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6.1 Circular Motion

Easy



PHYSICS

IB HL

6.1 Circular Motion

Question Paper

Course	DP IB Physics
Section	6. Circular Motion & Gravitation
Topic	6.1 Circular Motion
Difficulty	Easy

Time allowed: 20
Score: /10
Percentage: /100

Question 1

The linear speed of a motorcycle of mass 50 kg on a circular race track is 10 m s^{-1} . The radius of the race track is 500 m.

What is the centripetal force acting on the motorcycle?

- A. 10 N
- B. 50 N
- C. 150 N
- D. 100 N

[1 mark]

Question 2

An athletic hammer consists of a heavy metal ball on the end of a steel wire which is rotated around an athlete's head before being released.

The angular speed obtained by a training hammer thrown in a competition is 2 rad s^{-1} . The combined length of the steel rope and the athlete's arms is 2 m.

What is the centripetal acceleration of the hammer?

- A. 2 m s^{-2}
- B. 4 m s^{-2}
- C. 6 m s^{-2}
- D. 8 m s^{-2}

[1 mark]

Question 3

A man is running along a circular path with an angular velocity of 0.05 rad s^{-1} . His linear velocity is 2.5 m s^{-1} .

What is the radius of the path?

- A. 20 m
- B. 30 m
- C. 40 m
- D. 50 m

[1 mark]

Question 4

In uniform circular motion, which of the following is incorrect?

- A. Magnitude of the velocity is constant
- B. The direction of the velocity is constant
- C. The centripetal force is towards the centre of the circle
- D. The centripetal force is at 90° to the velocity

[1 mark]

Question 5

A child whirls a conker on a string around their head. The conker moves with uniform circular motion. The linear speed of the conker is 5 m s^{-1} and the radius of the circle is 0.5 m .

Calculate the angular speed of the conker.

- A. 2.5 rad s^{-1}
- B. 0.5 rad s^{-1}
- C. 10 rad s^{-1}
- D. 5 rad s^{-1}

[1 mark]

Question 6

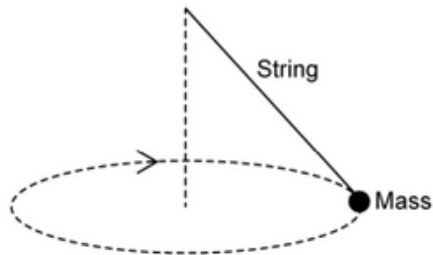
What is an angular displacement of $\frac{\pi}{6}$ rad in degrees?

- A. 180°
- B. 60°
- C. 45°
- D. 30°

[1 mark]

Question 7

A mass is swung on a string in a circle of radius r .



The string breaks and the mass continues to move.

Which line in the table below describes the motion of the mass in the horizontal and vertical dimensions?

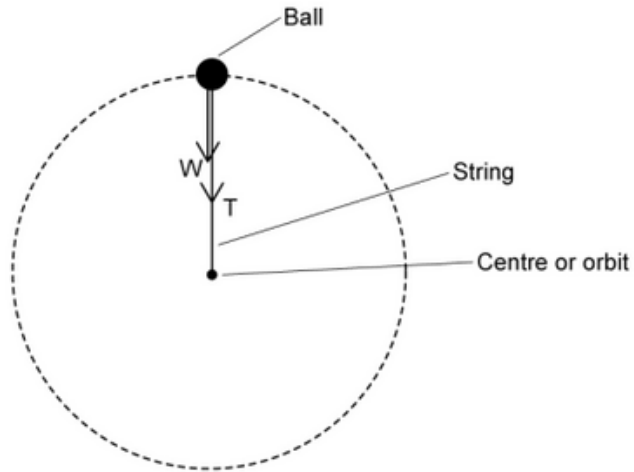
	Horizontal	Vertical
A.	Continues in a circle of radius r	No vertical motion
B.	Moves in a circle of radius $> r$	Moves at a constant speed downwards
C.	No horizontal motion	Decelerates downwards
D.	Moves in a straight line at 90° to r	Accelerates downwards

[1 mark]



Question 8

A ball attached to a string rotates in a gravitational field with a constant time period in a vertical plane. The forces acting on the mass are tension, T and weight, W .



What is an expression for the magnitude of the tension in the string at the top of the circle?

A. $\frac{mv^2}{r} - mg$

B. T

C. mg

D. $\frac{mv^2}{r} + mg$

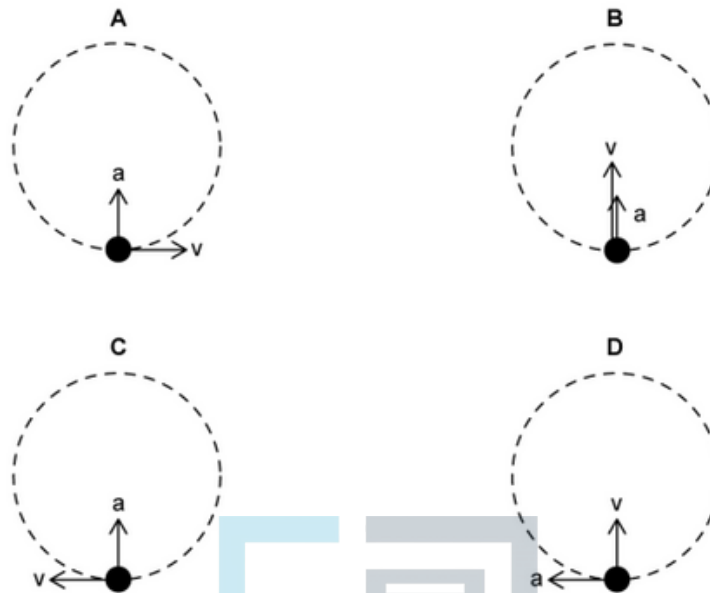


[1 mark]

Question 9

A satellite moves in a uniform circular orbit around the Earth in a clockwise direction.

Which diagram correctly shows the direction of the velocity v and acceleration a of the satellite at the position shown?



[1 mark]

Question 10

What is the force acting on an object rotating with constant speed v in a circle of radius r ?

- A. $\frac{mv^2}{r}$ towards the centre of the circle
- B. $\frac{v^2}{r}$ away from the centre of the circle
- C. $\frac{mv^2}{r}$ along a tangent to the circle
- D. No force acts on the object

[1 mark]