

#14 Circular Motion Pre-Class

Due: 11:00am on Monday, September 24, 2012

Note: *You will receive no credit for late submissions.* To learn more, read your instructor's [Grading Policy](#)

Exercise 5.56

The Cosmoclock 21 Ferris wheel in Yokohama City, Japan, has a diameter of 100 **m**. Its name comes from its 60 arms, each of which can function as a second hand (so that it makes one revolution every 60.0 **s**).

Part A

Find the speed of the passengers when the Ferris wheel is rotating at this rate.

ANSWER:

5.24 **m/s**

Correct

Part B

A passenger weighs 872 **N** at the weight-guessing booth on the ground. What is his apparent weight at the lowest point on the Ferris wheel?

ANSWER:

823.1 **N**

Try Again; 4 attempts remaining

Part C

What is his apparent weight at the highest point on the Ferris wheel?

ANSWER:

 N**Part D**

What would be the time for one revolution if the passenger's apparent weight at the highest point were zero?

ANSWER:

 s**Part E**

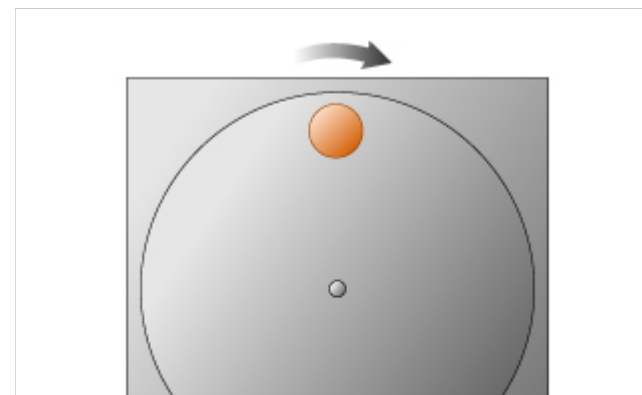
What then would be the passenger's apparent weight at the lowest point?

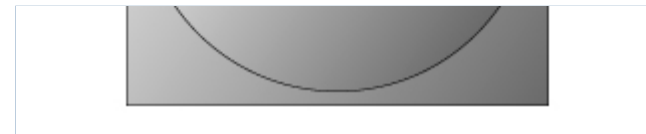
ANSWER:

 N

A Mass on a Turntable: Conceptual

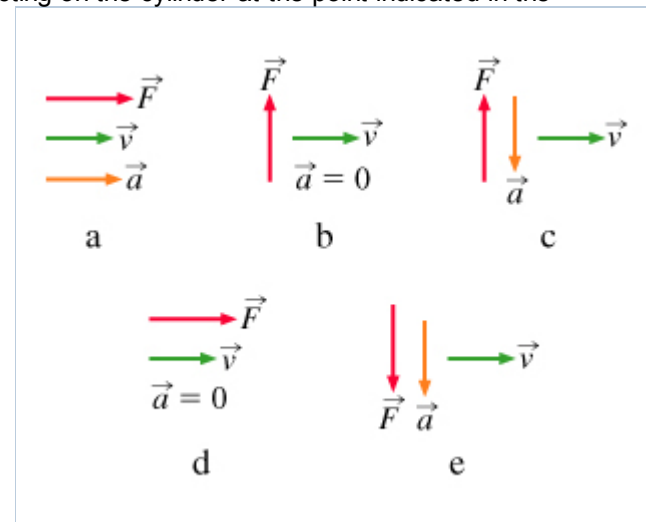
A small metal cylinder rests on a circular turntable that is rotating at a constant rate, as illustrated in the diagram.





Part A

Which of the following sets of vectors best describes the velocity, acceleration, and net force acting on the cylinder at the point indicated in the diagram?



Hint 1. The direction of acceleration can be determined from Newton's second law

According to Newton's second law, the acceleration of an object has the same direction as the net force acting on that object.

ANSWER:

- ☐ a
- ☐ b
- ☐ c
- ☐ d
- ☒ e

Correct

Part B

Let R be the distance between the cylinder and the center of the turntable. Now assume that the cylinder is moved to a new location $R/2$ from the center of the turntable. Which of the following statements accurately describe the motion of the cylinder at the new location?

Check all that apply.

Hint 1. Find the speed of the cylinder

Find the speed v of the cylinder at the new location. Assume that the cylinder makes one complete turn in a period of time T .

Express your answer in terms of R and T .

ANSWER:

$$v = \frac{\pi R}{T}$$

Hint 2. Find the acceleration of the cylinder

Find the magnitude of the acceleration a of the cylinder at the new location. Assume that the cylinder makes one complete turn in a period of time T .

Express your answer in terms of R and T .

Hint 1. Centripetal acceleration

Recall that the acceleration of an object that moves in a circular path of radius r with constant speed v has magnitude given by

$$a = \frac{v^2}{r}.$$

Note that both the velocity and radius of the trajectory change when the cylinder is moved.

ANSWER:

$$a = \frac{2\pi^2 R}{T^2}$$

ANSWER:

- ☒ The speed of the cylinder has decreased.
- ☐ The speed of the cylinder has increased.
- ☒ The magnitude of the acceleration of the cylinder has decreased.
- ☐ The magnitude of the acceleration of the cylinder has increased.
- ☐ The speed and the acceleration of the cylinder have not changed.

Correct

Exercise 5.50

A flat (unbanked) curve on a highway has a radius of 250.0 m . A car rounds the curve at a speed of 28.0 m/s .

Part A

What is the minimum coefficient of friction that will prevent sliding?

ANSWER:

$$\mu_{\min} = 0.320$$

Correct

Part B

Suppose the highway is icy and the coefficient of friction between the tires and pavement is only one-third what you found in part A. What should be the maximum speed of the car so it can round the curve safely?

ANSWER:

$$v_{\max} = 16.2 \text{ m/s}$$

Correct

Exercise 5.59: Stay Dry!

You tie a cord to a pail of water, and you swing the pail in a vertical circle of radius 0.650 m .

Part A

What minimum speed must you give the pail at the highest point of the circle if no water is to spill from it?

ANSWER:

$$v = 2.52 \text{ m/s}$$

Correct

Score Summary:

Your score on this assignment is 72.4%.

You received 14.47 out of a possible total of 20 points.