Circular Motion 2

Have a go at the following exam questions.

OCR, G484, JUNE 2010

2 **(a)** Fig. 2.1 shows an aeroplane flying in a horizontal circle at constant speed. The weight of the aeroplane is *W* and *L* is the lift force acting at right angles to the wings.

Fig. 2.1

(i) Explain how the lift force *L* maintains the aeroplane flying in a **horizontal** circle.

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..... **[2]**

(ii) The aeroplane of mass 1.2×10^5 kg is flying in a horizontal circle of radius 2.0 km.

The centripetal force acting on the aeroplane is 1.8×10^6 N. Calculate the speed of the aeroplane.

speed = ... $m\,s^{-1}$ **[2]**

(c) The satellites used in television communication systems are usually placed in geostationary orbits.

In your answer, you should use appropriate technical words spelled correctly.

(i) State two features of geostationary orbits.

1. .....

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2. .....

..... **[2]**

OCR, G484, JANUARY 2011

2 (a) (i) State, in terms of force, the conditions necessary for an object to move in a circular path at constant speed.

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..... **[1]**

(ii) Explain why this object is accelerating. State the direction of the acceleration.

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..... **[2]**

Eduqas, A420U10-1, JUNE 2018

2. *(a)* (i) Define the angular velocity, ω, for a body moving in a circle. [1]

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(ii) Two equations giving the acceleration of a body moving at constant speed in a circle are:

$$a = \frac{v^2}{r} \quad \text{and} \quad a = r\omega^2.$$

Show clearly that the equations are equivalent. [2]

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(b) A moon called *Deimos* orbits Mars in a circular path of radius 23 500 km. Astronomers have calculated the mass of Deimos to be 1.48×10^{15} kg, and the force exerted on it by Mars to be 1.15×10^{14} N.

(i) Calculate the speed of Deimos around Mars. [2]

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13 The London Eye consists of a large vertical circle with 32 equally-spaced passenger cabins attached to it. The wheel rotates so that each cabin has a constant speed of 0.26 m s^{-1} and moves around a circle of radius 61 m.

(a) Calculate the time taken for each cabin to make one complete revolution.

(2)

Time = ...

(b) Calculate the centripetal force acting on each cabin.

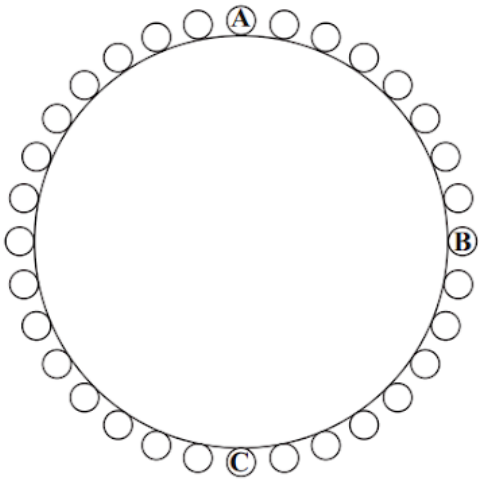
mass of cabin = 9.7×10^3 kg

(2)

Centripetal force = ...

(c) (i) The diagram shows just the circle and the cabins.
Draw arrows to show the direction of the centripetal force acting on a person in a cabin when the person is at each of positions **A**, **B** and **C**.

(1)



*(ii) As the person in a cabin moves around the circle, the normal contact force between the person and the cabin varies.

State the position at which this force will be a maximum and the position at which it will be a minimum. Explain your answers.

(4)

(Total for Question 13 = 9 marks)