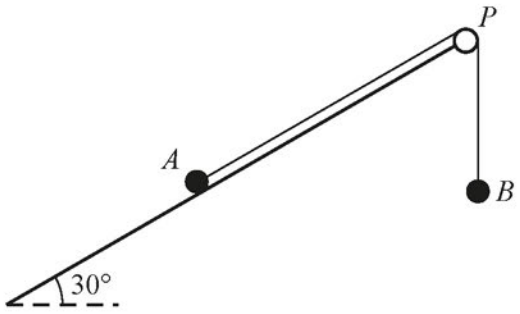
**12** One end of a light inextensible string is attached to a particle $A$ of mass $m$ kg. The other end of the string is attached to a second particle $B$ of mass $\lambda m$ kg, where $\lambda$ is a constant. Particle $A$ is in contact with a rough plane inclined at $30°$ to the horizontal. The string is taut and passes over a small smooth pulley $P$ at the top of the plane. The part of the string from $A$ to $P$ is parallel to a line of greatest slope of the plane. The particle $B$ hangs freely below $P$ (see diagram).




The coefficient of friction between $A$ and the plane is $\mu$.

**(i)** It is given that $A$ is on the point of moving down the plane.

**(a)** Find the exact value of $\mu$ when $\lambda = \frac{1}{4}$. **[7]**

**(b)** Show that the value of $\lambda$ must be less than $\frac{1}{2}$. **[2]**

**(ii)** Given instead that $\lambda = 2$ and that the acceleration of $A$ is $\frac{1}{4}g\,\text{m s}^{-2}$, find the exact value of $\mu$. **[5]**