Instructor(s): *Field/Rinzler*

PHYSICS DEPARTMENT

PHY 2053 Final Exam April 28, 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.

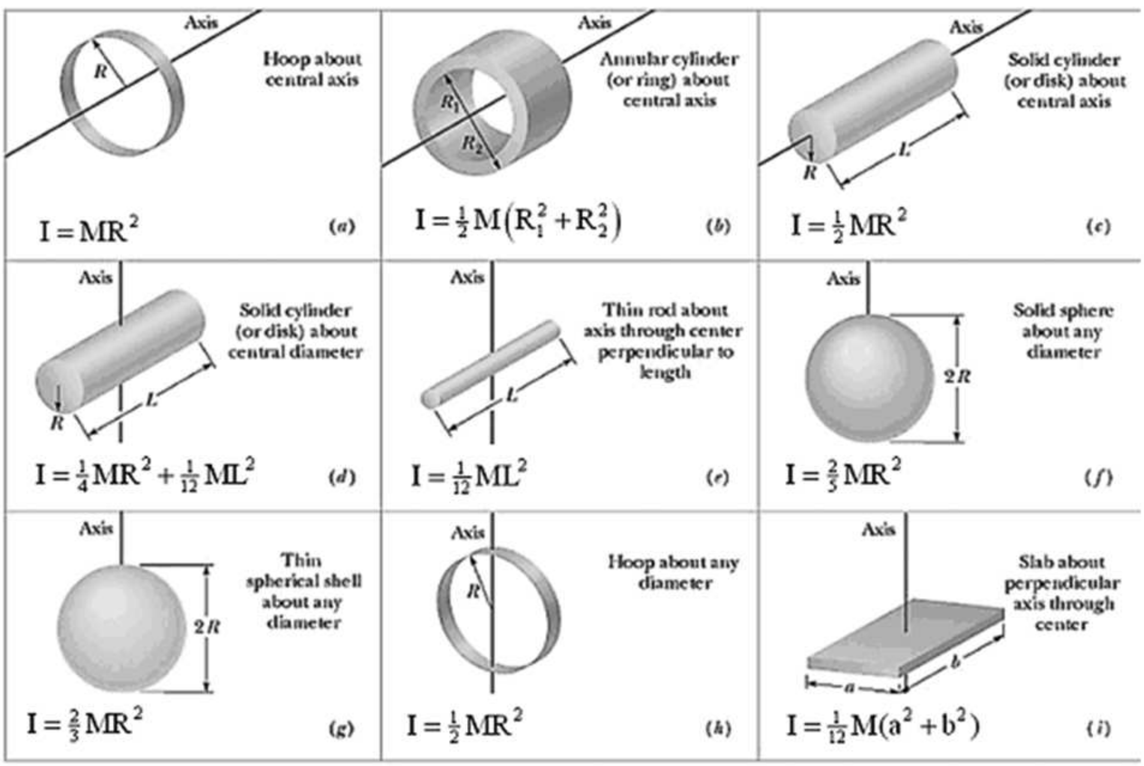
(3) Do all scratch work anywhere on this exam that you like. **Circle your answers on the test form.** At the end of the test, this exam printout is to be turned in. No credit will be given without both answer sheet and printout.

(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 $g = 9.80$ m/s^2



1. A beanbag is thrown horizontally from a dorm room window a height of 2.0 meters above the ground. If the beanbag's velocity just before impact with the ground is 30° below the horizontal, at what horizontal distance (in m) from the dorm directly below the window from which it was thrown does the beanbag hit the ground? Ignore air resistance.

   (1) 6.93 (2) 4.77 (3) 3.36 (4) 8.25 (5) 2.45

2. A beanbag is thrown horizontally from a dorm room window a height of 2.0 meters above the ground. If the beanbag's velocity just before impact with the ground is 40° below the horizontal, at what horizontal distance (in m) from the dorm directly below the window from which it was thrown does the beanbag hit the ground? Ignore air resistance.

   (1) 4.77 (2) 6.93 (3) 3.36 (4) 8.25 (5) 2.45

3. A beanbag is thrown horizontally from a dorm room window a height of 2.0 meters above the ground. If the beanbag's velocity just before impact with the ground is 50° below the horizontal, at what horizontal distance (in m) from the dorm directly below the window from which it was thrown does the beanbag hit the ground? Ignore air resistance.

   (1) 3.36 (2) 6.93 (3) 4.77 (4) 8.25 (5) 2.45

4. 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 displacement (in m) between $t = 0$ and $t = 5$ s?

   (1) 18.3 (2) 39.2 (3) 60.0 (4) 52.2 (5) 10.5

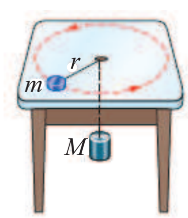
5. An elevator of mass 600 kg starts from rest at t = 0 and moves downward. The tension in the supporting cable is constant and equal to 4,000 N. What is the elevator's displacement (in m) between $t = 0$ and $t = 5$ s?

   (1) 39.2 (2) 18.3 (3) 60.0 (4) 52.2 (5) 10.5

6. 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 3,000 N. What is the elevator's displacement (in m) between $t = 0$ and $t = 5$ s?

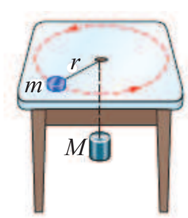
   (1) 60.0 (2) 18.3 (3) 39.2 (4) 52.2 (5) 10.5

7. A puck of mass $m = 2$ kg slides in a circle of radius $r = 2.0$ m on a frictionless table while attached to a hanging cylinder of mass M by a cord through a hole in the table, as shown in the figure. If the hanging cylinder is at rest when the period of the circular motion is 1.5 s, what is the mass M (in kg) of the cylinder?



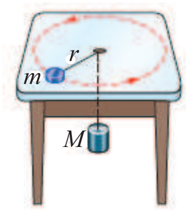
   (1) 7.16 (2) 4.03 (3) 2.58 (4) 8.65 (5) 1.89

8. A puck of mass $m = 2$ kg slides in a circle of radius $r = 2.0$ m on a frictionless table while attached to a hanging cylinder of mass M by a cord through a hole in the table, as shown in the figure. If the hanging cylinder is at rest when the period of the circular motion is 2.0 s, what is the mass M (in kg) of the cylinder?



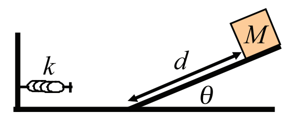
   (1) 4.03 (2) 7.16 (3) 2.58 (4) 8.65 (5) 1.89

9. A puck of mass $m = 2$ kg slides in a circle of radius $r = 2.0$ m on a frictionless table while attached to a hanging cylinder of mass M by a cord through a hole in the table, as shown in the figure. If the hanging cylinder is at rest when the period of the circular motion is 2.5 s, what is the mass M (in kg) of the cylinder?



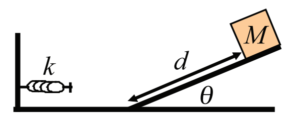
(1) 2.58 (2) 7.16 (3) 4.03 (4) 8.65 (5) 1.89

10. Near the surface of the Earth, an ideal spring with spring constant $k = 50$ N/m 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 released from rest a distance $d = 1.5$ m up the incline plane. If the block slides down and compresses the spring 0.5 m from its equilibrium position before coming to rest, what is the angle θ of the inclined plane relative to the horizontal?



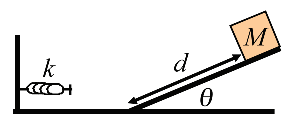
(1) 58.2° (2) 39.6° (3) 25.2° (4) 30.0° (5) 45.0°

11. Near the surface of the Earth, an ideal spring with spring constant $k = 50$ N/m 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 released from rest a distance $d = 2.0$ m up the incline plane. If the block slides down and compresses the spring 0.5 m from its equilibrium position before coming to rest, what is the angle θ of the inclined plane relative to the horizontal?



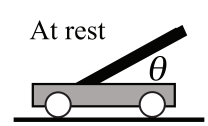
(1) 39.6° (2) 58.2° (3) 25.2° (4) 30.0° (5) 45.0°

12. Near the surface of the Earth, an ideal spring with spring constant $k = 50$ N/m 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 released from rest a distance $d = 3.0$ m up the incline plane. If the block slides down and compresses the spring 0.5 m from its equilibrium position before coming to rest, what is the angle θ of the inclined plane relative to the horizontal?



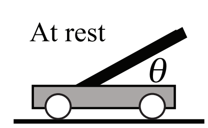
(1) 25.2° (2) 58.2° (3) 39.6° (4) 30.0° (5) 45.0°

13. A cannon on a railroad car is facing in a direction parallel to the tracks as shown in the figure. The cannon can fire a 100-kg cannon ball at a muzzle speed of 200 m/s at an angle of θ above the horizontal as shown in the figure. The cannon plus railway car have a mass of 5,000 kg. If the cannon, one cannon ball, and the railway car are initially at rest, at what angle θ must the cannon be fired so that the recoil speed of the railway car plus cannon is 1.0 m/s toward the left? Assume that the track is horizontal and there is no friction.



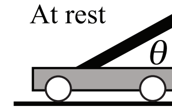
(1) 75.5° (2) 41.4° (3) 0.0° (4) 45.0° (5) 60.0°

14. A cannon on a railroad car is facing in a direction parallel to the tracks as shown in the figure. The cannon can fire a 100-kg cannon ball at a muzzle speed of 200 m/s at an angle of θ above the horizontal as shown in the figure. The cannon plus railway car have a mass of 5,000 kg. If the cannon, one cannon ball, and the railway car are initially at rest, at what angle θ must the cannon be fired so that the recoil speed of the railway car plus cannon is 3.0 m/s toward the left? Assume that the track is horizontal and there is no friction.



(1) 41.4° (2) 75.5° (3) 0.0° (4) 45.0° (5) 60.0°

15. A cannon on a railroad car is facing in a direction parallel to the tracks as shown in the figure. The cannon can fire a 100-kg cannon ball at a muzzle speed of 200 m/s at an angle of θ above the horizontal as shown in the figure. The cannon plus railway car have a mass of 5,000 kg. If the cannon, one cannon ball, and the railway car are initially at rest, at what angle θ must the cannon be fired so that the recoil speed of the railway car plus cannon is 4.0 m/s toward the left? Assume that the track is horizontal and there is no friction.



(1) 0.0° (2) 75.5° (3) 41.4° (4) 45.0° (5) 60.0°

16. A 1,000 kg piece of space debris has velocity $(5m/s)\hat{x} + (20m/s)\hat{y}$ when it collides with a second piece of space debris of mass 2,500 kg and moving with velocity $(5m/s)\hat{x}$, where $\hat{x}$ and $\hat{y}$ are unit vectors in the x and y-direction, respectively. If after the collision the two pieces are locked together, what is their speed (in m/s)?

(1) 7.6 (2) 9.9 (3) 5.8 (4) 2.5 (5) 12.2

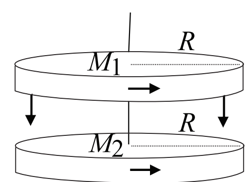
17. A 1,000 kg piece of space debris has velocity $(5m/s)\hat{x} + (30m/s)\hat{y}$ when it collides with a second piece of space debris of mass 2,500 kg and moving with velocity $(5m/s)\hat{x}$, where $\hat{x}$ and $\hat{y}$ are unit vectors in the x and y-direction, respectively. If after the collision the two pieces are locked together, what is their speed (in m/s)?

(1) 9.9 (2) 7.6 (3) 5.8 (4) 2.5 (5) 12.2

18. A 1,000 kg piece of space debris has velocity $(5m/s)\hat{x} + (10m/s)\hat{y}$ when it collides with a second piece of space debris of mass 2,500 kg and moving with velocity $(5m/s)\hat{x}$, where $\hat{x}$ and $\hat{y}$ are unit vectors in the x and y-direction, respectively. If after the collision the two pieces are locked together, what is their speed (in m/s)?

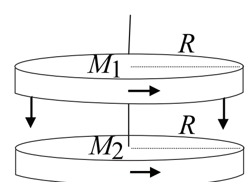
(1) 5.8 (2) 7.6 (3) 9.9 (4) 2.5 (5) 12.2

19. A uniform solid disk of mass M_2 and radius R is initially rotating with angular speed 2ω about the axis shown in the figure. A uniform solid disk mass M_1 and the same radius R is initially rotating with angular speed ω about the same axis. The top disk is suddenly dropped onto the rotating disk so that their central axes are coincident. The two disks stick together and rotate at the same new angular speed. If $M_2 = 2M_1$, what is the new angular speed of the two disk system?



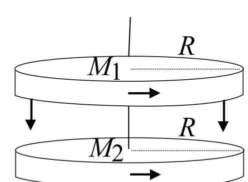
(1) $5\omega/3$ (2) $4\omega/3$ (3) $7\omega/3$ (4) 3ω (5) $2\omega/3$

20. A uniform solid disk of mass M_2 and radius R is initially rotating with angular speed 3ω about the axis shown in the figure. A uniform solid disk mass M_1 and the same radius R is initially rotating with angular speed ω about the same axis. The top disk is suddenly dropped onto the rotating disk so that their central axes are coincident. The two disks stick together and rotate at the same new angular speed. If $M_2 = 2M_1$, what is the new angular speed of the two disk system?



(1) $7\omega/3$ (2) $5\omega/3$ (3) $4\omega/3$ (4) 3ω (5) $2\omega/3$

21. A uniform solid disk of mass M_2 and radius R is initially rotating with angular speed 4ω about the axis shown in the figure. A uniform solid disk mass M_1 and the same radius R is initially rotating with angular speed ω about the same axis. The top disk is suddenly dropped onto the rotating disk so that their central axes are coincident. The two disks stick together and rotate at the same new angular speed. If $M_2 = 2M_1$, what is the new angular speed of the two disk system?



(1) 3ω (2) $5\omega/3$ (3) $4\omega/3$ (4) $7\omega/3$ (5) $2\omega/3$

22. 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 a constant torque of 1.16×10^{-3}N·m is delivered by the motor, starting from rest, how many revolutions of the turntable does it take to reach its final angular speed?

(1) 1.5 (2) 2.0 (3) 2.5 (4) 3.0 (5) 1.0

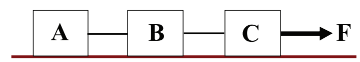
23. A turntable must spin at 33.3 rpm to play an old-fashioned vinyl record. The turntable is a uniform disk of radius 15 cm and mass 0.16 kg. If a constant torque of 8.71×10^{-4}N·m is delivered by the motor, starting from rest, how many revolutions of the turntable does it take to reach its final angular speed?

(1) 2.0 (2) 1.5 (3) 2.5 (4) 3.0 (5) 1.0

24. 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 a constant torque of 6.97×10^{-4}N·m is delivered by the motor, starting from rest, how many revolutions of the turntable does it take to reach its final angular speed?

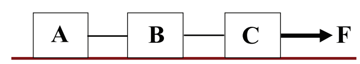
(1) 2.5 (2) 1.5 (3) 2.0 (4) 3.0 (5) 1.0

25. Three blocks (A,B,C), each having mass $M_A = M$, $M_B = 2M$, $M_C = 4M$ are connected by strings on a horizontal frictionless surface as shown in the figure. Block C is pulled to the right by a horizontal force of magnitude F that causes the entire system to accelerate. What is the magnitude of the net horizontal force acting on block B due to the strings?



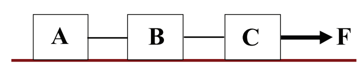
(1) $2F/7$ (2) $F/3$ (3) $F/6$ (4) $2F/3$ (5) F

26. Three blocks (A,B,C), each having mass $M_A = 2M$, $M_B = 3M$, $M_C = 4M$ are connected by strings on a horizontal frictionless surface as shown in the figure. Block C is pulled to the right by a horizontal force of magnitude F that causes the entire system to accelerate. What is the magnitude of the net horizontal force acting on block B due to the strings?



(1) $F/3$ (2) $2F/7$ (3) $F/6$ (4) $2F/3$ (5) F

27. Three blocks (A,B,C), each having mass $M_A = 2M$, $M_B = M$, $M_C = 3M$ are connected by strings on a horizontal frictionless surface as shown in the figure. Block C is pulled to the right by a horizontal force of magnitude F that causes the entire system to accelerate. What is the magnitude of the net horizontal force acting on block B due to the strings?



(1) $F/6$ (2) $2F/7$ (3) $F/3$ (4) $2F/3$ (5) F

28. As indicated in the figure, a cart of mass M is tied between two ideal springs with spring constants, k_1 and k_2, respectively. If $k_1 = k_2 = 10$ N/m, the cart oscillates with angular frequency ω. If the spring constants are changed to $k_1 = 100$ N/m and $k_2 = 80$ N/m, what is the new angular frequency of the oscillation?

(1) 3.0ω (2) 4.2ω (3) 2.4ω (4) 5.0ω (5) 9.0ω

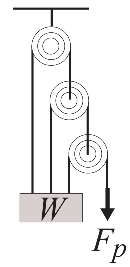
29. As indicated in the figure, a cart of mass M is tied between two ideal springs with spring constants, k_1 and k_2, respectively. If $k_1 = k_2 = 5$ N/m, the cart oscillates with angular frequency ω. If the spring constants are changed to $k_1 = 100$ N/m and $k_2 = 80$ N/m, what is the new angular frequency of the oscillation?

(1) 4.2ω (2) 3.0ω (3) 2.4ω (4) 5.0ω (5) 9.0ω

30. As indicated in the figure, a cart of mass M is tied between two ideal springs with spring constants, k_1 and k_2, respectively. If $k_1 = k_2 = 15$ N/m, the cart oscillates with angular frequency ω. If the spring constants are changed to $k_1 = 100$ N/m and $k_2 = 80$ N/m, what is the new angular frequency of the oscillation?

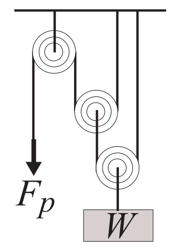
(1) 2.4ω (2) 3.0ω (3) 4.2ω (4) 5.0ω (5) 9.0ω

31. The ideal mechanical advantage is defined to be the ratio of the weight W to the force of the pull F_P for equilibrium (*i.e.,* W/F_P in equilibrium). Assuming that the pulleys have negligible mass, rotate without friction and without the rope slipping, what is the ideal mechanical advantage of the combination of pulleys shown in the figure?



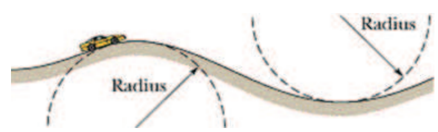
(1) 7 (2) 1 (3) 2 (4) 3 (5) 4

32. The ideal mechanical advantage is defined to be the ratio of the weight W to the force of the pull FP for equilibrium (*i.e.,* W/FP in equilibrium). Assuming that the pulleys have negligible mass, rotate without friction and without the rope slipping, what is the ideal mechanical advantage of the combination of pulleys shown in the figure?



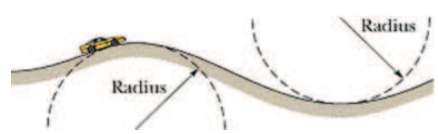
(1) 4 (2) 7 (3) 2 (4) 3 (5) 8

33. In the figure, a car is driven at speed v_1 over a circular hill and then into a circular valley with the same radius, but with speed v_2. The driver's mass is M. At the top of the hill, the normal force on the driver from the car seat is zero. If $v_2 = 2v_1$, what is the magnitude of the normal force on the driver from the seat when the car passes through the bottom of the valley?



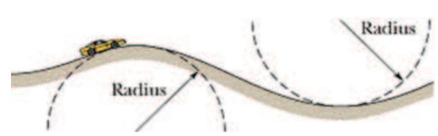
(1) 5 Mg (2) 10 Mg (3) 17 Mg (4) 2 Mg (5) zero

34. In the figure, a car is driven at speed v_1 over a circular hill and then into a circular valley with the same radius, but with speed v_2. The driver's mass is M. At the top of the hill, the normal force on the driver from the car seat is zero. If $v_2 = 3v_1$, what is the magnitude of the normal force on the driver from the seat when the car passes through the bottom of the valley?



(1) 10 Mg (2) 5 Mg (3) 17 Mg (4) 2 Mg (5) zero

35. In the figure, a car is driven at speed v_1 over a circular hill and then into a circular valley with the same radius, but with speed v_2. The driver's mass is M. At the top of the hill, the normal force on the driver from the car seat is zero. If $v_2 = 4v_1$, what is the magnitude of the normal force on the driver from the seat when the car passes through the bottom of the valley?



(1) 17 Mg (2) 5 Mg (3) 10 Mg (4) 2 Mg (5) zero

36. A block of wood weighs 160 N and has a density of 600 kg/m^3. In water (density 1000 kg/m^3) the block floats. How much downward force must you supply to fully submerge the block so that it rests just below the water surface?

(1) 106.7 N (2) 133.3 N (3) 166.7 N (4) 64.2 N (5) 84.6 N

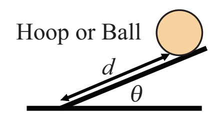
37. A block of wood weighs 200 N and has a density of 600 kg/m^3. In water (density 1000 kg/m^3) the block floats. How much downward force must you supply to fully submerge the block so that it rests just below the water surface?

(1) 133.3 N (2) 106.7 N (3) 166.7 N (4) 64.2 N (5) 84.6 N

38. A block of wood weighs 250 N and has a density of 600 kg/m^3. In water (density 1000 kg/m^3) the block floats. How much downward force must you supply to fully submerge the block so that it rests just below the water surface?

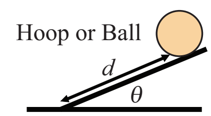
(1) 166.7 N (2) 106.7 N (3) 133.3 N (4) 64.2 N (5) 84.6 N

39. A thin hoop ($I = MR^2$) and a solid spherical ball ($I = 2MR^2/5$) start from rest and roll without slipping a distance d down an incline ramp as shown in the figure. If it takes 2 s for the ball to roll down the incline, how long does it take for the hoop (in s)?



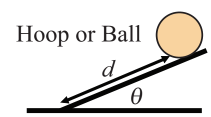
(1) 2.39 (2) 3.59 (3) 4.78 (4) 1.67 (5) 2.00

40. A thin hoop ($I = MR^2$) and a solid spherical ball ($I = 2MR^2/5$) start from rest and roll without slipping a distance d down an incline ramp as shown in the figure. If it takes 3 s for the ball to roll down the incline, how long does it take for the hoop (in s)?



(1) 3.59 (2) 2.39 (3) 4.78 (4) 1.67 (5) 2.00

41. A thin hoop ($I = MR^2$) and a solid spherical ball ($I = 2MR^2/5$) start from rest and roll without slipping a distance d down an incline ramp as shown in the figure. If it takes 4 s for the ball to roll down the incline, how long does it take for the hoop (in s)?



(1) 4.78 (2) 2.39 (3) 3.59 (4) 1.67 (5) 2.00

42. A simple harmonic oscillator consists of a block of mass M attached to a spring with a spring constant of 320 N/m. If the amplitude of the oscillations is 1.0 m and the speed of the block is 4.0 m/s when the displacement from equilibrium is 0.5 m, what is the mass M (in kg)?

(1) 15 (2) 60 (3) 135 (4) 30 (5) 10

43. A simple harmonic oscillator consists of a block of mass M attached to a spring with a spring constant of 320 N/m. If the amplitude of the oscillations 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 mass M (in kg)?

(1) 60 (2) 15 (3) 135 (4) 30 (5) 10

44. A simple harmonic oscillator consists of a block of mass M attached to a spring with a spring constant of 320 N/m. If the amplitude of the oscillations is 3.0 m and the speed of the block is 4.0 m/s when the displacement from equilibrium is 1.5 m, what is the mass M (in kg)?

(1) 135 (2) 15 (3) 60 (4) 30 (5) 10

45. An asteroid, whose mass is 0.008 times the mass of Earth, revolves in a circular orbit around the Sun at a distance that is 4 times the Earth's distance from the Sun. What is the period of revolution of the asteroid (in years). (You do not need the following information: $G = 6.67 \times 10^{-11}\text{Nm}^2/\text{kg}^2$, $M_{\text{Earth}} = 5.98 \times 10^{24}\text{kg}$, $R_{\text{Earth}} = 6.37 \times 10^{6}\text{m}$, $M_{\text{Sun}} = 1.99 \times 10^{30}\text{kg}$, $d_{\text{Earth}-\text{Sun}} = 1.5 \times 10^{11}\text{m}$.)

(1) 8.0 (2) 11.2 (3) 14.7 (4) 4.0 (5) 6.5

46. An asteroid, whose mass is 0.008 times the mass of Earth, revolves in a circular orbit around the Sun at a distance that is 5 times the Earth's distance from the Sun. What is the period of revolution of the asteroid (in years). (You do not need the following information: $G = 6.67 \times 10^{-11}\text{Nm}^2/\text{kg}^2$, $M_{\text{Earth}} = 5.98 \times 10^{24}\text{kg}$, $R_{\text{Earth}} = 6.37 \times 10^{6}\text{m}$, $M_{\text{Sun}} = 1.99 \times 10^{30}\text{kg}$, $d_{\text{Earth}-\text{Sun}} = 1.5 \times 10^{11}\text{m}$.)

(1) 11.2 (2) 8.0 (3) 14.7 (4) 4.0 (5) 6.5

47. An asteroid, whose mass is 0.008 times the mass of Earth, revolves in a circular orbit around the Sun at a distance that is 6 times the Earth's distance from the Sun. What is the period of revolution of the asteroid (in years). (You do not need the following information: $G = 6.67 \times 10^{-11}\text{Nm}^2/\text{kg}^2$, $M_{\text{Earth}} = 5.98 \times 10^{24}\text{kg}$, $R_{\text{Earth}} = 6.37 \times 10^{6}\text{m}$, $M_{\text{Sun}} = 1.99 \times 10^{30}\text{kg}$, $d_{\text{Earth}-\text{Sun}} = 1.5 \times 10^{11}\text{m}$.)

(1) 14.7 (2) 8.0 (3) 11.2 (4) 4.0 (5) 6.5

48. A source of frequency f sends waves of wavelength λ traveling with speed v in some medium. The frequency is changed from f to 4f. After this change the wavelength and wave speed, respectively, are:

(1) $\lambda/4$, v (2) 4λ, v (3) λ, 4v (4) λ, v/4 (5) $\lambda/2$, v/2

49. The function $y(x,t) = A\cos(kx - \omega t)$ describes a wave traveling to the right on a tight string with the x-axis parallel to the string. The transverse velocity of the string is $u(x,t) = -\omega A \sin(kx - \omega t)$. If the wave is traveling to the right at speed v, what is the maximum transverse speed of a particle in the string?

(1) kvA (2) kA (3) v (4) ω/k (5) $\sqrt{v\omega/k}$

50. The sound level 25 m from a loudspeaker is 70 dB. What is the rate at which sound energy (in mW) is produced by the loudspeaker, assuming it to be an isotropic source?

(1) 78.5 (2) 248.4 (3) 785.4 (4) 55.2 (5) 950.3

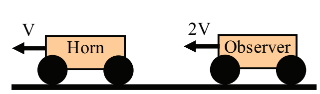
51. The sound level 25 m from a loudspeaker is 75 dB. What is the rate at which sound energy (in mW) is produced by the loudspeaker, assuming it to be an isotropic source?

(1) 248.4 (2) 78.5 (3) 785.4 (4) 55.2 (5) 950.3

52. The sound level 25 m from a loudspeaker is 80 dB. What is the rate at which sound energy (in mW) is produced by the loudspeaker, assuming it to be an isotropic source?

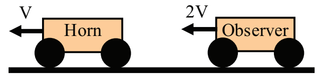
(1) 785.4 (2) 78.5 (3) 248.4 (4) 55.2 (5) 950.3

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 = 20 m/s, what frequency does the observer hear?



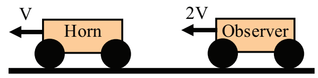
(1) 527.5 Hz (2) 540.2 Hz (3) 552.2 Hz (4) 592.9 Hz (5) 469.0 Hz

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 = 30 m/s, what frequency does the observer hear?



(1) 540.2 Hz (2) 527.5 Hz (3) 552.2 Hz (4) 643.8 Hz (5) 452.1 Hz

55. 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) 552.2 Hz (2) 527.5 Hz (3) 540.2 Hz (4) 698.0 Hz (5) 434.0 Hz

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
TYPE 12
Q# S 33
Q# S 34
Q# S 35
TYPE 13
Q# S 36
Q# S 37
Q# S 38
TYPE 14
Q# S 39

77777

Q# S 40
Q# S 41
TYPE 15
Q# S 42
Q# S 43
Q# S 44
TYPE 16
Q# S 45
Q# S 46
Q# S 47
TYPE 17
Q# S 50
Q# S 51
Q# S 52
TYPE 18
Q# S 53
Q# S 54
Q# S 55