

QQQ – Further Mechanics 2 – Chapter 1 – Circular Motion (Version 2)

Total Marks: 25

(25 = Platinum, 23 = Gold, 20 = Silver, 17 = Bronze)

1.

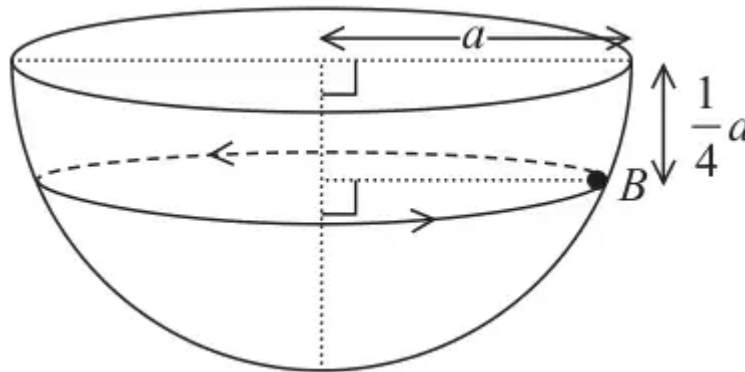


Figure 1

A hemispherical shell of radius a is fixed with its rim uppermost and horizontal. A small bead, B , is moving with constant angular speed, ω , in a horizontal circle on the smooth inner surface of the shell. The centre of the path of B is at a distance $\frac{1}{4}a$ vertically below the level of the rim of the hemisphere, as shown in Figure 1.

Find the magnitude of ω , giving your answer in terms of a and g .

(6)

(Total 6 marks)

Edexcel A2 June 2019 Q1

2. A rough disc rotates about its centre in a horizontal plane with constant angular speed 80 revolutions per minute. A particle P lies on the disc at a distance 8 cm from the centre of the disc. The coefficient of friction between P and the disc is μ . Given that P remains at rest relative to the disc, find the least possible value of μ .

(7)

(Total 7 marks)

Edexcel M3 January 2009 Q3

3. A fixed smooth sphere has centre O and radius a . A particle P is placed on the surface of the sphere at the point A , where OA makes an angle α with the upward vertical through O . The particle is released from rest at A . When OP makes an angle θ to the upward vertical through O , P is on the surface of the sphere and the speed of P is v .

Given that $\cos \alpha = \frac{3}{5}$

(a) show that

$$v^2 = \frac{2ga}{5}(3 - 5 \cos \theta)$$

(4)

(b) find the speed of P at the instant when it loses contact with the sphere.

(8)

(Total 12 marks)