

**AP Physics**

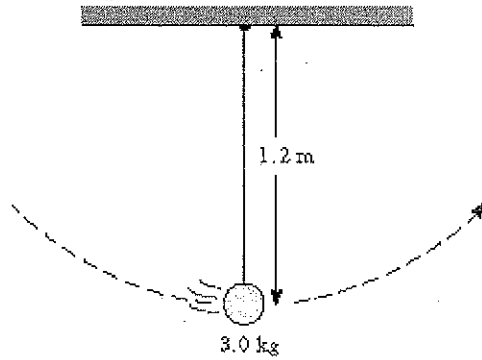
**Instructor: Mr. Butler**

**Practice Quiz  
Circular Motion**

1. Which of the following diagrams shows the instantaneous velocity  $v$  and centripetal force  $F$  for an object in uniform circular motion.

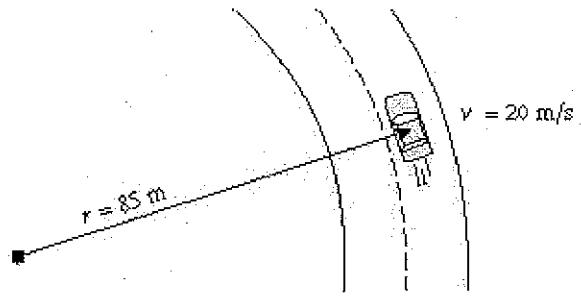


2. A 1.2 m long pendulum reaches a speed of 4.0 m/s at the bottom of its swing.



What is the tension in the string at this position?

- A. 11                      B. 29 N                      C. 40 N                      D. 69 N
3. A 1200 kg car rounds a flat circular section of road at 20 m/s as shown in the diagram.



The coefficient of friction between the car tires and the road surface is 0.65. What minimum friction force is required for the car to follow this curve?

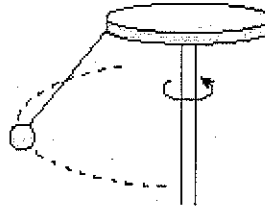
- A.  $3.7 \times 10^3$  N                      B.  $5.6 \times 10^3$  N                      C.  $7.6 \times 10^3$  N                      D.  $1.2 \times 10^4$  N

4. A 65 kg student is in a car travelling at 25 m/s on a hill of radius 110 m. When the car is at the top of the hill, what upward force does the seat exert on the student?

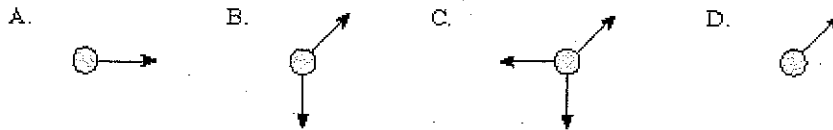


- A. 270 N                      B. 370 N                      C. 640 N                      D. 910 N

5. An object attached to a rotating table is moving in a circular path with a constant speed.



Which is the correct free body diagram for the object?



6. An object travels with a constant speed in a circular path. The net force on the object is

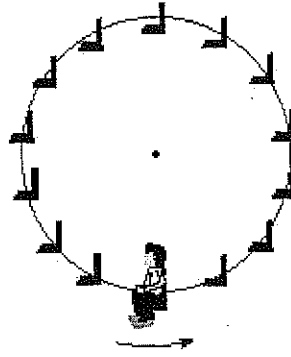
- A. zero.  
B. towards the centre.  
C. away from the centre.  
D. tangent to the object's path.

7. A car moving in a circular path with a constant speed has

- A. no acceleration.  
B. outward acceleration.  
C. tangential acceleration.  
D. centripetal acceleration.

8.

A person is moving at constant speed in a vertical circular path.



Which is the correct free body diagram for the person while passing through the lowest point?

A.



B.



C.

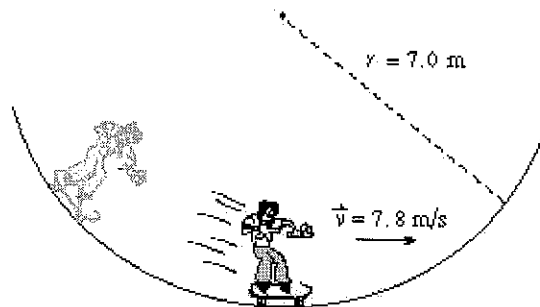


D.



9.

A 61 kg skateboarder is moving down a ramp with a 7.0 m radius of curvature. At the bottom of this ramp he reaches a speed of 7.8 m/s.



What upward force acts on the skateboarder at the bottom of the ramp?

A.  $7.0 \times 10^1 \text{ N}$

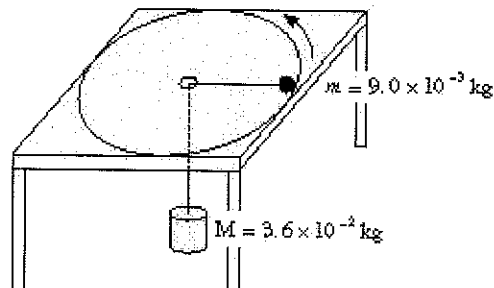
B.  $5.3 \times 10^2 \text{ N}$

C.  $6.0 \times 10^2 \text{ N}$

D.  $1.1 \times 10^3 \text{ N}$

10.

A  $9.0 \times 10^{-3} \text{ kg}$  ball is attached to a  $3.6 \times 10^{-2} \text{ kg}$  mass M by a string that passes through a hole in a horizontal frictionless surface. The ball travels in a circular path of radius 0.35 m.



What is the speed of the ball?

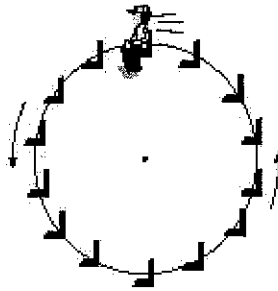
A. 0.93 m/s

B. 1.9 m/s

C. 3.7 m/s

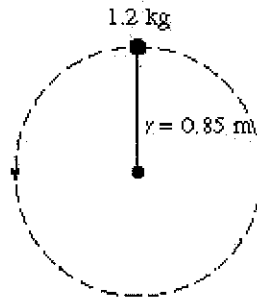
D. 4.1 m/s

11. Hans, whose mass is 50 kg, rides on a ferris wheel in a circular path at constant speed. When he is at the top of the wheel, the seat exerts an upward force of 420 N on Hans.



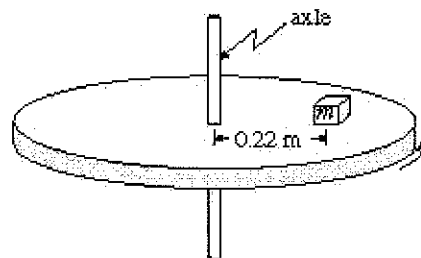
What is the centripetal force on Hans at the top of the wheel?

- A. 70 N                      B. 420 N                      C. 490 N                      D. 910 N
12. A 1.2 kg mass on the end of a string is rotated in a vertical circle of radius 0.85 m.



If the speed of the mass at the top of the circle is 3.6 m/s, what is the tension in the string at this location?

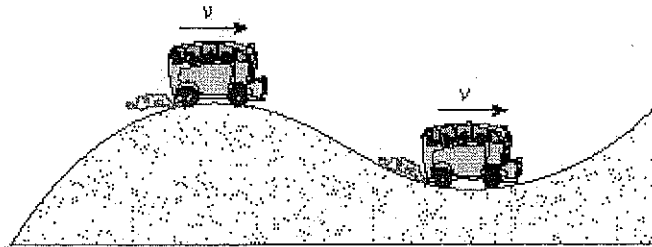
- A. 6.5 N                      B. 12 N                      C. 18 N                      D. 30 N
13. An object of mass  $m$  is on a horizontal rotating platform. The mass is located 0.22 m from the axle and makes one revolution every 0.74 s.



The friction force needed to keep the mass from sliding is 13 N. What is the object's mass?

- A. 0.82 kg                      B. 1.3 kg                      C. 2.7 kg                      D. 5.2 kg

14. A bus of weight  $g$  is moving at a constant speed over a hill and dip that have the same radius of curvature.



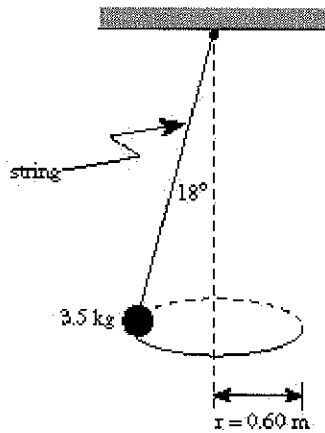
When the bus is passing over the crest of the hill, the road exerts a normal force on the bus equal to three quarters of the bus's weight ( $3/4 F_g$ ). What is the normal force the road exerts on the bus when the bus is passing through the bottom of the dip?

- A.  $1/4 F_g$                       B.  $3/4 F_g$                       C.  $5/4 F_g$                       D.  $7/4 F_g$

15. A child is riding on a merry-go-round which is rotating at a constant rate. Which of the following describes the child's speed, velocity, and magnitude of acceleration?

	SPEED	VELOCITY	MAGNITUDE OF ACCELERATION
A.	constant	constant	constant
B.	constant	changing	constant
C.	changing	constant	changing
D.	changing	changing	changing

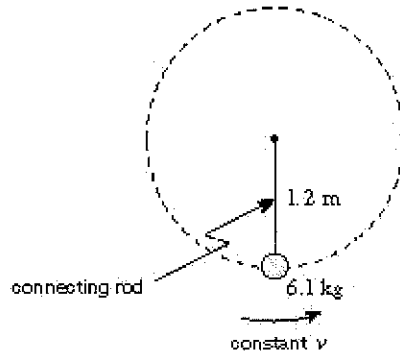
16. A 3.5 kg object is suspended by a string and moves in a horizontal circle of radius 0.60 m. The tension in the string is 36 N.



- a) What is the magnitude of the net force on the object? (3 marks)
- b) What is the period of revolution of the object? (4 marks)

17.

A 6.1 kg object on the end of a massless connecting rod moves in uniform circular motion in a vertical circle with radius 1.2 m. The period of revolution is 0.80 s.



a) Calculate the tension in the connecting rod at this position. (7 marks)

## Answer Key: Circular Motion Test #1

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### Answer Key

1. D
2. D
3. B
4. A
5. B
6. B
7. D
8. D
9. D
10. C
11. A
12. A
13. A
14. C
15. B
16. a)  $F_{\text{net}} = 11 \text{ N}$   
b)  $T = 2.7 \text{ s}$
17.  $T = 510 \text{ N}$