A light elastic string has natural length $8a$ and modulus of elasticity $5mg$. A particle $P$ of mass $m$ is attached to the midpoint of the string. The ends of the string are attached to points $A$ and $B$ which are a distance $12a$ apart on a smooth horizontal table. The particle $P$ is held on the table so that $AP = BP = L$ (see diagram). The particle $P$ is released from rest. When $P$ is at the midpoint of $AB$ it has speed $\sqrt{80ag}$.

**(a)** Find $L$ in terms of $a$. [5]

**(b)** Find the initial acceleration of $P$ in terms of $g$. [3]