**3.**

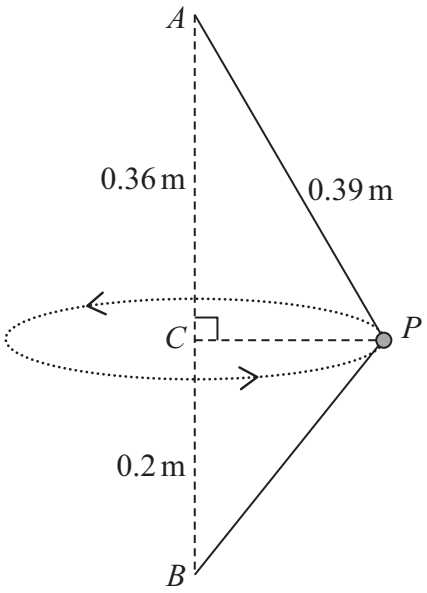



**Figure 2**

Two fixed points, $A$ and $B$, are such that $AB = 0.56\,\text{m}$ and $A$ is vertically above $B$.
The point $C$ on $AB$ is such that $AC = 0.36\,\text{m}$ and $CB = 0.2\,\text{m}$.
A light inextensible string of length 0.64 m has one end attached to $A$ and the other end attached to $B$.

A particle of mass $0.1\,\text{kg}$ is attached to the string at the point $P$, where $AP = 0.39\,\text{m}$.
The particle moves with constant angular speed in a horizontal circle with centre $C$, as shown in Figure 2.
The angular speed of the particle is $\omega\ \text{rad}\,\text{s}^{-1}$

Given that both parts of the string are taut,

(a) find the tension in $PB$ when $\omega = 3\sqrt{5}$

**(7)**

(b) Find the greatest value of $\omega$ for which $PB$ is slack, making your method clear.

**(4)**

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**Question 3 continued**

**(Total for Question 3 is 11 marks)**