1 Particles may be accelerated in a cyclotron.
Which of the following statements is true for a cyclotron?

☒ **A** Particles travel in a circular path of constant radius.

☒ **B** Protons and neutrons can be accelerated in a cyclotron.

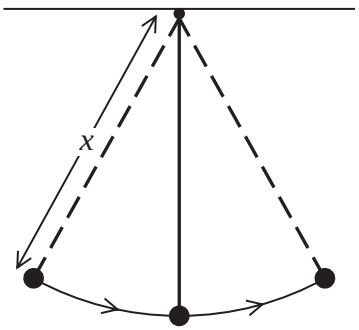
☒ **C** Particles can be accelerated to speeds up to 3.2×10^8 m s^{-1}.

☒ **D** A magnetic field is used to keep particles moving in a circular path.

(Total for Question = 1 mark)

2 A pendulum consists of a bob of mass m and a string of length x.

The diagram shows the pendulum swinging through the arc of a circle. At the bottom of its swing the tension in the string is T and the velocity of the bob is v.



Which of the following is correct for the bob at the bottom of the swing?

☒ **A** $T = \frac{mv^2}{x} - mg$

☒ **B** $T = \frac{mv^2}{x} + mg$

☒ **C** $T = mg - \frac{mv^2}{x}$

☒ **D** $T = \frac{mv^2}{x}$

(Total for Question = 1 mark)

3 The photograph shows cars driving around a roundabout at a constant speed.

The resultant force F on a car causes it to follow a circular path.

Which of the following statements about F is **incorrect**?

☒ **A** F is equal to the product of the mass and angular velocity of the car.

☒ **B** F is equal to the product of the momentum and angular velocity of the car.

☒ **C** F is in the same direction as the acceleration of the car.

☒ **D** F is perpendicular to the momentum of the car.

(Total for Question = 1 mark)

4 A fairground roundabout makes 8 revolutions in 1 minute. The angular velocity of the roundabout is

☒ **A** 0.10 rad s^{-1}

☒ **B** 0.42 rad s^{-1}

☒ **C** 0.84 rad s^{-1}

☒ **D** 0.94 rad s^{-1}

(Total for Question = 1 mark)

5 A racing car of mass 1200 kg travels at 0.63 rad s^{-1} around a bend of radius 50 m.
The force on the car necessary for this motion is

☒ **A** 2.4×10^4 N away from the centre of the circle.

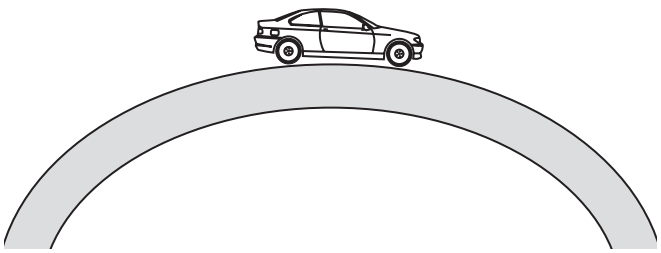
☒ **B** 2.4×10^4 N towards the centre of the circle.

☒ **C** 3.8×10^4 N away from the centre of the circle.

☒ **D** 3.8×10^4 N towards the centre of the circle.

(Total for Question = 1 mark)

6 A car, mass *m*, drives over a circular hump-back bridge of radius *r* with a constant speed *v*.



When it is at the top of the bridge, the force on the car from the bridge is given by

☒ **A** mg

☒ **B** $\frac{mv^2}{r} + mg$

☒ **C** $\frac{mv^2}{r} - mg$

☒ **D** $mg - \frac{mv^2}{r}$

(Total for Question = 1 mark)

7 A proton is moving in a circle, radius 1.5 m, within a magnetic field of flux density 0.020 T. The speed of the proton is

☒ **A** 4.8×10^{-21} m s^{-1}

☒ **B** 2.9×10^{6} m s^{-1}

☒ **C** 5.3×10^{9} m s^{-1}

☒ **D** 1.8×10^{25} m s^{-1}

(Total for Question = 1 mark)

8 A student is sitting on the right-hand side in a bus, facing the direction of travel. The bus goes round a bend to the left. The student remains in the same position within the bus.

The student experiences

☒ **A** a force to the left and a force to the right.

☒ **B** a resultant force to the left.

☒ **C** a resultant force to the right.

☒ **D** no resultant force.

(Total for Question 1 mark)

9 A particle, mass 0.020 kg, is moving with an angular velocity of 3π rad s ^{1} around a circle of radius 0.50 m. The force, in N, responsible for this motion is

☒ **A** 0.03π towards the centre of the circle.

☒ **B** 0.03π away from the centre of the circle.

☒ **C** $0.09\pi^2$ towards the centre of the circle.

☒ **D** $0.09\pi^2$ away from the centre of the circle.

(Total for Question 1 mark)

10 A particle completes 6.0 revolutions in 4.0 s. The angular velocity, in rad s^{-1}, is

☒ **A** 1.5

☒ **B** 9.4

☒ **C** 24

☒ **D** 150

(Total for Question = 1 mark)

11 A particle moving in a circular path completes 8.0 revolutions in 5.0 s.
Its angular velocity in rad s^{-1} is

☒ **A** 1.6

☒ **B** 10

☒ **C** 40

☒ **D** 250

(Total for Question = 1 mark)

12 The drum of a washing machine rotates with an angular velocity of 8.5 rad s^{-1}.
The time to complete 10 revolutions is

☒ **A** 0.85 s

☒ **B** 1.3 s

☒ **C** 3.7 s

☒ **D** 7.4 s

(Total for Question = 1 mark)