Instructor(s): *Field/Furic*

PHYSICS DEPARTMENT

PHY 2053 Final Exam December 10, 2011

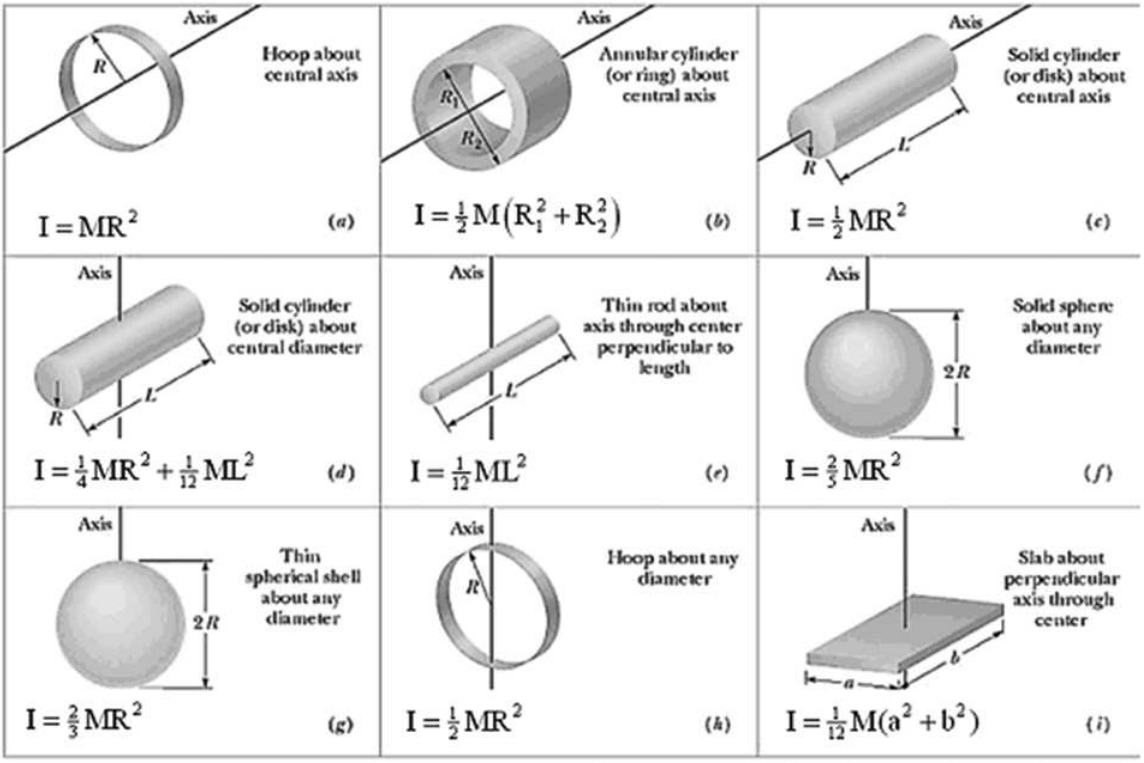
Name (print, last first): _____ Signature: _____

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



1. If vector $\vec{A} = 3\hat{x} - 4\hat{y}$ and vector $\vec{B} = 2\hat{x} + 5\hat{y}$, what is the magnitude of the vector $\vec{A} - \vec{B}$ divided by the magnitude of the vector $\vec{A} + \vec{B}$? Namely, what is $\dfrac{|\vec{A} - \vec{B}|}{|\vec{A} + \vec{B}|}$?

   (1) 1.78 (2) 0.56 (3) 0.14 (4) 0.19 (5) 5.39

2. If vector $\vec{A} = 3\hat{x} + 4\hat{y}$ and vector $\vec{B} = -2\hat{x} + 5\hat{y}$, what is the magnitude of the vector $\vec{A} - \vec{B}$ divided by the magnitude of the vector $\vec{A} + \vec{B}$? Namely, what is $\dfrac{|\vec{A} - \vec{B}|}{|\vec{A} + \vec{B}|}$?

   (1) 0.56 (2) 1.78 (3) 0.14 (4) 0.19 (5) 5.39

3. If vector $\vec{A} = -3\hat{x} + 4\hat{y}$ and vector $\vec{B} = -2\hat{x} + 5\hat{y}$, what is the magnitude of the vector $\vec{A} - \vec{B}$ divided by the magnitude of the vector $\vec{A} + \vec{B}$? Namely, what is $\dfrac{|\vec{A} - \vec{B}|}{|\vec{A} + \vec{B}|}$?

   (1) 0.14 (2) 0.56 (3) 1.78 (4) 0.19 (5) 5.39

4. An object is released from rest at $t = 0$ near the surface of the Earth. How far does it fall during the time interval from $t = 1$ s to t = 3 s?

   (1) 39.2 m (2) 58.8 m (3) 78.4 m (4) 19.6 m (5) 24.5 m

5. An object is released from rest at $t = 0$ near the surface of the Earth. How far does it fall during the time interval from $t = 2$ s to t = 4 s?

   (1) 58.8 m (2) 39.2 m (3) 78.4 m (4) 19.6 m (5) 24.5 m

6. An object is released from rest at $t = 0$ near the surface of the Earth. How far does it fall during the time interval from $t = 3$ s to t = 5 s?

   (1) 78.4 m (2) 58.8 m (3) 39.2 m (4) 19.6 m (5) 24.5 m

7. 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 seconds before the other, what is the speed v_0 (in m/s)?

   (1) 9.8 (2) 14.7 (3) 19.6 (4) 4.9 (5) 29.4

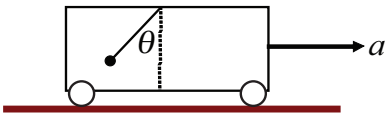
8. Near the surface of the Earth a suspension bridge is a height H above the level base of a gorge. Two identical stones are simultaneously thrown from the bridge. One stone is thrown straight down with speed v_0 and the other is thrown straight up at the same speed v_0. Ignore air resistance. If one of the stones lands at the bottom of the gorge 3 seconds before the other, what is the speed v_0 (in m/s)?

   (1) 14.7 (2) 9.8 (3) 19.6 (4) 4.9 (5) 29.4

9. 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 4 seconds before the other, what is the speed v_0 (in m/s)?

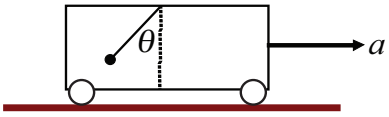
(1) 19.6 (2) 14.7 (3) 9.8 (4) 4.9 (5) 29.4

10. Consider a mass $M = 2$ kg suspended by a very light string from the ceiling of a railway car near the surface of the Earth. The car has a constant acceleration of a as shown in the figure, causing the mass to hang at an angle θ with the vertical. If the tension in the string is 78.4 N, what is the acceleration a (in m/s^2) of the railway car?



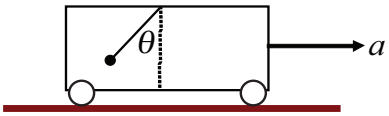
(1) 38.0 (2) 17.0 (3) 27.7 (4) 11.0 (5) 45.0

11. Consider a mass $M = 2$ kg suspended by a very light string from the ceiling of a railway car near the surface of the Earth. The car has a constant acceleration of a as shown in the figure, causing the mass to hang at an angle θ with the vertical. If the tension in the string is 39.2 N, what is the acceleration a (in m/s^2) of the railway car?



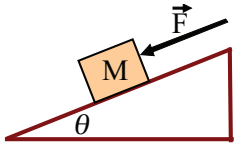
(1) 17.0 (2) 38.0 (3) 27.7 (4) 11.0 (5) 45.0

12. Consider a mass $M = 2$ kg suspended by a very light string from the ceiling of a railway car near the surface of the Earth. The car has a constant acceleration of a as shown in the figure, causing the mass to hang at an angle θ with the vertical. If the tension in the string is 58.8 N, what is the acceleration a (in m/s^2) of the railway car?



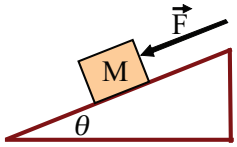
(1) 27.7 (2) 17.0 (3) 38.0 (4) 11.0 (5) 45.0

13. Near the surface of the Earth you push a 12-kg box down a 15° ramp. The coefficient of kinetic friction between the ramp and the box is 0.40. With what magnitude force parallel to the ramp should you push on the box so that it moves down the ramp at a constant speed?



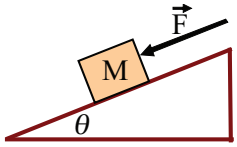
(1) 15.0 N (2) 26.4 N (3) 37.7 N (4) 20.7 N (5) 7.5 N

14. Near the surface of the Earth you push a 12-kg box down a 15° ramp. The coefficient of kinetic friction between the ramp and the box is 0.50. With what magnitude force parallel to the ramp should you push on the box so that it moves down the ramp at a constant speed?



(1) 26.4 N (2) 15.0 N (3) 37.7 N (4) 20.7 N (5) 7.5 N

15. Near the surface of the Earth you push a 12-kg box down a 15° ramp. The coefficient of kinetic friction between the ramp and the box is 0.60. With what magnitude force parallel to the ramp should you push on the box so that it moves down the ramp at a constant speed?



(1) 37.7 N (2) 26.4 N (3) 15.0 N (4) 20.7 N (5) 7.5 N

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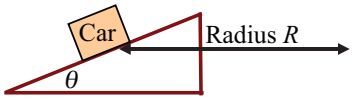
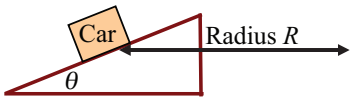
16. A dangerous highway curve has a radius $R = 200$ m is banked in the wrong direction $\theta = 10°$ as shown in the figure. If the static coefficient of friction between the car and the highway is 0.4, what is the maximum speed the car can travel around the curve without slipping (in m/s)?



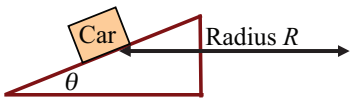
(1) 20.2 (2) 15.3 (3) 7.9 (4) 24.3 (5) 4.6

17. A dangerous highway curve has a radius $R = 200$ m is banked in the wrong direction $\theta = 15°$ as shown in the figure. If the static coefficient of friction between the car and the highway is 0.4, what is the maximum speed the car can travel around the curve without slipping (in m/s)?



(1) 15.3 (2) 20.2 (3) 7.9 (4) 24.3 (5) 4.6

18. A dangerous highway curve has a radius $R = 200$ m is banked in the wrong direction $\theta = 20°$ as shown in the figure. If the static coefficient of friction between the car and the highway is 0.4, what is the maximum speed the car can travel around the curve without slipping (in m/s)?



(1) 7.9 (2) 20.2 (3) 15.3 (4) 24.3 (5) 4.6

19. A remote controlled toy car accelerates from rest at 3.0 m/s^2 under the power of its own wheels on a horizontal balcony until it shoots off the edge of the balcony 3.0 m from its starting point. If the balcony is 10.0 m high, what is the horizontal distance from the point the car left the balcony to where the car lands on level ground?

(1) 6.1 m (2) 7.0 m (3) 3.5 m (4) 4.9 m (5) 7.9 m

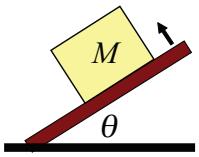
20. A remote controlled toy car accelerates from rest at 4.0 m/s^2 under the power of its own wheels on a horizontal balcony until it shoots off the edge of the balcony 3.0 m from its starting point. If the balcony is 10.0 m high, what is the horizontal distance from the point the car left the balcony to where the car lands on level ground?

(1) 7.0 m (2) 6.1 m (3) 3.5 m (4) 4.9 m (5) 7.9 m

21. A remote controlled toy car accelerates from rest at 1.0 m/s^2 under the power of its own wheels on a horizontal balcony until it shoots off the edge of the balcony 3.0 m from its starting point. If the balcony is 10.0 m high, what is the horizontal distance from the point the car left the balcony to where the car lands on level ground?

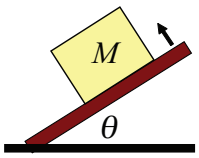
(1) 3.5 m (2) 6.1 m (3) 7.0 m (4) 4.9 m (5) 7.9 m

22. Near the surface of the Earth, a block of mass M is at rest on a plane inclined at angle θ to the horizontal. As the angle θ is increased, the block begins to slip when $\theta = 35°$. What is the coefficient of static friction between the block and the surface of the plane?



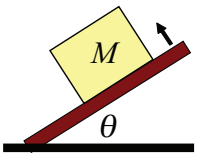
(1) 0.70 (2) 0.58 (3) 0.47 (4) 0.36 (5) 0.84

23. Near the surface of the Earth, a block of mass M is at rest on a plane inclined at angle θ to the horizontal. As the angle θ is increased, the block begins to slip when $\theta = 30°$. What is the coefficient of static friction between the block and the surface of the plane?



(1) 0.58 (2) 0.70 (3) 0.47 (4) 0.36 (5) 0.84

24. Near the surface of the Earth, a block of mass M is at rest on a plane inclined at angle θ to the horizontal. As the angle θ is increased, the block begins to slip when $\theta = 25°$. What is the coefficient of static friction between the block and the surface of the plane?



(1) 0.47 (2) 0.70 (3) 0.58 (4) 0.36 (5) 0.84

25. The coefficient of static friction between a non-uniform cylinder (mass M, radius R) and the horizontal floor is $\mu_s = 0.4$. If the magnitude of the maximum translational acceleration the cylinder can have without sliding is 19.6 m/s^2, what is the moment of inertia of the cylinder about its rotation axis?

(1) $MR^2/5$ (2) $MR^2/4$ (3) $2MR^2/5$ (4) $MR^2/2$ (5) MR^2

26. The coefficient of static friction between a non-uniform cylinder (mass M, radius R) and the horizontal floor is $\mu_s = 0.5$. If the magnitude of the maximum translational acceleration the cylinder can have without sliding is 19.6 m/s^2, what is the moment of inertia of the cylinder about its rotation axis?

(1) $MR^2/4$ (2) $MR^2/5$ (3) $2MR^2/5$ (4) $MR^2/2$ (5) MR^2

27. The coefficient of static friction between a non-uniform cylinder (mass M, radius R) and the horizontal floor is $\mu_s = 0.8$. If the magnitude of the maximum translational acceleration the cylinder can have without sliding is 19.6 m/s^2, what is the moment of inertia of the cylinder about its rotation axis?

(1) $2MR^2/5$ (2) $MR^2/5$ (3) $MR^2/4$ (4) $MR^2/2$ (5) MR^2

28. A man with mass M is riding in a cart at speed v along a frictionless horizontal surface. He jumps off in such a way as to land on the ground with no horizontal velocity. If the new speed of the cart is $3v$, what is the mass of the cart?

(1) $M/2$ (2) $M/3$ (3) M (4) $2M$ (5) $M/4$

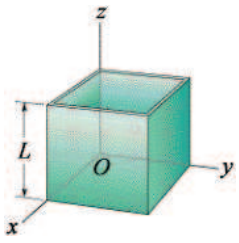
29. A man with mass M is riding in a cart at speed v along a frictionless horizontal surface. He jumps off in such a way as to land on the ground with no horizontal velocity. If the new speed of the cart is $2v$, what is the mass of the cart?

(1) M (2) $M/3$ (3) $M/2$ (4) $2M$ (5) $M/4$

30. A man with mass M is riding in a cart at speed v along a frictionless horizontal surface. He jumps off in such a way as to land on the ground with no horizontal velocity. If the new speed of the cart is $4v$, what is the mass of the cart?

(1) $M/3$ (2) $M/2$ (3) M (4) $2M$ (5) $M/4$

31. The figure shows a cubical box with each side consisting of a uniform metal plate of negligible thickness. Each of the four sides have mass M, and the bottom has mass $M_{\text{bottom}} = 2M$. The box is open at the top (at $z = L$) and has edge length L. What is the z-coordinate of the center-of-mass of the box?



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

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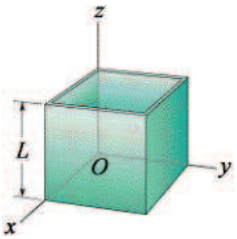
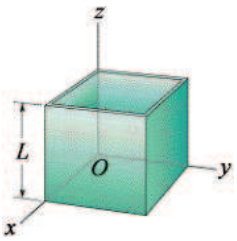
32. The figure shows a cubical box with each side consisting of a uniform metal plate of negligible thickness. Each of the four sides have mass M, and the bottom has mass $M_{\text{bottom}} = M/2$. The box is open at the top (at $z = L$) and has edge length L. What is the z-coordinate of the center-of-mass of the box?



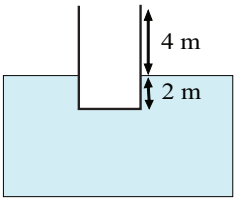
(1) $4L/9$
(2) $2L/5$
(3) $2L/3$
(4) $L/2$
(5) $L/3$

33. The figure shows a cubical box with each side consisting of a uniform metal plate of negligible thickness. Each of the four sides have mass M, and the bottom has mass $M_{\text{bottom}} = M$. The box is open at the top (at $z = L$) and has edge length L. What is the z-coordinate of the center-of-mass of the box?



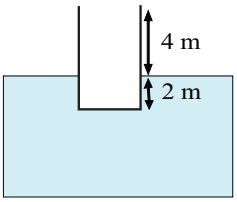
(1) $2L/5$
(2) $L/3$
(3) $2L/3$
(4) $L/2$
(5) $4L/9$

34. A large cargo container has a square base with an area of 4 m^2 and height $H = 6$ m. When empty it floats on the water ($\rho_{\text{water}} = 1{,}000$ kg/m^3) with 4 meters above the surface of the water and 2 m below the surface as shown in the figure. The cargo container is being loaded with small 50-kg boxes. What is the maximum number of boxes the cargo container can hold without sinking?



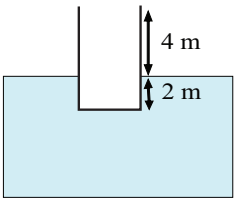
(1) 320 (2) 400 (3) 500 (4) 240 (5) 300

35. A large cargo container has a square base with an area of 4 m^2 and height $H = 6$ m. When empty it floats on the water ($\rho_{\text{water}} = 1{,}000$ kg/m^3) with 4 meters above the surface of the water and 2 m below the surface as shown in the figure. The cargo container is being loaded with small 40-kg boxes. What is the maximum number of boxes the cargo container can hold without sinking?



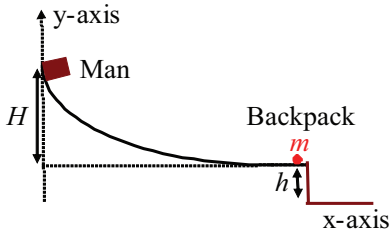
(1) 400 (2) 320 (3) 500 (4) 240 (5) 300

36. A large cargo container has a square base with an area of 4 m^2 and height $H = 6$ m. When empty it floats on the water ($\rho_{\text{water}} = 1{,}000$ kg/m^3) with 4 meters above the surface of the water and 2 m below the surface as shown in the figure. The cargo container is being loaded with small 32-kg boxes. What is the maximum number of boxes the cargo container can hold without sinking?



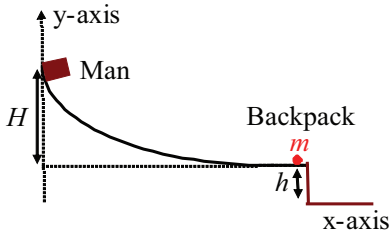
(1) 500 (2) 320 (3) 400 (4) 240 (5) 300

37. A man with a mass of 65 kg skis down a frictionless hill that is $H = 10$ m high. At the bottom of the hill the terrain levels out. As the man reaches the horizontal section, he grabs a backpack with mass m 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 mass m of the backpack?



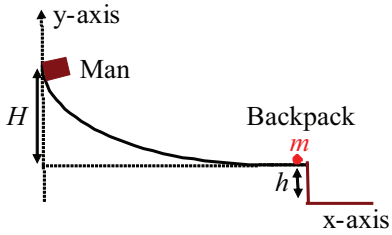
(1) 7.7 kg (2) 18.1 kg (3) 31.9 kg (4) 3.4 kg (5) 10.2 kg

38. A man with a mass of 65 kg skis down a frictionless hill that is $H = 10$ m high. At the bottom of the hill the terrain levels out. As the man reaches the horizontal section, he grabs a backpack with mass m 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 7 m, what is the mass m of the backpack?



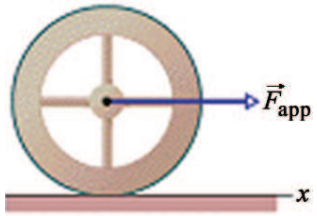
(1) 18.1 kg (2) 7.7 kg (3) 31.9 kg (4) 3.4 kg (5) 10.2 kg

39. A man with a mass of 65 kg skis down a frictionless hill that is $H = 10$ m high. At the bottom of the hill the terrain levels out. As the man reaches the horizontal section, he grabs a backpack with mass m 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 6 m, what is the mass m of the backpack?



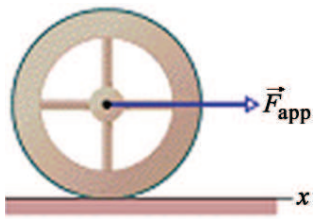
(1) 31.9 kg (2) 7.7 kg (3) 18.1 kg (4) 3.4 kg (5) 10.2 kg

40. A constant horizontal force $\vec{F}_{app}$ is applied to a wheel of mass 30 kg, radius 0.5 m, and moment of inertia about the rotation axis through its center of mass of 5 kg·m^2 as shown in the figure. If the wheel rolls smoothly on the horizontal surface, and the acceleration of its center of mass has magnitude 0.5 m/s^2, what is the magnitude of the constant force $\vec{F}_{app}$?



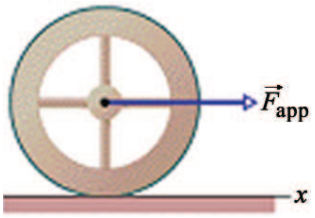
(1) 25 N (2) 30 N (3) 40 N (4) 20 N (5) 50 N

41. A constant horizontal force $\vec{F}_{app}$ is applied to a wheel of mass 40 kg, radius 0.5 m, and moment of inertia about the rotation axis through its center of mass of 5 kg·m^2 as shown in the figure. If the wheel rolls smoothly on the horizontal surface, and the acceleration of its center of mass has magnitude 0.5 m/s^2, what is the magnitude of the constant force $\vec{F}_{app}$?



(1) 30 N (2) 25 N (3) 40 N (4) 20 N (5) 50 N

42. A constant horizontal force $\vec{F}_{app}$ is applied to a wheel of mass 60 kg, radius 0.5 m, and moment of inertia about the rotation axis through its center of mass of 5 kg·m^2 as shown in the figure. If the wheel rolls smoothly on the horizontal surface, and the acceleration of its center of mass has magnitude 0.5 m/s^2, what is the magnitude of the constant force $\vec{F}_{app}$?



(1) 40 N (2) 25 N (3) 30 N (4) 20 N (5) 50 N

43. An airtight box, having a lid of area 80 cm^2, is partially evacuated to a pressure of 2.60×10^4Pa. The atmospheric pressure is 1.01×10^5Pa. What is the magnitude of the minimum force required to pull the lid off of the box?

(1) 600 N (2) 450 N (3) 375 N (4) 675 N (5) 250 N

44. An airtight box, having a lid of area 60 cm^2, is partially evacuated to a pressure of 2.60×10^4Pa. The atmospheric pressure is 1.01×10^5Pa. What is the magnitude of the minimum force required to pull the lid off of the box?

(1) 450 N (2) 600 N (3) 375 N (4) 675 N (5) 250 N

45. An airtight box, having a lid of area 50 cm^2, is partially evacuated to a pressure of 2.60×10^4Pa. The atmospheric pressure is 1.01×10^5Pa. What is the magnitude of the minimum force required to pull the lid off of the box?

(1) 375 N (2) 600 N (3) 450 N (4) 675 N (5) 250 N

46. A simple harmonic oscillator consists of a block of mass 2 kg attached to an ideal spring with spring constant k. If the speed of the block is 40 m/s when the displacement from equilibrium is 3 m and the amplitude of the oscillations is 5 m, what is the spring constant k (in N/m)?

(1) 200 (2) 50 (3) 450 (4) 800 (5) 600

47. A simple harmonic oscillator consists of a block of mass 2 kg attached to an ideal spring with spring constant k. If the speed of the block is 60 m/s when the displacement from equilibrium is 3 m and the amplitude of the oscillations is 5 m, what is the spring constant k (in N/m)?

(1) 450 (2) 50 (3) 200 (4) 800 (5) 600

48. A simple harmonic oscillator consists of a block of mass 2 kg attached to an ideal spring with spring constant k. If the speed of the block is 20 m/s when the displacement from equilibrium is 3 m and the amplitude of the oscillations is 5 m, what is the spring constant k (in N/m)?

(1) 50 (2) 200 (3) 450 (4) 800 (5) 600

49. A stationary motion detector sends sound waves of frequency of 500 Hz toward an approaching truck. The waves sent out by the detector are reflected off the truck 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 speed of the approaching truck (in m/s)? (Take the speed of sound to be 343 m/s.)

(1) 31.2 (2) 44.7 (3) 57.2 (4) 38.1 (5) 16.3

50. A stationary motion detector sends sound waves of frequency of 500 Hz toward an approaching truck. The waves sent out by the detector are reflected off the truck and then are received back at the detector. If the frequency of the waves received back at the detector is 700 Hz, what is the speed of the approaching truck (in m/s)? (Take the speed of sound to be 343 m/s.)

(1) 57.2 (2) 44.7 (3) 31.2 (4) 38.1 (5) 16.3

51. A stationary motion detector sends sound waves of frequency of 500 Hz toward an approaching truck. The waves sent out by the detector are reflected off the truck and then are received back at the detector. If the frequency of the waves received back at the detector is 650 Hz, what is the speed of the approaching truck (in m/s)? (Take the speed of sound to be 343 m/s.)

(1) 44.7 (2) 31.2 (3) 57.2 (4) 38.1 (5) 16.3

52. Two traveling pressure waves (wave A and wave B) have the same frequency and wavelength. The waves are superimposed upon each other. The amplitude of the resulting wave (wave C) is 13 kPa. If the amplitude of wave A is 12 kPa and the phase difference between wave B and wave A is $\phi_B - \phi_A = 90°$, what is the amplitude of wave B and the magnitude of the phase difference between wave A and wave C, respectively?

(1) 5 kPa, 22.62° (2) 8 kPa, 28.07° (3) 15 kPa, 61.93° (4) 15 kPa, 22.62° (5) 8 kPa, 61.93°

53. Two traveling pressure waves (wave A and wave B) have the same frequency and wavelength. The waves are superimposed upon each other. The amplitude of the resulting wave (wave C) is 17 kPa. If the amplitude of wave A is 15 kPa and the phase difference between wave B and wave A is $\phi_B - \phi_A = 90°$, what is the amplitude of wave B and the magnitude of the phase difference between wave A and wave C, respectively?

(1) 8 kPa, 28.07° (2) 5 kPa, 22.62° (3) 15 kPa, 61.93° (4) 15 kPa, 22.62° (5) 8 kPa, 61.93°

54. Two traveling pressure waves (wave A and wave B) have the same frequency and wavelength. The waves are superimposed upon each other. The amplitude of the resulting wave (wave C) is 17 kPa. If the amplitude of wave A is 8 kPa and the phase difference between wave B and wave A is $\phi_B - \phi_A = 90°$, what is the amplitude of wave B and the magnitude of the phase difference between wave A and wave C, respectively?

(1) 15 kPa, 61.93° (2) 5 kPa, 22.62° (3) 8 kPa, 28.07° (4) 15 kPa, 22.62° (5) 8 kPa, 61.93°

55. A string in a grand piano is 2 m long and has a mass density of 1 g/m. If the fundamental frequency of oscillations of the string is 440 Hz, what is the tension in the string (in N)?

(1) 3097.6 (2) 1548.8 (3) 774.4 (4) 387.2 (5) 193.6

56. A string in a grand piano is 2 m long and has a mass density of 1 g/m. If the fundamental frequency of oscillations of the string is 220 Hz, what is the tension in the string (in N)?

(1) 774.4 (2) 1548.8 (3) 3097.6 (4) 387.2 (5) 193.6

57. A string in a grand piano is 0.5 m long and has a mass density of 1 g/m. If the fundamental frequency of oscillations of the string is 440 Hz, what is the tension in the string (in N)?

(1) 193.6 (2) 1548.8 (3) 3097.6 (4) 387.2 (5) 774.4

58. The keys A4 and B4 on a piano correspond to frequencies of 440 Hz and 493 Hz, respectively. If these two keys are played together, what is the beat frequency of the resulting wave (in Hz)?

(1) 53 (2) 15 (3) 106 (4) 30 (5) 80

77777

59. The keys A4 and B4 on a piano correspond to frequencies of 262 Hz and 277 Hz, respectively. If these two keys are played together, what is the beat frequency of the resulting wave (in Hz)?

(1) 15 (2) 53 (3) 106 (4) 30 (5) 80

60. The keys A4 and B4 on a piano correspond to frequencies of 880 Hz and 986 Hz, respectively. If these two keys are played together, what is the beat frequency of the resulting wave (in Hz)?

(1) 106 (2) 53 (3) 15 (4) 30 (5) 80

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
Q# S 60