Instructor(s): *Field/Rinzler*

PHYSICS DEPARTMENT

PHY 2053 Final Exam April 27, 2013

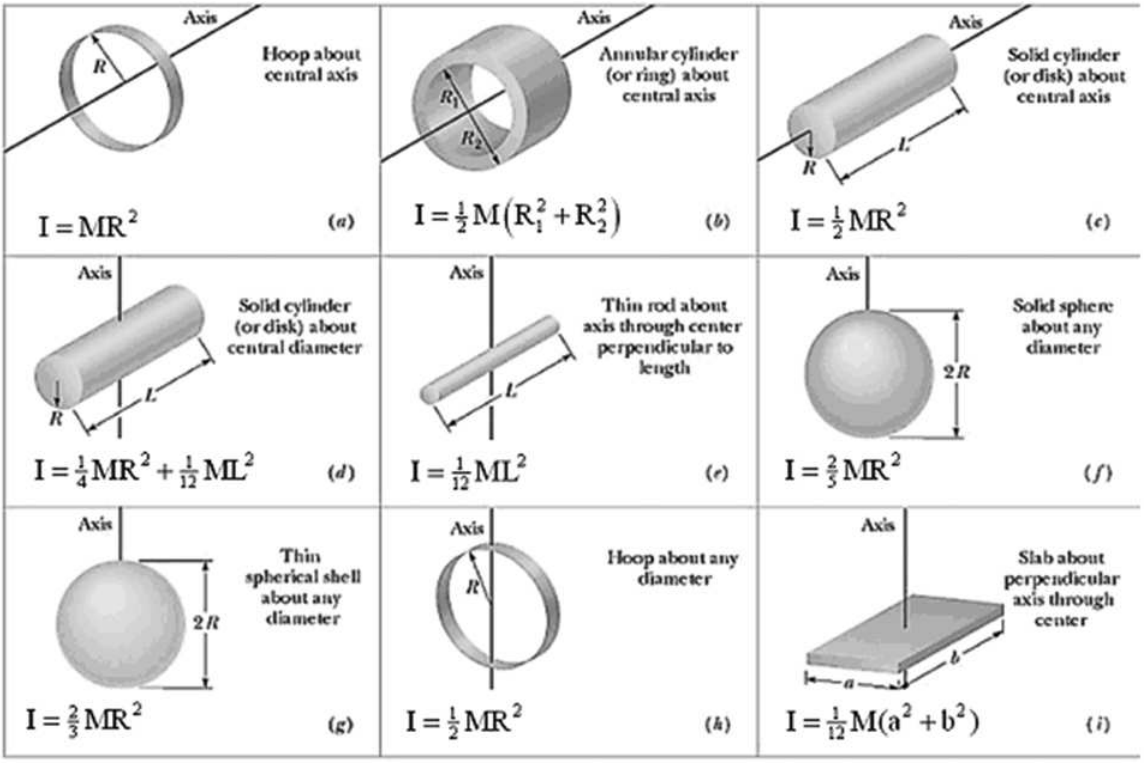
Name (print, last first): _____ Signature: _____

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 $g = 9.80$ m/s^2



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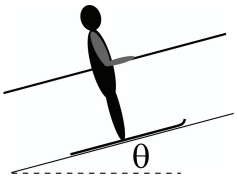
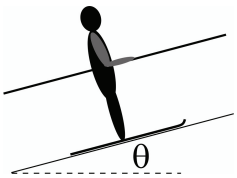
1. A skier of mass 64 kg is being towed up a slope ($\theta = 15°$) by a towrope at a constant speed of 3 m/s as shown in the figure. If the force that the towrope applies to the skier is 200 N, what is the coefficient of kinetic friction between the skis and the snow?



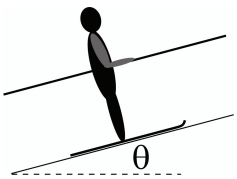
(1) 0.06 (2) 0.10 (3) 0.13 (4) 0.03 (5) 0.16

2. A skier of mass 64 kg is being towed up a slope ($\theta = 15°$) by a towrope at a constant speed of 3 m/s as shown in the figure. If the force that the towrope applies to the skier is 220 N, what is the coefficient of kinetic friction between the skis and the snow?



(1) 0.10 (2) 0.06 (3) 0.13 (4) 0.03 (5) 0.16

3. A skier of mass 64 kg is being towed up a slope ($\theta = 15°$) by a towrope at a constant speed of 3 m/s as shown in the figure. If the force that the towrope applies to the skier is 240 N, what is the coefficient of kinetic friction between the skis and the snow?



(1) 0.13 (2) 0.06 (3) 0.10 (4) 0.03 (5) 0.16

4. A truck loses its brakes while rolling down a long straight grade making an angle θ with the horizontal. If the truck is moving at 10 m/s when it is 500 m (measured along the road) from the bottom of the hill and the truck's speed is 50 m/s when it passes the bottom, what is the angle θ? Ignore friction and air resistance.

(1) 14.2° (2) 20.9° (3) 29.3° (4) 10.5° (5) 34.6°

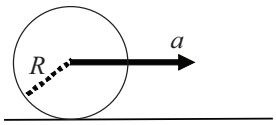
5. A truck loses its brakes while rolling down a long straight grade making an angle θ with the horizontal. If the truck is moving at 10 m/s when it is 500 m (measured along the road) from the bottom of the hill and the truck's speed is 60 m/s when it passes the bottom, what is the angle θ? Ignore friction and air resistance.

(1) 20.9° (2) 14.2° (3) 29.3° (4) 10.5° (5) 34.6°

6. A truck loses its brakes while rolling down a long straight grade making an angle θ with the horizontal. If the truck is moving at 10 m/s when it is 500 m (measured along the road) from the bottom of the hill and the truck's speed is 70 m/s when it passes the bottom, what is the angle θ? Ignore friction and air resistance.

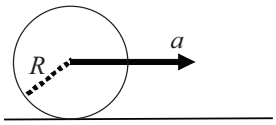
(1) 29.3° (2) 14.2° (3) 20.9° (4) 10.5° (5) 34.6°

7. Starting from rest at time $t = 0$, a circular wheel with radius $R = 3$ m is pulled to the right along a horizontal surface at a constant acceleration, a, as shown in the figure. If the wheel rolls without slipping and it takes the wheel 10 seconds to make 6 revolutions, what is the acceleration, a, of the wheel?



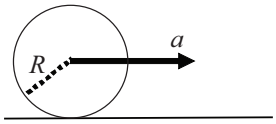
(1) 2.3 (2) 3.0 (3) 4.5 (4) 5.3 (5) 1.5

8. Starting from rest at time $t = 0$, a circular wheel with radius $R = 3$ m is pulled to the right along a horizontal surface at a constant acceleration, a, as shown in the figure. If the wheel rolls without slipping and it takes the wheel 10 seconds to make 8 revolutions, what is the acceleration, a, of the wheel?



(1) 3.0 (2) 2.3 (3) 4.5 (4) 5.3 (5) 1.5

9. Starting from rest at time $t = 0$, a circular wheel with radius $R = 3$ m is pulled to the right along a horizontal surface at a constant acceleration, a, as shown in the figure. If the wheel rolls without slipping and it takes the wheel 10 seconds to make 12 revolutions, what is the acceleration, a, of the wheel?



(1) 4.5 (2) 2.3 (3) 3.0 (4) 5.3 (5) 1.5

10. The escape speed for a projectile fired straight upward from the Earth's surface is $V_{esc} = \sqrt{2GM_E/R_E}$, where M_E and R_E are the mass and radius of the Earth, respectively, and G is Newton's constant. If a projectile fired straight upward from the Earth's surface reaches a highest altitude as measured from the surface of the Earth of $R_E/2$, what is its initial speed?

(1) $0.577V_{esc}$ (2) $0.707V_{esc}$ (3) $0.816V_{esc}$ (4) $0.894V_{esc}$ (5) $0.412V_{esc}$

11. The escape speed for a projectile fired straight upward from the Earth's surface is $V_{esc} = \sqrt{2GM_E/R_E}$, where M_E and R_E are the mass and radius of the Earth, respectively, and G is Newton's constant. If a projectile fired straight upward from the Earth's surface reaches a highest altitude as measured from the surface of the Earth of R_E, what is its initial speed?

(1) $0.707V_{esc}$ (2) $0.577V_{esc}$ (3) $0.816V_{esc}$ (4) $0.894V_{esc}$ (5) $0.412V_{esc}$

12. The escape speed for a projectile fired straight upward from the Earth's surface is $V_{esc} = \sqrt{2GM_E/R_E}$, where M_E and R_E are the mass and radius of the Earth, respectively, and G is Newton's constant. If a projectile fired straight upward from the Earth's surface reaches a highest altitude as measured from the surface of the Earth of $2R_E$, what is its initial speed?

(1) $0.816V_{esc}$ (2) $0.577V_{esc}$ (3) $0.707V_{esc}$ (4) $0.894V_{esc}$ (5) $0.412V_{esc}$

13. At time $t = 0$ a 2-kg particle is located at $\vec{r} = (2m)\hat{x} + (4m)\hat{y}$, and its velocity is $\vec{v} = -(6m/s)\hat{x}$, and it is subject to the force $\vec{F} = (8N)\hat{y}$, where $\hat{x}$ and $\hat{y}$ are unit vectors in the x and y direction, respectively. What is the magnitude of the torque about the origin at $t = 0$?

(1) 16 N·m (2) 18 N·m (3) 20 N·m (4) 32 N·m (5) 48 N·m

14. At time $t = 0$ a 2-kg particle is located at $\vec{r} = (2m)\hat{x} + (4m)\hat{y}$, and its velocity is $\vec{v} = -(6m/s)\hat{x}$, and it is subject to the force $\vec{F} = (9N)\hat{y}$, where $\hat{x}$ and $\hat{y}$ are unit vectors in the x and y direction, respectively. What is the magnitude of the torque about the origin at $t = 0$?

(1) 18 N·m (2) 16 N·m (3) 20 N·m (4) 32 N·m (5) 48 N·m

15. At time $t = 0$ a 2-kg particle is located at $\vec{r} = (2m)\hat{x} + (4m)\hat{y}$, and its velocity is $\vec{v} = -(6m/s)\hat{x}$, and it is subject to the force $\vec{F} = (10N)\hat{y}$, where $\hat{x}$ and $\hat{y}$ are unit vectors in the x and y direction, respectively. What is the magnitude of the torque about the origin at $t = 0$?

(1) 20 N·m (2) 16 N·m (3) 18 N·m (4) 32 N·m (5) 48 N·m

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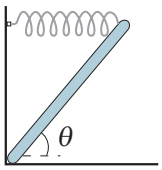
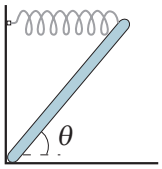
16. A modern sculpture has a large horizontal spring that is attached to a uniform piece of metal at its end and holds the metal at rest at an angle of $\theta = 45°$ above the horizontal direction as shown in the figure. The other end of the metal is wedged into a corner and is free to rotate. If the spring is stretched 0.2 m and the spring constant is $k = 1,600$ N/m, what is the mass of the metal (in kg)?



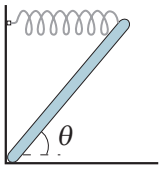
(1) 65.3 (2) 54.8 (3) 45.7 (4) 60.0 (5) 38.5

17. A modern sculpture has a large horizontal spring that is attached to a uniform piece of metal at its end and holds the metal at rest at an angle of $\theta = 40°$ above the horizontal direction as shown in the figure. The other end of the metal is wedged into a corner and is free to rotate. If the spring is stretched 0.2 m and the spring constant is $k = 1,600$ N/m, what is the mass of the metal (in kg)?



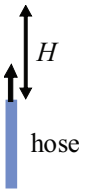
(1) 54.8 (2) 65.3 (3) 45.7 (4) 60.0 (5) 38.5

18. A modern sculpture has a large horizontal spring that is attached to a uniform piece of metal at its end and holds the metal at rest at an angle of $\theta = 35°$ above the horizontal direction as shown in the figure. The other end of the metal is wedged into a corner and is free to rotate. If the spring is stretched 0.2 m and the spring constant is $k = 1,600$ N/m, what is the mass of the metal (in kg)?



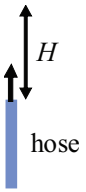
(1) 45.7 (2) 65.3 (3) 54.8 (4) 60.0 (5) 38.5

19. A garden hose of inner radius 0.60 cm carries water at 1.8 m/s. The nozzle at the end has radius R and is held in a vertical position as shown in the figure. If the water rises a height $H = 2$ m above the nozzle, what is the radius R of the nozzle (in cm)?



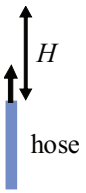
(1) 0.32 (2) 0.26 (3) 0.23 (4) 0.15 (5) 0.60

20. A garden hose of inner radius 0.60 cm carries water at 1.8 m/s. The nozzle at the end has radius R and is held in a vertical position as shown in the figure. If the water rises a height $H = 5$ m above the nozzle, what is the radius R of the nozzle (in cm)?



(1) 0.26 (2) 0.32 (3) 0.23 (4) 0.15 (5) 0.60

21. A garden hose of inner radius 0.60 cm carries water at 1.8 m/s. The nozzle at the end has radius R and is held in a vertical position as shown in the figure. If the water rises a height $H = 8$ m above the nozzle, what is the radius R of the nozzle (in cm)?



(1) 0.23 (2) 0.32 (3) 0.26 (4) 0.15 (5) 0.60

22. An ideal spring-and-mass system is undergoing simple harmonic motion (SHM) with a period of oscillations $T = 2$ s. If the speed of the block is 1.0 m/s when the displacement from equilibrium is 2.0 m, what is the speed of the block (in m/s) when the displacement from equilibrium is 1.0 m?

(1) 5.5 (2) 3.8 (3) 2.9 (4) 6.2 (5) 1.9

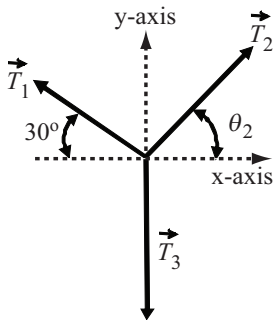
23. An ideal spring-and-mass system is undergoing simple harmonic motion (SHM) with a period of oscillations $T = 3$ s. If the speed of the block is 1.0 m/s when the displacement from equilibrium is 2.0 m, what is the speed of the block (in m/s) when the displacement from equilibrium is 1.0 m?

(1) 3.8 (2) 5.5 (3) 2.9 (4) 6.2 (5) 1.9

24. An ideal spring-and-mass system is undergoing simple harmonic motion (SHM) with a period of oscillations $T = 4$ s. If the speed of the block is 1.0 m/s when the displacement from equilibrium is 2.0 m, what is the speed of the block (in m/s) when the displacement from equilibrium is 1.0 m?

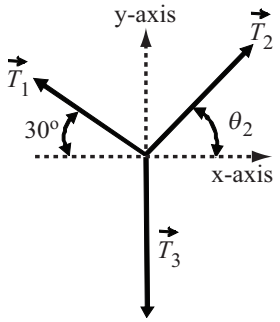
(1) 2.9 (2) 5.5 (3) 3.8 (4) 6.2 (5) 1.9

25. The system shown in the figure is in equilibrium (*i.e.,* the sum of all forces acting at the origin is zero). If the magnitude of the tension T_3 is three times the magnitude of the tension T_1, what is the angle θ_2?



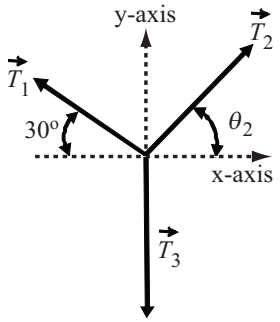
(1) 70.9°
(2) 76.1°
(3) 79.1°
(4) 60.0°
(5) 30.0°

26. The system shown in the figure is in equilibrium (*i.e.,* the sum of all forces acting at the origin is zero). If the magnitude of the tension T_3 is four times the magnitude of the tension T_1, what is the angle θ_2?



(1) 76.1°
(2) 70.9°
(3) 79.1°
(4) 60.0°
(5) 30.0°

27. The system shown in the figure is in equilibrium (*i.e.,* the sum of all forces acting at the origin is zero). If the magnitude of the tension T_3 is five times the magnitude of the tension T_1, what is the angle θ_2?



(1) 79.1°
(2) 70.9°
(3) 76.1°
(4) 60.0°
(5) 30.0°

28. Near the surface of the Earth a suspension bridge is a height H above the level base of a gorge. Two identical stones are simultaneously thrown from the bridge. One stone is thrown straight down with speed v_0 and the other is thrown straight up at the same speed v_0. Ignore air resistance. If one of the stones lands at the bottom of the gorge 1.4 seconds before the other, what is the speed v_0 (in m/s)?

(1) 6.9 (2) 8.8 (3) 10.8 (4) 4.9 (5) 9.8

29. Near the surface of the Earth a suspension bridge is a height H above the level base of a gorge. Two identical stones are simultaneously thrown from the bridge. One stone is thrown straight down with speed v_0 and the other is thrown straight up at the same speed v_0. Ignore air resistance. If one of the stones lands at the bottom of the gorge 1.8 seconds before the other, what is the speed v_0 (in m/s)?

(1) 8.8 (2) 6.9 (3) 10.8 (4) 4.9 (5) 9.8

30. Near the surface of the Earth a suspension bridge is a height H above the level base of a gorge. Two identical stones are simultaneously thrown from the bridge. One stone is thrown straight down with speed v_0 and the other is thrown straight up at the same speed v_0. Ignore air resistance. If one of the stones lands at the bottom of the gorge 2.2 seconds before the other, what is the speed v_0 (in m/s)?

(1) 10.8 (2) 6.9 (3) 8.8 (4) 4.9 (5) 9.8

31. The coefficient of static friction between a non-uniform cylinder (mass $M = 1$ kg, radius $R = 2$ m) and the horizontal floor is $\mu_s = 0.4$. If the magnitude of the maximum translational acceleration the cylinder can have without sliding is 5.0 m/s^2, what is the moment of inertia of the cylinder about its rotation axis (in kg·m^2)?

(1) 3.14 (2) 2.61 (3) 2.24 (4) 5.35 (5) 1.89

32. The coefficient of static friction between a non-uniform cylinder (mass $M = 1$ kg, radius $R = 2$ m) and the horizontal floor is $\mu_s = 0.4$. If the magnitude of the maximum translational acceleration the cylinder can have without sliding is 6.0 m/s^2, what is the moment of inertia of the cylinder about its rotation axis (in kg·m^2)?

(1) 2.61 (2) 3.14 (3) 2.24 (4) 5.35 (5) 1.89

33. The coefficient of static friction between a non-uniform cylinder (mass $M = 1$ kg, radius $R = 2$ m) and the horizontal floor is $\mu_s = 0.4$. If the magnitude of the maximum translational acceleration the cylinder can have without sliding is 7.0 m/s^2, what is the moment of inertia of the cylinder about its rotation axis (in kg·m^2)?

(1) 2.24 (2) 3.14 (3) 2.61 (4) 5.35 (5) 1.89

34. An elevator of mass 600 kg starts from rest at $t = 0$ and moves downward. The tension in the supporting cable is constant and equal to 5,000 N. What is the elevator's kinetic energy (in kJ) at time $t = 4$ s?

(1) 10.3 (2) 16.1 (3) 23.2 (4) 5.1 (5) 35.4

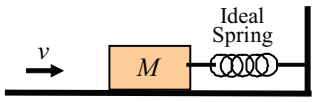
35. An elevator of mass 600 kg starts from rest at $t = 0$ and moves downward. The tension in the supporting cable is constant and equal to 5,000 N. What is the elevator's kinetic energy (in kJ) at time $t = 5$ s?

(1) 16.1 (2) 10.3 (3) 23.2 (4) 5.1 (5) 35.4

36. An elevator of mass 600 kg starts from rest at $t = 0$ and moves downward. The tension in the supporting cable is constant and equal to 5,000 N. What is the elevator's kinetic energy (in kJ) at time $t = 6$ s?

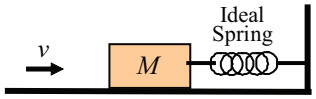
(1) 23.2 (2) 10.3 (3) 16.1 (4) 5.1 (5) 35.4

37. 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 period of the subsequent simple harmonic motion of the bullet-block system is 1.73 s, what is the amplitude of the oscillations (in cm)?



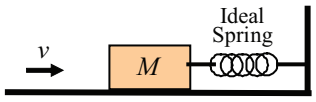
(1) 4.0 (2) 6.0 (3) 8.0 (4) 2.0 (5) 10.0

38. 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 period of the subsequent simple harmonic motion of the bullet-block system is 2.60 s, what is the amplitude of the oscillations (in cm)?



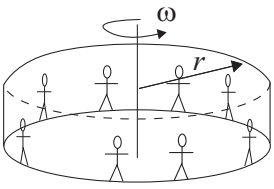
(1) 6.0 (2) 4.0 (3) 8.0 (4) 2.0 (5) 10.0

39. 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 period of the subsequent simple harmonic motion of the bullet-block system is 3.47 s, what is the amplitude of the oscillations (in cm)?



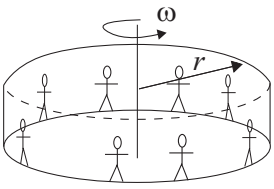
(1) 8.0 (2) 4.0 (3) 6.0 (4) 2.0 (5) 10.0

40. A carnival ride consists of the riders standing against the inside wall of a cylindrical room having radius $R = 5.0$ m. The room spins about the vertical cylinder axis with angular velocity $\omega = 3.0$ rad/s. Once it is up to speed the floor of the room falls away. What minimum coefficient of static friction between the riders and the wall will keep them from dropping with the floor?



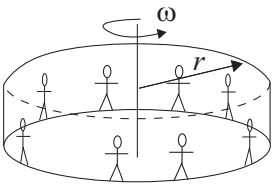
(1) 0.218 (2) 0.490 (3) 0.123 (4) 0.288 (5) 0.331

41. A carnival ride consists of the riders standing against the inside wall of a cylindrical room having radius $R = 5.0$ m. The room spins about the vertical cylinder axis with angular velocity $\omega = 2.0$ rad/s. Once it is up to speed the floor of the room falls away. What minimum coefficient of static friction between the riders and the wall will keep them from dropping with the floor?



(1) 0.490 (2) 0.218 (3) 0.123 (4) 0.288 (5) 0.331

42. A carnival ride consists of the riders standing against the inside wall of a cylindrical room having radius $R = 5.0$ m. The room spins about the vertical cylinder axis with angular velocity $\omega = 4.0$ rad/s. Once it is up to speed the floor of the room falls away. What minimum coefficient of static friction between the riders and the wall will keep them from dropping with the floor?



(1) 0.123 (2) 0.218 (3) 0.490 (4) 0.288 (5) 0.331

43. Suppose that you release a small stone from rest at the surface in a pool of water (with density ρ_{water}) near the surface of the Earth. If the stone drops 5 meters in 2 seconds, what is its specific gravity (*i.e.,* what is $\rho_{\text{stone}}/\rho_{\text{water}}$)? Assume negligible viscous drag between the water and the stone.

(1) 1.34 (2) 2.04 (3) 4.26 (4) 3.14 (5) 5.43

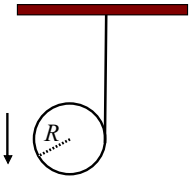
44. Suppose that you release a small stone from rest at the surface in a pool of water (with density ρ_{water}) near the surface of the Earth. If the stone drops 10 meters in 2 seconds, what is its specific gravity (*i.e.,* what is $\rho_{\text{stone}}/\rho_{\text{water}}$)? Assume negligible viscous drag between the water and the stone.

(1) 2.04 (2) 1.34 (3) 4.26 (4) 3.14 (5) 5.43

45. Suppose that you release a small stone from rest at the surface in a pool of water (with density ρ_{water}) near the surface of the Earth. If the stone drops 15 meters in 2 seconds, what is its specific gravity (*i.e.,* what is $\rho_{\text{stone}}/\rho_{\text{water}}$)? Assume negligible viscous drag between the water and the stone.

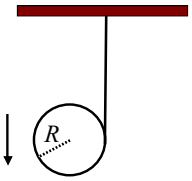
(1) 4.26 (2) 1.34 (3) 2.04 (4) 3.14 (5) 5.43

46. A cloth tape is wound around the outside of a uniform solid cylinder (mass M, radius R, moment of inertia $I = MR^2/2$) and fastened to the ceiling as shown in the figure. The cylinder is held with the tape vertical and then released from rest at $t = 0$. If $R = 0.5$ m, how many revolutions about its symmetry axis does the cylinder make between $t = 0$ and $t = 2$ s?



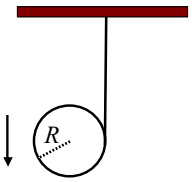
(1) 4.2 (2) 9.4 (3) 16.6 (4) 2.1 (5) 26.1

47. A cloth tape is wound around the outside of a uniform solid cylinder (mass M, radius R, moment of inertia $I = MR^2/2$) and fastened to the ceiling as shown in the figure. The cylinder is held with the tape vertical and then released from rest at $t = 0$. If $R = 0.5$ m, how many revolutions about its symmetry axis does the cylinder make between $t = 0$ and $t = 3$ s?



(1) 9.4 (2) 4.2 (3) 16.6 (4) 2.1 (5) 26.1

48. A cloth tape is wound around the outside of a uniform solid cylinder (mass M, radius R, moment of inertia $I = MR^2/2$) and fastened to the ceiling as shown in the figure. The cylinder is held with the tape vertical and then released from rest at $t = 0$. If $R = 0.5$ m, how many revolutions about its symmetry axis does the cylinder make between $t = 0$ and $t = 4$ s?

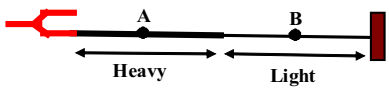


(1) 16.6 (2) 4.2 (3) 9.4 (4) 2.1 (5) 26.1

49. Fully destructive interference between two sinusoidal waves of the same frequency and amplitude occurs only if they:

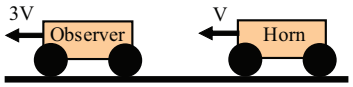
(1) travel in the same direction and are 180° out of phase.
(2) travel in opposite directions and are in phase.
(3) travel in opposite directions are 180° out of phase.
(4) travel in the same direction and are in phase.
(5) travel in the same direction and are 90° out of phase.

50. As shown in the figure a string of length 10 m and mass 8 g is tied to a second string of the same length (10 m) but half the mass (4 g). The free end of the lighter string is tied to a wall while the free end of the heavier string is tied to one tine of a tuning fork. The tuning fork is pulled away from the wall generating a tension of 80 N in the strings. When the tuning fork is struck it vibrates at 800 Hz launching a traveling wave down the strings. After the wave has passed point B (but before any reflections of the wave off the wall return) the periods of the transverse oscillations of the strings at point B and point A have ratio (B/A):



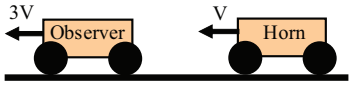
(1) 1 (2) 2 (3) $\frac{1}{2}$ (4) 4 (5) $\frac{1}{4}$

51. 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 3V 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?



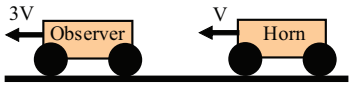
(1) 438.1 Hz (2) 404.2 Hz (3) 368.0 Hz (4) 351.1 Hz (5) 623.8 Hz

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 3V 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?



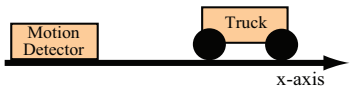
(1) 404.2 Hz (2) 438.1 Hz (3) 368.0 Hz (4) 351.1 Hz (5) 623.8 Hz

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 3V 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?



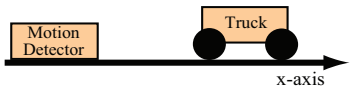
(1) 368.0 Hz (2) 438.1 Hz (3) 404.2 Hz (4) 351.1 Hz (5) 623.8 Hz

54. A stationary motion detector on the x-axis sends sound waves of frequency of 600 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 750 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.)



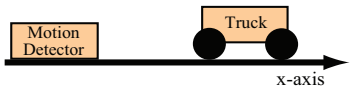
(1) −38.1 (2) 68.6 (3) 90.3 (4) 38.1 (5) −68.6

55. A stationary motion detector on the x-axis sends sound waves of frequency of 600 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) 68.6 (2) −38.1 (3) 90.3 (4) 38.1 (5) −68.6

56. A stationary motion detector on the x-axis sends sound waves of frequency of 600 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) 90.3 (2) −38.1 (3) 68.6 (4) 38.1 (5) −90.3

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 51
Q# S 52
Q# S 53
TYPE 18
Q# S 54
Q# S 55
Q# S 56