

6.1 Circular Motion

Question Paper

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

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

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.

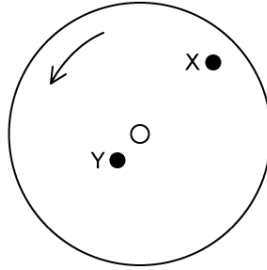
What is the centripetal force on the ball if the string is 0.1 m long and the ball has a time period of $\frac{\pi}{10}$ s?

- 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.	$3v$	a
B.	v	a
C.	$3v$	$3a$
D.	$2v$	$2a$

[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	$\omega/\text{rad s}^{-1}$
5	2	0.4
15	16	2.4
25	42	4.4
35	80	6.4

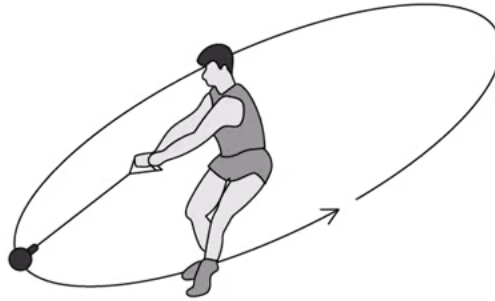
The angular acceleration of the body:

A. is constant at 0.2 rad s^{-2} B. gradually decreases and is 6.25 rad s^{-2} when $t = 15 \text{ s}$ C. is constant at 0.4 rad s^{-2} D. increases at a constant rate and is 0.2 rad s^{-2} when $t = 15 \text{ s}$

[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 m 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 $2v$ as X?

A. $2T$ B. T C. $\frac{T}{2}$ D. $\frac{T}{4}$

[1 mark]