6.1 Circular Motion

Question Paper

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

To be used by all students preparing for DP IB Physics SL
Students of other boards may also find this useful

Question 1

A particle of mass *m* moves in a circle of radius *r* at uniform speed, taking time *T* for each revolution. What is the kinetic energy of the particle?

A. $2mr\pi f^2$

B. $mr^2\pi^2 f^2$

C. $2mr^2\pi^2 f^2$

D. $4mr^2\pi^2 f^2$

[1 mark]

Question 2

A 0.05 kg ball is attached to an inextensible string and whirled overhead such that it rotates in a horizontal circle.

What is the centripetal force on the ball if the string is 0.1 m long and the ball has a time period of $\frac{\pi}{10}$ s?

A. 1.0 N

B. 0.1 N

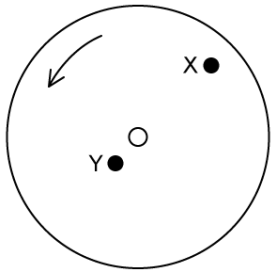
C. 8.0 N

D. 2.0 N

[1 mark]

Question 3

A horizontal disc rotates uniformly at a constant angular velocity about a central axis normal to the plane of the disc.



Point X is on a distance *3L* from the centre of the disc. Point *Y* is a distance *L* from the centre of the disc. Point Y has a linear speed *v* and a centripetal acceleration *a*.

What is the linear speed and centripetal acceleration of point X?

	Linear Speed of X	Acceleration of X
A.	3*v*	*a*
B.	*v*	*a*
C.	3*v*	3*a*
D.	2*v*	2*a*

[1 mark]

Question 4

A girl of mass 50 kg is standing on a roundabout 100 cm from the centre. The force of friction on the girl is 600 N. What is the time period if the roundabout is rotating uniformly?

A. $\sqrt{\frac{\pi}{6}}$

B. $\sqrt{\frac{2}{3}}\pi$

C. $\frac{1}{3}\pi^2$

D. $\sqrt{\frac{1}{3}}\pi$

[1 mark]

Question 5

A spinning top makes twenty revolutions in five minutes in a clockwise direction.

What is the angular velocity of the spinning top?

A. $\frac{2\pi}{15}$

B. $\frac{\pi}{150}$

C. 10π

D. $\frac{1}{15}$

[1 mark]

Question 6

A body moves in a circle with increasing angular velocity. At times t, the angles θ swept out by the body added cumulatively from the same reference point and its angular velocities ω are as follows:

t / s	θ / rad	ω / rad s^{-1}
5	2	0.4
15	16	2.4
25	42	4.4
35	80	6.4

The angular acceleration of the body:

A. is constant at 0.2 rad s^{-2}

B. gradually decreases and is 6.25 rad s^{-2} when t = 15 s

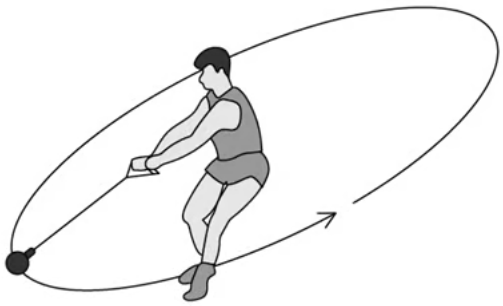
C. is constant at 0.4 rad s^{-2}

D. increases at a constant rate and is 0.2 rad s^{-2} when t = 15 s

[1 mark]

Question 7

A hammer thrower rotates a ball on a string in a circular path gradually increasing its angular velocity with each rotation.



When the hammer releases the ball, the subsequent path taken by the ball is

A. a vertical circle

B. a parabola in a horizontal plane

C. a parabola in a vertical plane

D. a straight line along a radius of the circle

[1 mark]

Question 8

An object at the end of a steel rod rotates in a vertical circle at a constant angular velocity. Which of the following statements correctly describes the tension in the rod?

A. it is greatest when the object is halfway up the circle

B. it is greatest when the object is at the bottom of the circle

C. it is unchanged throughout the motion

D. it is greatest when the object is at the top of the circle

[1 mark]

Question 9

For a particle moving in a circle with uniform speed, which of the following statements is incorrect?

A. The speed of the particle is constant

B. The acceleration of the particle is perpendicular to its direction of motion

C. The momentum of the particle is constant

D. The particle is accelerating

[1 mark]

Question 10

A satellite X of mass orbits the Earth with a period *T* and radius *r* and linear speed *v*. What will be the orbital period of satellite Y with mass *m* occupying an orbit with radius $\frac{r}{2}$ and speed 2*v* as X?

A. 2T

B. T

C. $\frac{T}{2}$

D. $\frac{T}{4}$

[1 mark]