

A particle P of mass m is attached to one end of a light inextensible string of length a . The other end of the string is attached to a fixed point O . The particle P is held at the point A , where OA makes an angle θ with the downward vertical through O , and with the string taut. The particle P is projected perpendicular to OA in an upwards direction with speed u . It then starts to move along a circular path in a vertical plane. The string goes slack when P is at B , where angle AOB is 90° and the speed of P is $\sqrt{\frac{4}{5}ag}$.

(a) Find the value of $\sin \theta$. [2]

(b) Find, in terms of m and g , the tension in the string when P is at A . [5]