

Name: _____

**AP Physics 1: Uniform Circular Motion
Centripetal Forces Part II**

*****All work for free response must be shown for full credit**

Multiple Choice:

1. A centripetal force F is applied to an object moving at a constant speed v in a horizontal circle of radius r . If the radius is halved and the speed doubled, what happens to the centripetal force?
A. Increases by 2
B. Stays the same
C. Decreases by 4
D. Increases by 8
2. A roller coaster is on a track that forms a circular loop of radius R in a vertical plane. If the car is to just maintain contact with the track at the top of the loop, what is the minimum value for its velocity at this point?
A. gR
B. $\frac{1}{2}gR$
C. $2gR$
D. \sqrt{gR}
3. A 2.0 kg cat is sitting on a spinning roomba, 0.20 m from its rotational axis. The period of the roomba's rotation is 5.0 s. The coefficient of static friction is 0.80. What is the magnitude of the force of friction acting on the cat?
A. 1.96 N
B. 1.60 N
C. 0.980 N
D. 0.630 N
4. A bottle is tied to a string and swung in a vertical circle with a set radius. Which of the following cannot be true?
A. The string is most likely to break at the bottom of the circle
B. The tension force is the same everywhere in the circle
C. The tension force and weight of the bottle always affect the centripetal force
D. The tension is the least when the stone is at the top of the circle.

Multiple Correct

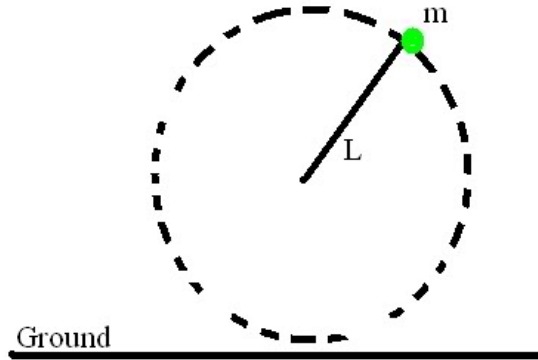
5. Four particles have the following masses, speeds, and radii. Which two particles have the same centripetal force?

Particle	Mass	Speed	Radius
1	m	v	r
2	$m/2$	$2v$	$2r$
3	$2m$	$v/2$	r
4	1	$2v$	$3r$

- A. Particle 1
- B. Particle 2
- C. Particle 3
- D. Particle 4

Free Response:

6. A ball with a mass m is attached to a string of length L and moves in a vertical circle as shown. At the top of the circular path, the tension in the string is twice the weight of the ball. At the bottom, the ball just clears the ground. Air resistance is negligible. Express your answers to the questions below in terms of m , L , and g only.



- A. Determine the magnitude and direction of the net force on the ball when it is at the top of its motion.

- B. Determine the speed (v_0) of the ball at the top of the circle.

The string is then cut when the ball is at the top

- C. Determine the time it takes for the ball to reach the ground.

- D. Determine the horizontal distance the ball travels before hitting the ground.