Physics 3204

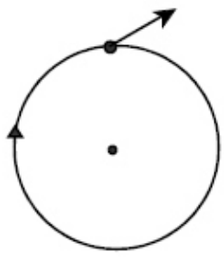
Worksheet #1: Horizontal UCM

1. Which describes uniform circular motion?

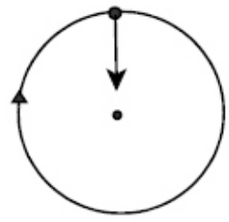
	Speed	Velocity
(A)	changing	changing
(B)	changing	constant
(C)	constant	changing
(D)	constant	constant

2. Which shows the velocity vector for an object in uniform circular motion?

(A)



(B)



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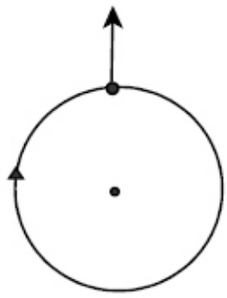
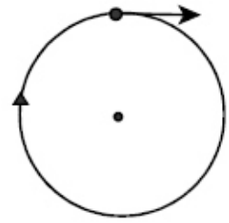
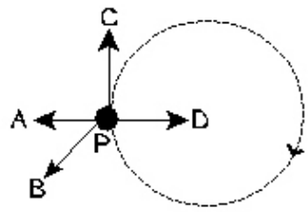


(D)



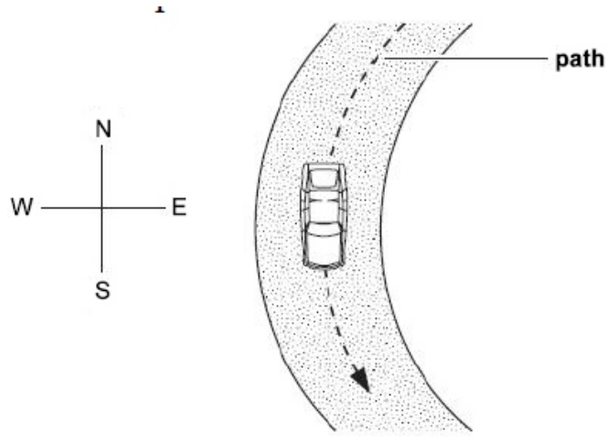
3. What is the direction of the velocity at point P if the object shown moves uniformly in a horizontal circle?

(A) A
(B) B
(C) C
(D) D



4. In the diagram below, a car is moving south at a constant speed along a circular path. In which direction is the centripetal force directed?

(A) east
(B) north
(C) south
(D) west

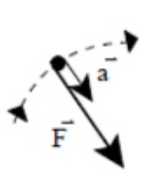


5. What is true of the velocity of an object experiencing uniform circular motion?

	Speed	Velocity
(A)	changes	changes
(B)	changes	constant
(C)	constant	changes
(D)	constant	constant

6. Which best represents the acceleration and force for an object travelling along a circular path?

(A)



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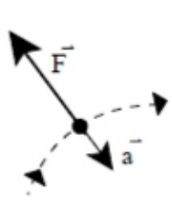

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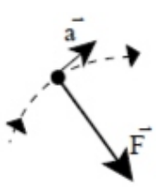

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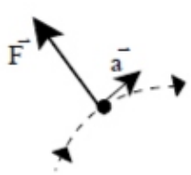
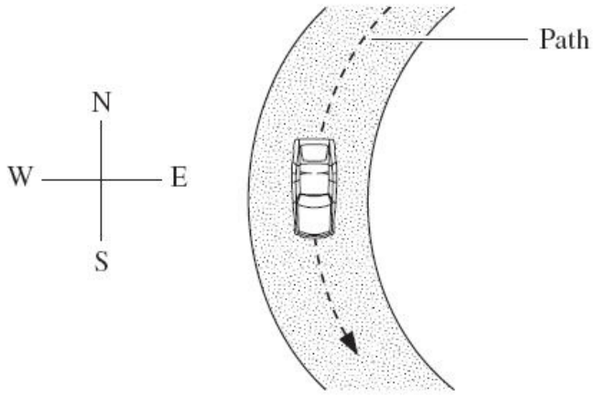


7. In the diagram below, a car is moving south at a constant speed along a circular path. In which direction is the acceleration directed?

(A) East
(B) North
(C) South
(D) West

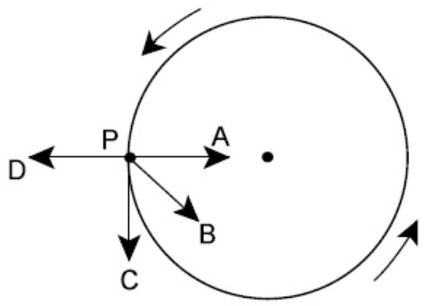


8. Which best describes the direction of the centripetal acceleration of an object in uniform circular motion?

(A) in the direction of motion
(B) inward towards the centre of the circle
(C) opposite the direction of motion
(D) outward from the centre of the circle

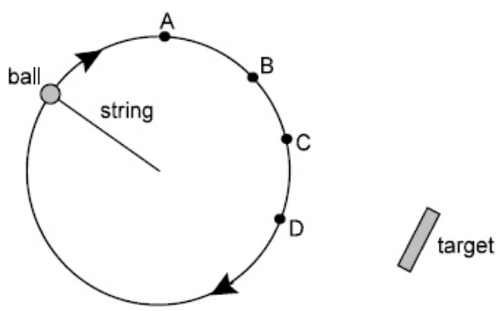
9. The diagram below shows an object moving at a constant speed in a horizontal circle. What is the direction of the acceleration at point P?

(A) A
(B) B
(C) C
(D) D



10. The diagram below shows a ball on the end of a string moving at a constant speed in a horizontal circle. A target is located near the path of the ball as shown. At which point should the ball be released in order to hit the target?

(A) A
(B) B
(C) C
(D) D

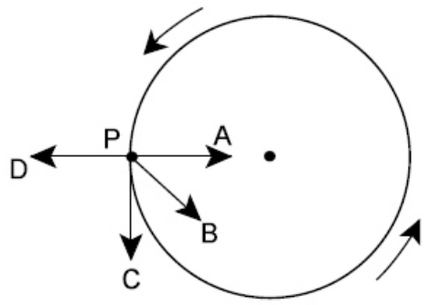


11 What is the direction of the centripetal acceleration for an object moving in a horizontal circle?

(A) up
(B) down
(C) away from the center
(D) towards the center

12. The diagram below shows an object moving at a constant speed in a horizontal circle. What is the direction of the acceleration at point P?

(A) A
(B) B
(C) C
(D) D



13. If a student swings a ball, attached by a string, in a horizontal circle, in which direction would the ball travel if the string breaks?

(A) in the circular path
(B) towards the student's hand
(C) tangent to the circular path
(D) tangent to the student's hand

14. The tires on a moving bicycle make one complete rotation in 0.18 s. If the radius of the tires is 0.42 m, how fast is the bicycle travelling?

(A) 2.3 m/s
(B) 3.1 m/s
(C) 4.7 m/s
(D) 15 m/s

15. What is the speed of a planet that travels in a circular path of radius 3.85×10^8 m, and has a period of 27.3 days?

(A) 5.13×10^2 m/s
(B) 1.03×10^3 m/s
(C) 2.46×10^4 m/s
(D) 2.80×10^4 m/s

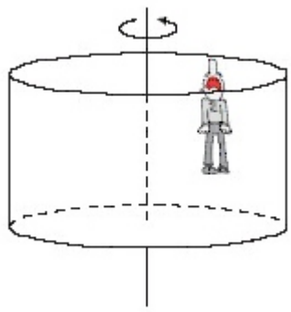
16. A runner completes one lap of a circular track in 37s at a speed of 9.0 m/s. What is the radius of the track?

(A) 26 m
(B) 53 m
(C) 330 m
(D) 490 m

17. Tires on a moving bicycle make two complete rotations in 0.18 s. If the radius of the tires is 0.42 m, how fast is the bicycle travelling?

(A) 0.47 m/s
(B) 2.3 m/s
(C) 15 m/s
(D) 29 m/s

18. A person of mass, m, on a carnival ride stands inside a large drum that begins to rotate. When a safe speed is reached, the floor of the drum falls away and the rider is left "stuck" to the wall. What is the minimum speed at which the drum can turn so that the person does not fall?



(A) $v = \sqrt{rg}$

(B) $v = \dfrac{rg}{\mu}$

(C) $v = \sqrt{\dfrac{rg}{\mu}}$

(D) $v = rg$

19. An object is moving in uniform circular motion at a speed of 6.20 m/s around a path having radius 3.85 m. How long does it take to make one complete revolution?

(A) 0.256 s
(B) 0.621 s
(C) 1.61 s
(D) 3.90 s

20. What is the centripetal acceleration of a car as it travels at 36.0 m/s around a circle with radius 3.4×10^2 m?

(A) $0.11 m/s^2$
(B) $0.26 m/s^2$
(C) $3.8 m/s^2$
(D) $9.4 m/s^2$

21. What is the acceleration of a car that goes around a curve of radius 150 m at a constant speed of 30.0 m/s?

(A) $0 m/s^2$
(B) $0.20 m/s^2$
(C) $5.0 m/s^2$
(D) $6.0 m/s^2$

22. A rubber stopper spins in a horizontal circle on the end of a 1.2 m long string. If the stopper moves at a speed of 3.2 m/s, what is its acceleration?

(A) $0.12 m/s^2$
(B) $0.38 m/s^2$
(C) $2.7 m/s^2$
(D) $8.5 m/s^2$

23. A car goes around a curve with a radius of 84 m at a speed of 22 m/s. What is the centripetal acceleration of the car?

(A) $0.17 m/s^2$
(B) $0.26 m/s^2$
(C) $3.8 m/s^2$
(D) $5.8 m/s^2$

24. In a series of test runs, a car travels around the same circular track at different velocities. Which graph shows the relationship between its centripetal acceleration, ac, and its velocity v?

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 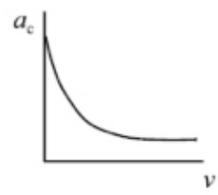
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 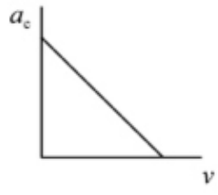
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 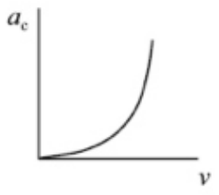
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 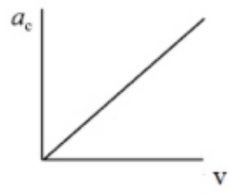
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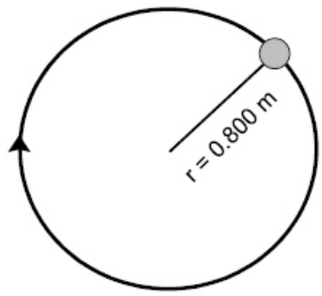
25. A ball on a string is spun in a horizontal circle. If the speed remains constant and the radius is halved, by what factor will the centripetal acceleration change?

(A) ¼
(B) ½
(C) 2
(D) 4

26. The diagram below shows an object, attached to a string, moving at a constant speed of 4.00 m/s in a horizontal circle. What is the magnitude of the centripetal acceleration of the object?

(A) 0.0500 m/s^2
(B) 2.00 m/s^2
(C) 5.00 m/s^2
(D) 20.0 m/s^2



27. A 25.0 kg girl is spinning around at 1.25 m/s on a merry-go-round with a radius of 2.39 m. What is the centripetal force on the girl?

(A) 13.1 N
(B) 16.3 N
(C) 32.5 N
(D) 47.8 N

28. An object of mass 20.0 kg undergoes 50 rotations in 25 s making a circle of radius 0.95 m. What is the centripetal force experienced by the object?

(A) 1.9×10^2 N
(B) 2.5×10^2 N
(C) 1.5×10^3 N
(D) 3.0×10^3 N

29 A circular race track has a radius of 159 m. If the centripetal force acting on a 65.0 kg cyclist is 4.16 N, how long does it take to complete one lap around the track?

(A) 9.91 s
(B) 98.2 s
(C) 313 s
(D) 785 s

30. As the speed of a merry-go-round doubles, how does the magnitude of the centripetal force acting on a passenger change?

(A) halves
(B) doubles
(C) triples
(D) quadruples

31 As the radius of a merry-go-round doubles, by what factor does the magnitude of the centripetal force acting on a passenger change?

(A) double
(B) half
(C) triple
(D) quadruple

32. An object travels along a horizontal circular path at a constant speed. By what factor will the centripetal force change if the radius is halved?

(A) ¼
(B) ½
(C) 2
(D) 4

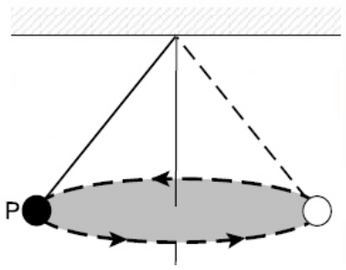
33. By what factor does the centripetal force change if a car goes around a curve at half its original speed?

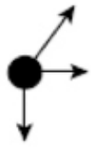
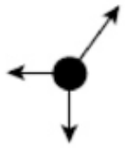
(A) decreases by a factor of 2
(B) decreases by a factor of 4
(C) increases by a factor of 2
(D) increases by a factor of 4

34. What is the centripetal force on an object of mass 0.200 kg, that is spinning at 6.40 m/s in a horizontal circle of radius 0.350 m?

(A) 2.87 N
(B) 3.66 N
(C) 23.4 N
(D) 117 N

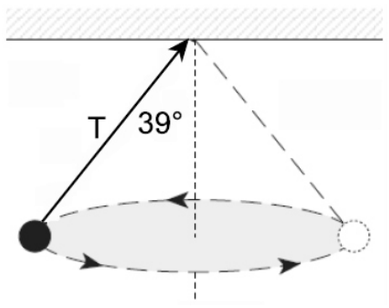
35. The diagram below shows a ball, suspended by a string, travelling in a horizontal circular path at a constant speed. Which is the free body diagram for the ball at P?



(A) 	(B) 
(C) 	(D) 

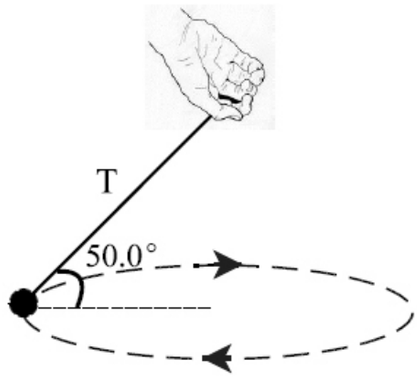
36. The diagram below shows a 3.0 kg ball, suspended by a string, undergoing uniform circular motion. If the speed of the ball is 3.1 m/s and the radius of the circle is 1.2 m, what is the tension in the string?

(A) 31 N
(B) 38 N
(C) 62 N
(D) 76 N



37. A 4.0 kg ball on a string is swung in a horizontal circle at a speed of 3.5 m/s. If the tension in the string is 51 N, what is the radius of the circular path traced out by the ball?

(A) 0.43 m
(B) 0.67 m
(C) 1.3 m
(D) 1.5 m



38. A car moves at 25 m/s around a level curve with a 50.0 m radius. The centripetal force provided by the friction between the tires and the road is 1.8×10^4 N. What is the mass of the car? **AUGUST 2005**

39. What happens to the motion of an object undergoing uniform circular motion if the net force on the object becomes zero? **AUGUST 2004**