

Name:

Date:

CIRCULAR MOTION TEST 3

A2-Level

Mark

Grade

PHYSICS

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown

Information

- The marks for the questions are shown in brackets

1 For a particle moving in a circle with uniform speed, which **one** of the following statements is correct?

- A The displacement of the particle is in the direction of the force.
- B The force on the particle is in the same direction as the direction of motion of the particle.
- C The momentum of the particle is constant.
- D The kinetic energy of the particle is constant.

(Total 1 mark)

2 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 $\frac{\pi^2 m r}{T^2}$

B $\frac{\pi^2 m r^2}{T^2}$

C $\frac{2\pi^2 m r^2}{T}$

D $\frac{2\pi^2 m r^2}{T^2}$

(Total 1 mark)

3 A particle of mass m moves in a circle of radius r at a uniform speed with frequency f . What is the kinetic energy of the particle?

A $\frac{mf^2r^2}{4\pi^2}$

B $\frac{mf^2r}{2}$

C $2\pi^2mf^2r^2$

D $4\pi^2mf^2r^2$

(Total 1 mark)

4

What is the angular speed of a point on the Earth's equator?

- A $7.3 \times 10^{-5} \text{ rad s}^{-1}$
- B $4.2 \times 10^{-3} \text{ rad s}^{-1}$
- C $2.6 \times 10^{-1} \text{ rad s}^{-1}$
- D 15 rad s^{-1}

(Total 1 mark)

5

An object moving at constant speed in a circle experiences a force that is

- A in the direction of motion.
- B outwards and at right angles to the direction of motion.
- C inwards and at right angles to the direction of motion.
- D opposite to the direction of motion.

(Total 1 mark)

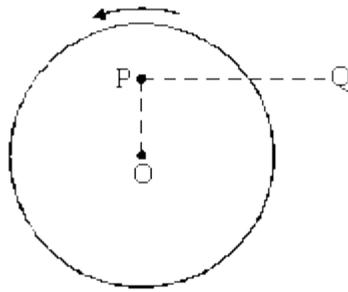
6

A fairground roundabout makes nine revolutions in one minute. What is the angular speed of the roundabout?

- A 0.15 rad s^{-1}
- B 0.34 rad s^{-1}
- C 0.94 rad s^{-1}
- D 2.1 rad s^{-1}

(Total 1 mark)

7

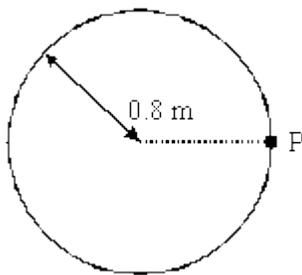


A small mass is placed at P on a horizontal disc which has centre O. The disc rotates anti-clockwise about a vertical axis through O with constant angular speed. Which one of the following describes the force which keeps the mass at rest relative to the disc?

- A the weight of the mass
- B a frictional force directed away from O
- C a frictional force directed towards O
- D a frictional force directed from P to Q

(Total 1 mark)

8



A model car moves in a circular path of radius 0.8 m at an angular speed of $\frac{\pi}{2}$ rad s⁻¹.

What is its displacement from point P, 6 s after passing P?

- A zero
- B 1.6 m
- C 0.4π m
- D 1.6π m

(Total 1 mark)

9

A girl of mass 40 kg stands on a roundabout 2.0 m from the vertical axis as the roundabout rotates uniformly with a period of 3.0 s. The horizontal force acting on the girl is approximately

- A zero.
- B 3.5×10^2 N.
- C 7.2×10^2 N.
- D 2.8×10^4 N.

(Total 1 mark)

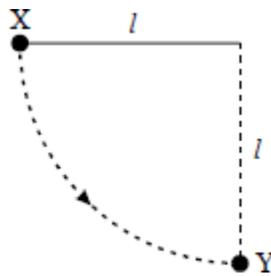
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For a particle moving in a circle with uniform speed, which one of the following statements is **incorrect**?

- A The velocity of the particle is constant.
- B The force on the particle is always perpendicular to the velocity of the particle.
- C There is no displacement of the particle in the direction of the force.
- D The kinetic energy of the particle is constant.

(Total 1 mark)

11

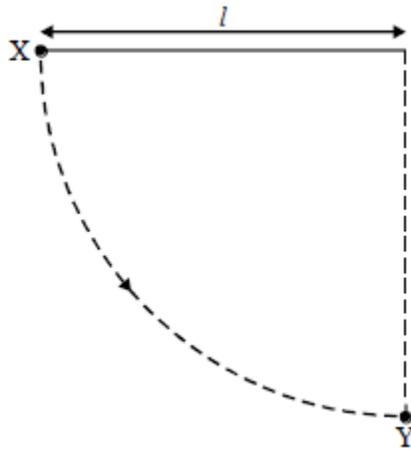


A ball of mass m , which is fixed to the end of a light string of length l , is released from rest at X. It swings in a circular path, passing through the lowest point Y at speed v . If the tension in the string at Y is T , which one of the following equations represents a correct application of Newton's laws of motion to the ball at Y?

- A $T = \frac{mv^2}{l} - mg$
- B $T - mg = \frac{mv^2}{l}$
- C $mg - T = \frac{mv^2}{l}$
- D $T + \frac{mv^2}{l} = mg$

(Total 1 mark)

12



A simple pendulum consists of a bob of mass m on the end of a light string of length l . The bob is released from rest at X when the string is horizontal. When the bob passes through Y its velocity is v and the tension in the string is T . Which one of the following equations gives the correct value of T ?

A $T = mg$

B $T = \frac{mv^2}{l}$

C $T + mg = \frac{mv^2}{l}$

D $T - mg = \frac{mv^2}{l}$

(Total 1 mark)