

Practice Physics Final Exam - Standards 57-61

- 1) A 0.50-kg mass is attached to the end of a 1.0-m string. The system is whirled in a horizontal circular path. If the maximum tension that the string can withstand is 350 N. What is the maximum speed of the mass if the string is not to break?

- A. 700 m/s  
B. 13 m/s  
C. 26 m/s  
D. 19 m/s

$$F_c = ma_c$$

$$350 = (.5)a_c$$

$$700 = a_c$$

$$a_c = \frac{v^2}{r}$$

$$700 = \frac{v^2}{1}$$

$$700 = v^2$$

$$26.46 = v \text{ m/s}$$

1) C

- 2) When an object experiences uniform circular motion, the direction of the acceleration is

- F. is directed toward the center of the circular path.  
G. in the opposite direction of the velocity vector.  
H. is directed away from the center of the circular path.  
J. in the same direction as the velocity vector.

The direction of acceleration is always towards the center for an object traveling in a circle. It is called centripetal acceleration = center seeking.

2) F

- 3) A boy and a girl are riding a merry-go-round which is turning at a constant rate. The boy is near the outer edge, while the girl is closer to the center. Who has the greater centripetal acceleration?

- A. the boy  
B. the girl  
C. Both have the same non-zero centripetal acceleration.  
D. Both have zero centripetal acceleration.

Boy is traveling faster (higher v) so therefore has a higher acceleration  
 $a_c = \frac{v^2}{r}$

3) A

- 4) A car goes around a curve of radius r at a constant speed v. Then it goes around the same curve at half of the original speed. What is the centripetal force on the car as it goes around the curve for the second time, compared to the first time?

- F. half as big  
G. one-fourth as big  
H. twice as big  
J. four times as big

$$\text{1st time } F = ma_c$$

$$F = m \frac{v^2}{r}$$

$$\text{2nd time } F = ma_c$$

$$= m \frac{(\frac{1}{2}v)^2}{r}$$

$$= m \frac{v^2}{r} \left(\frac{1}{4}\right)$$

2nd time  $F = \frac{1}{4}$  1st Time  $F$

4) G

- 5) What force is needed to make an object move in a circle?

- A. centripetal force  
B. static friction  
C. kinetic friction  
D. weight

The net force on an object traveling in a circle is always the centripetal force.

5) A

- 6) What type of acceleration does an object moving with constant speed in a circular path experience?

- F. free fall  
G. constant acceleration  
H. linear acceleration  
J. centripetal acceleration

The acceleration on an object traveling in a circle is center seeking or otherwise known as centripetal acceleration.

6) J

7) A point on a wheel rotating at 5.00 rev/s is located 0.200 m from the axis. What is the centripetal acceleration?

7) D

- A. 1.35 m/s<sup>2</sup>
- B. 48.0 m/s<sup>2</sup>
- C. 0.050 m/s<sup>2</sup>
- D. 198 m/s<sup>2</sup>

$$f = 5 \text{ rev/s} = 5 \text{ Hz}$$

$$T = \frac{1}{f} = \frac{1}{5} = .2 \text{ sec}$$

$$v = \frac{2\pi r}{T}$$

$$v = \frac{2\pi(.2)}{(.2)}$$

$$v = 6.28 \text{ m/s}$$

$$a_c = \frac{v^2}{r}$$

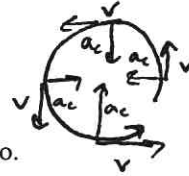
$$a_c = \frac{(6.28)^2}{.2}$$

$$a_c = 197.19 \text{ m/s}^2$$

8) An object moves in a circular path at a constant speed. Compare the direction of the object's velocity and acceleration vectors.

8) H

- F. The vectors point in opposite directions.
- G. Both vectors point in the same direction.
- H. The vectors are perpendicular.
- J. The question is meaningless, since the acceleration is zero.

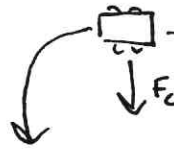


$a_c \perp v$  for traveling in a circle.

9) A car goes around a curve of radius  $r$  at a constant speed  $v$ . What is the direction of the net force on the car?

9) D

- A. away from the curve's center
- B. toward the back of the car
- C. toward the front of the car
- D. toward the curve's center



The net force on an object traveling in a circle is always the centripetal force, or center seeking.

10) A boy and a girl are riding on a merry-go-round which is turning at a constant rate. The boy is near the outer edge, and the girl is closer to the center. Who has the greater linear speed?

10) F

- F. the boy
- G. the girl
- H. Both have the same non-zero translational velocity.
- J. Both have zero translational velocity.



The Boy has to travel a greater distance in the same amount of time the girl does therefore has to be going faster.

11. A 75 kg physics student decides to ride the carousel that has a radius of 5.5 meters. If it takes her 22 seconds to go around once, calculate the student's centripetal acceleration.

What do you know?	$m = 75 \text{ kg}$ $T = 22 \text{ sec}$ $r = 5.5 \text{ m}$ $\pi = 3.14$
What formula?	$v = \frac{2\pi r}{T}$ $a_c = \frac{v^2}{r}$
Substitute in values	$v = \frac{2(3.14)(5.5)}{22}$ $a_c = \frac{(1.57)^2}{5.5}$
Calculations	$v = 1.57 \text{ m/s}$ $a_c = .448 \text{ m/s}^2$
Answer	$a_c = .448 \text{ m/s}^2$

12. Calculate the centripetal force acting on the student riding the carousel.

What do you know?	$m = 75 \text{ kg}$ $T = 22 \text{ sec}$ $a_c = .448 \text{ m/s}^2$ $r = 5.5 \text{ m}$ $\pi = 3.14$
What formula?	$F_c = m a_c$
Substitute in values	$F_c = (75)(.448)$
Calculations	$F_c = 33.6 \text{ N}$
Answer	$33.6 \text{ N}$