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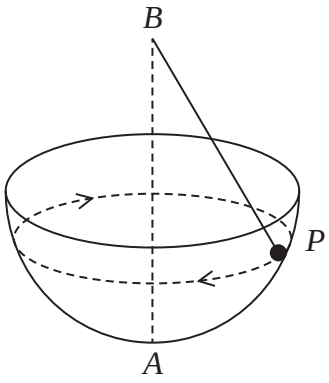


Figure 1

Figure 1 shows a hemispherical bowl of internal radius a fixed with its open plane face uppermost and horizontal. The lowest point of the bowl is A. A light inextensible string of length $a\sqrt{3}$ has one end fixed to the point B, where B is vertically above A and $AB = 2a$. A particle, P, of mass m is attached to the other end of the string.

The particle moves in a horizontal circle on the smooth inner surface of the bowl with constant angular speed ω. The string remains taut and the particle remains in contact with the bowl throughout the motion.

(a) Find, in terms of m, a, ω and g, the tension in the string.

(7)

(b) Show that $\omega \geqslant \sqrt{\dfrac{2g}{3a}}$

(4)

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Question 3 continued

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Q3