



Two small balls P and Q , of masses 3 kg and 2 kg respectively, are attached to the ends of a light inextensible string. The string passes over a smooth fixed pulley. The balls are held at a height of 4 m above a horizontal floor, with the string taut. The parts of the string which are not in contact with the pulley are vertical (see diagram).

The system is set in motion in such a way that P moves vertically downwards.

- (a) Determine the tension in the string immediately after the system is set in motion. [4]

The initial downward speed of P is 4.2 m s^{-1} and when P reaches the floor it is immediately brought to rest. It is given that Q does not reach the pulley in the subsequent motion.

- (b) Find the speed of P as it hits the floor. [2]

- (c) Determine the time, after the start of the motion, at which Q reaches its greatest height above the floor. [4]

- (d) State what it would mean about the accelerations of the balls if the string could not be assumed to be inextensible. [1]