

- 5 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 string is held taut with OP horizontal. The particle P is projected vertically downwards with speed $\sqrt{\frac{1}{3}ag}$ and starts to move in a vertical circle. P passes through the lowest point of the circle and reaches the point Q where OQ makes an angle θ with the downward vertical. At Q the speed of P is \sqrt{kag} and the tension in the string is $\frac{11}{6}mg$.

(a) Find the value of k and the value of $\cos \theta$.

[4]

[illegible]

At Q the particle P becomes detached from the string.

- (b)** In the subsequent motion, find the greatest height reached by P above the level of the lowest point of the circle. [4]

[illegible]