2 A metal ball of mass 50 g travels in a horizontal circle of radius 10 cm around a smooth cone as shown by Fig 2.1. The metal ball makes 3.0 revolutions every second.
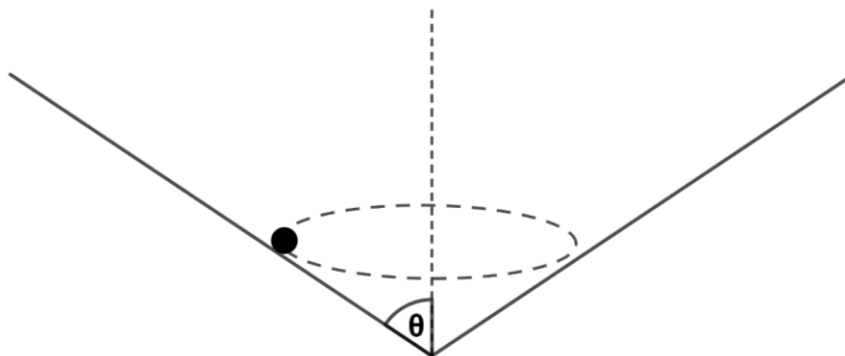

Fig. 2.1

(a) Explain why the metal ball in uniform circular motion is said to experience an acceleration.

…………………..………………………………………………………………………………………....

……..……

…………………..………………………………………………………………………………………....

…… [2]

(b) (i) Show that

$$\tan \theta = \frac{g}{r\omega^2}$$

where θ is shown in Fig. 2.1, r is the radius of the horizontal circle and ω is the angular velocity of the metal ball.

[2]

(ii) Hence determine θ.

θ = ………….…………… ° [2]

(c) The angular velocity ω of the metal ball is now increased.

Sketch, on Fig. 2.2, a graph to show the variation with angular velocity ω, of the radius r of the horizontal circle of the metal ball around the cone.

Fig. 2.2

[1]

[Total: 7]