-4} (3) 4.35×10^{-4} (4) 1.16×10^{-3} (5) 6.25×10^{-3}

27. A turntable must spin at 33.3 rpm to play an old-fashioned vinyl record. The turntable is a uniform disk of radius 15 cm and mass 0.16 kg. If starting from rest it takes 4 revolutions of the turntable to reach its final angular speed, what constant torque is delivered by the motor (in N·m)?

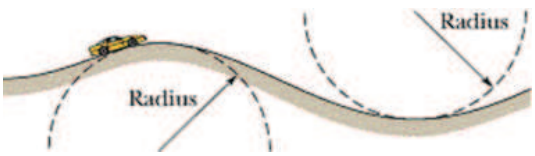
(1) 4.35×10^{-4} (2) 8.71×10^{-4} (3) 5.81×10^{-4} (4) 1.16×10^{-3} (5) 6.25×10^{-3}

28. A man with a weight of 100 N drives a car at speed $v_1 = 50$ m/s over a circular hill and then into a circular valley with the same radius, but with speed v_2, as shown. At the top of the hill, the normal force on the man from the car seat is zero. If the magnitude of the normal force on the man from the seat when the car passes through the bottom of the valley is 500 N, what is the speed v_2 (in m/s)?



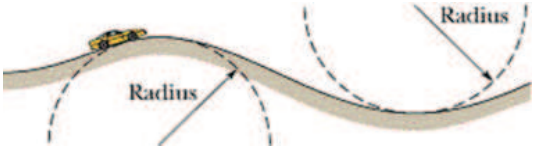
(1) 100 (2) 150 (3) 200 (4) 75 (5) 50

29. A man with a weight of 100 N drives a car at speed $v_1 = 50$ m/s over a circular hill and then into a circular valley with the same radius, but with speed v_2, as shown. At the top of the hill, the normal force on the man from the car seat is zero. If the magnitude of the normal force on the man from the seat when the car passes through the bottom of the valley is 1000 N, what is the speed v_2 (in m/s)?



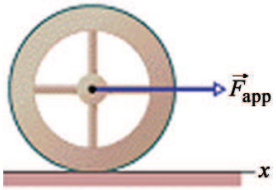
(1) 150 (2) 100 (3) 200 (4) 75 (5) 50

30. A man with a weight of 100 N drives a car at speed $v_1 = 50$ m/s over a circular hill and then into a circular valley with the same radius, but with speed v_2, as shown. At the top of the hill, the normal force on the man from the car seat is zero. If the magnitude of the normal force on the man from the seat when the car passes through the bottom of the valley is 1,700 N, what is the speed v_2 (in m/s)?



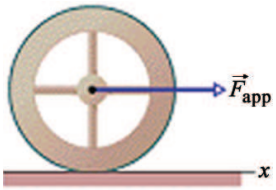
(1) 200 (2) 100 (3) 150 (4) 75 (5) 50

31. A constant horizontal force $\vec{F}_{\text{app}}$ is applied to a wheel of radius R, mass $M = 10$ kg and moment of inertia $I = \frac{3}{4}MR^2$ as shown in the figure. If the coefficient of static friction between the wheel and the horizontal floor is $\mu_s = 0.4$, what is the magnitude of the maximum horizontal applied force (in N) such that the wheel will roll without slipping on the horizontal surface and not slide?



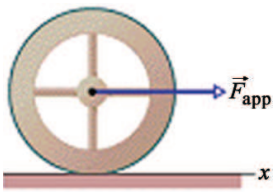
(1) 91.5 (2) 182.9 (3) 274.4 (4) 328.5 (5) 52.3

32. A constant horizontal force $\vec{F}_{\text{app}}$ is applied to a wheel of radius R, mass $M = 20$ kg and moment of inertia $I = \frac{3}{4}MR^2$ as shown in the figure. If the coefficient of static friction between the wheel and the horizontal floor is $\mu_s = 0.4$, what is the magnitude of the maximum horizontal applied force (in N) such that the wheel will roll without slipping on the horizontal surface and not slide?



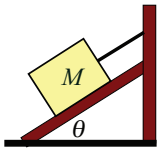
(1) 182.9 (2) 91.5 (3) 274.4 (4) 328.5 (5) 52.3

33. A constant horizontal force $\vec{F}_{\text{app}}$ is applied to a wheel of radius R, mass $M = 30$ kg and moment of inertia $I = \frac{3}{4}MR^2$ as shown in the figure. If the coefficient of static friction between the wheel and the horizontal floor is $\mu_s = 0.4$, what is the magnitude of the maximum horizontal applied force (in N) such that the wheel will roll without slipping on the horizontal surface and not slide?



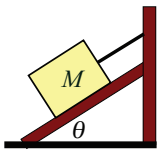
(1) 274.4 (2) 91.5 (3) 182.9 (4) 328.5 (5) 52.3

34. Near the surface of the Earth a block of mass $M = 2$ kg is held at rest on a plane inclined at an angle $\theta = 30°$ by a rope attached to the wall, as shown in the figure. If the coefficient of static friction between the block and the inclined plane is $\mu_s = 0.4$, what is the tension of the rope (in N)?



(1) 3.0 (2) 8.3 (3) 13.1 (4) 1.8 (5) 9.8

35. Near the surface of the Earth a block of mass $M = 2$ kg is held at rest on a plane inclined at an angle $\theta = 45°$ by a rope attached to the wall, as shown in the figure. If the coefficient of static friction between the block and the inclined plane is $\mu_s = 0.4$, what is the tension of the rope (in N)?



(1) 8.3 (2) 3.0 (3) 13.1 (4) 1.8 (5) 9.8

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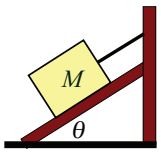
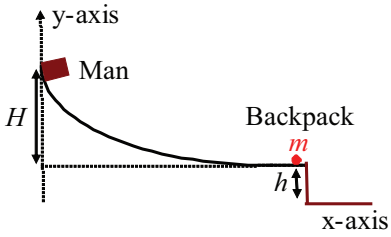
36. Near the surface of the Earth a block of mass $M = 2$ kg is held at rest on a plane inclined at an angle $\theta = 60°$ by a rope attached to the wall, as shown in the figure. If the coefficient of static friction between the block and the inclined plane is $\mu_s = 0.4$, what is the tension of the rope (in N)?



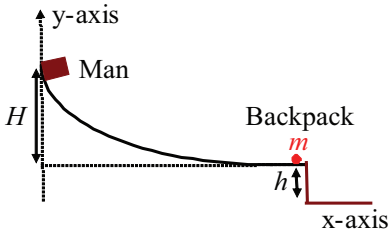
(1) 13.1 (2) 3.0 (3) 8.3 (4) 1.8 (5) 9.8

37. A man with a mass of 80 kg skis down a frictionless hill of height H. At the bottom of the hill the terrain levels out. As the man reaches the horizontal section, he grabs a backpack with mass $m = 5$ kg and skis off an $h = 2$ m high ledge as shown in the figure. If the man (with the backpack) lands a horizontal distance from the edge of the ledge of 8 m, what is the height H (in m) of the hill?



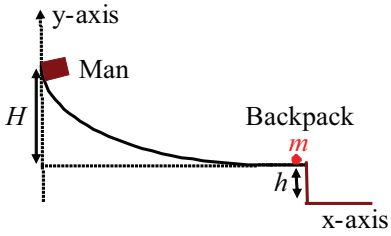
(1) 9.0 (2) 11.4 (3) 14.1 (4) 7.6 (5) 16.2

38. A man with a mass of 80 kg skis down a frictionless hill of height H. At the bottom of the hill the terrain levels out. As the man reaches the horizontal section, he grabs a backpack with mass $m = 5$ kg and skis off an $h = 2$ m high ledge as shown in the figure. If the man (with the backpack) lands a horizontal distance from the edge of the ledge of 9 m, what is the height H (in m) of the hill?



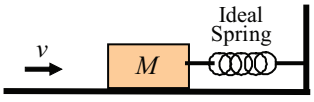
(1) 11.4 (2) 9.0 (3) 14.1 (4) 7.6 (5) 16.2

39. A man with a mass of 80 kg skis down a frictionless hill of height H. At the bottom of the hill the terrain levels out. As the man reaches the horizontal section, he grabs a backpack with mass $m = 5$ kg and skis off an $h = 2$ m high ledge as shown in the figure. If the man (with the backpack) lands a horizontal distance from the edge of the ledge of 10 m, what is the height H (in m) of the hill?



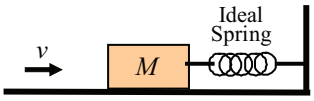
(1) 14.1 (2) 9.0 (3) 11.4 (4) 7.6 (5) 16.2

40. A block of mass $M = 4$ kg is at rest on a horizontal frictionless surface and is connected to an ideal spring as shown in the figure. A 2-gram bullet traveling horizontally at 290 m/s strikes the block and becomes embedded in the block. If the bullet-block system comes to rest after compressing the spring a distance of 4 cm, what is the period (in s) of the subsequent simple harmonic motion of the system?



(1) 1.73 (2) 2.60 (3) 3.47 (4) 0.87 (5) 4.95

41. A block of mass $M = 4$ kg is at rest on a horizontal frictionless surface and is connected to an ideal spring as shown in the figure. A 2-gram bullet traveling horizontally at 290 m/s strikes the block and becomes embedded in the block. If the bullet-block system comes to rest after compressing the spring a distance of 6 cm, what is the period (in s) of the subsequent simple harmonic motion of the system?



(1) 2.60 (2) 1.73 (3) 3.47 (4) 0.87 (5) 4.95

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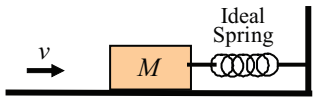
42. A block of mass $M = 4$ kg is at rest on a horizontal frictionless surface and is connected to an ideal spring as shown in the figure. A 2-gram bullet traveling horizontally at 290 m/s strikes the block and becomes embedded in the block. If the bullet-block system comes to rest after compressing the spring a distance of 8 cm, what is the period (in s) of the subsequent simple harmonic motion of the system?



(1) 3.47 (2) 1.73 (3) 2.60 (4) 0.87 (5) 4.95

43. An ideal spring-and-mass system is undergoing simple harmonic motion (SHM). If the speed of the block is 1.0 m/s when the displacement from equilibrium is 2.0 m, and the speed of the block is 3.0 m/s when the displacement from equilibrium is 1.0 m, what is the angular frequency of the oscillations (in rad/s)?

(1) 1.63 (2) 2.24 (3) 2.83 (4) 1.00 (5) 3.95

44. An ideal spring-and-mass system is undergoing simple harmonic motion (SHM). If the speed of the block is 1.0 m/s when the displacement from equilibrium is 2.0 m, and the speed of the block is 4.0 m/s when the displacement from equilibrium is 1.0 m, what is the angular frequency of the oscillations (in rad/s)?

(1) 2.24 (2) 1.63 (3) 2.83 (4) 1.00 (5) 3.95

45. An ideal spring-and-mass system is undergoing simple harmonic motion (SHM). If the speed of the block is 1.0 m/s when the displacement from equilibrium is 2.0 m, and the speed of the block is 5.0 m/s when the displacement from equilibrium is 1.0 m, what is the angular frequency of the oscillations (in rad/s)?

(1) 2.83 (2) 1.63 (3) 2.24 (4) 1.00 (5) 3.95

46. At a baseball game, a spectator is 60.0 m away from the batter. If it takes the sound of the bat connecting with the ball 176.49 ms to travel to the spectator's ears, what is the air temperature (in °C)?

(1) 15.0 (2) 20.0 (3) 30.0 (4) 10.0 (5) 35.0

47. At a baseball game, a spectator is 60.0 m away from the batter. If it takes the sound of the bat connecting with the ball 174.98 ms to travel to the spectator's ears, what is the air temperature (in °C)?

(1) 20.0 (2) 15.0 (3) 30.0 (4) 10.0 (5) 35.0

48. At a baseball game, a spectator is 60.0 m away from the batter. If it takes the sound of the bat connecting with the ball 172.07 ms to travel to the spectator's ears, what is the air temperature (in °C)?

(1) 30.0 (2) 15.0 (3) 20.0 (4) 10.0 (5) 35.0

49. The average power emitted by a point source of sound is 10 W. At a distance of 80 meters, a parabolic reflector intercepts 2.0 square meters of the passing sound waves. How much of the radiated power is captured by the reflector (in Watts)?

(1) 2.5×10^{-4} (2) 1.6×10^{-4} (3) 9.4×10^{-5} (4) 5.1×10^{-7} (5) 3.3×10^{-6}

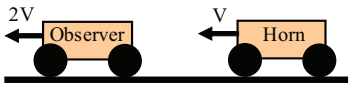
50. The average power emitted by a point source of sound is 10 W. At a distance of 100 meters, a parabolic reflector intercepts 2.0 square meters of the passing sound waves. How much of the radiated power is captured by the reflector (in Watts)?

(1) 1.6×10^{-4} (2) 2.5×10^{-4} (3) 9.4×10^{-5} (4) 5.1×10^{-7} (5) 3.3×10^{-6}

51. The average power emitted by a point source of sound is 10 W. At a distance of 130 meters, a parabolic reflector intercepts 2.0 square meters of the passing sound waves. How much of the radiated power is captured by the reflector (in Watts)?

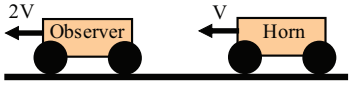
(1) 9.4×10^{-5} (2) 2.5×10^{-4} (3) 1.6×10^{-4} (4) 5.1×10^{-7} (5) 3.3×10^{-6}

52. A large horn with fundamental frequency $f_0 = 500$ Hz is mounted on a car that is moving to the left at speed V. An observer in another car is moving to the left at speed 2V as shown in the figure. If the speed of sound in the air is 343 m/s and V = 20 m/s, what frequency does the observer hear?



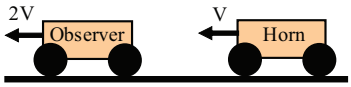
(1) 469.0 Hz (2) 452.1 Hz (3) 434.0 Hz (4) 395.6 Hz (5) 527.5 Hz

53. A large horn with fundamental frequency $f_0 = 500$ Hz is mounted on a car that is moving to the left at speed V. An observer in another car is moving to the left at speed 2V as shown in the figure. If the speed of sound in the air is 343 m/s and V = 30 m/s, what frequency does the observer hear?



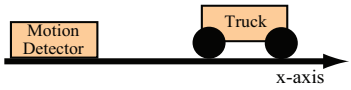
(1) 452.1 Hz (2) 469.0 Hz (3) 434.0 Hz (4) 395.6 Hz (5) 527.5 Hz

54. A large horn with fundamental frequency $f_0 = 500$ Hz is mounted on a car that is moving to the left at speed V. An observer in another car is moving to the left at speed 2V as shown in the figure. If the speed of sound in the air is 343 m/s and V = 40 m/s, what frequency does the observer hear?



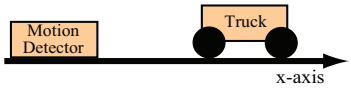
(1) 434.0 Hz (2) 469.0 Hz (3) 452.1 Hz (4) 395.6 Hz (5) 527.5 Hz

55. A stationary motion detector on the x-axis sends sound waves of frequency of 500 Hz, as shown in the figure. The waves sent out by the detector are reflected off a truck traveling along the x-axis and then are received back at the detector. If the frequency of the waves received back at the detector is 600 Hz, what is the x-component of the velocity of the truck (in m/s)? (Take the speed of sound to be 343 m/s.)



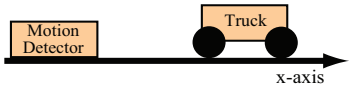
(1) −31.2 (2) 38.1 (3) 60.5 (4) 31.2 (5) −38.1

56. A stationary motion detector on the x-axis sends sound waves of frequency of 500 Hz, as shown in the figure. The waves sent out by the detector are reflected off a truck traveling along the x-axis and then are received back at the detector. If the frequency of the waves received back at the detector is 400 Hz, what is the x-component of the velocity of the truck (in m/s)? (Take the speed of sound to be 343 m/s.)



(1) 38.1 (2) −31.2 (3) 60.5 (4) 31.2 (5) −38.1

57. A stationary motion detector on the x-axis sends sound waves of frequency of 500 Hz, as shown in the figure. The waves sent out by the detector are reflected off a truck traveling along the x-axis and then are received back at the detector. If the frequency of the waves received back at the detector is 350 Hz, what is the x-component of the velocity of the truck (in m/s)? (Take the speed of sound to be 343 m/s.)



(1) 60.5 (2) −31.2 (3) 38.1 (4) 31.2 (5) −60.5

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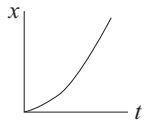
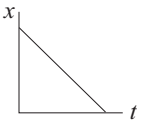
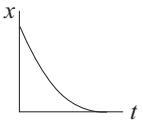
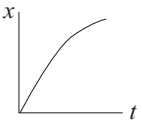
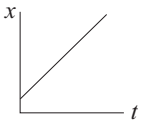
58. Which of the following five graphs of position, x, versus time, t, represents the motion of an object whose speed is increasing with time?

(1) 

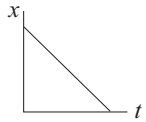
(2) 

(3) 

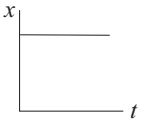
(4) 

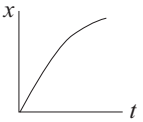
(5) 

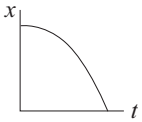
59. Which of the following five graphs of position, x, versus time, t, represents the motion of an object moving with a constant nonzero speed?

(1) 

(2) 

(3) 

(4) 

(5) 

FOLLOWING GROUPS OF QUESTIONS WILL BE SELECTED AS ONE GROUP FROM EACH TYPE
TYPE 1
Q# S 1
Q# S 2
Q# S 3
TYPE 2
Q# S 4
Q# S 5
Q# S 6
TYPE 3
Q# S 7
Q# S 8
Q# S 9
TYPE 4
Q# S 10
Q# S 11
Q# S 12
TYPE 5
Q# S 13
Q# S 14
Q# S 15
TYPE 6
Q# S 16
Q# S 17
Q# S 18
TYPE 7
Q# S 19
Q# S 20
Q# S 21
TYPE 8
Q# S 22
Q# S 23
Q# S 24
TYPE 9
Q# S 25
Q# S 26
Q# S 27
TYPE 10
Q# S 28
Q# S 29
Q# S 30
TYPE 11
Q# S 31
Q# S 32
Q# S 33
TYPE 12
Q# S 34
Q# S 35
Q# S 36

TYPE 13
Q# S 37
Q# S 38
Q# S 39
TYPE 14
Q# S 40
Q# S 41
Q# S 42
TYPE 15
Q# S 43
Q# S 44
Q# S 45
TYPE 16
Q# S 46
Q# S 47
Q# S 48
TYPE 17
Q# S 49
Q# S 50
Q# S 51
TYPE 18
Q# S 52
Q# S 53
Q# S 54
TYPE 19
Q# S 55
Q# S 56
Q# S 57
TYPE 20
Q# S 58
Q# S 59