



Particles P and Q , of masses 4 kg and 6 kg respectively, are attached to the ends of a light inextensible string. The string passes over a smooth fixed pulley. The system is in equilibrium with P hanging 1.75 m above a horizontal plane and Q resting on the plane. Both parts of the string below the pulley are vertical (see diagram).

- (a) Find the magnitude of the normal reaction force acting on Q . [1]

The mass of P is doubled, and the system is released from rest. You may assume that in the subsequent motion Q does not reach the pulley.

- (b) Determine the magnitude of the force exerted on the pulley by the string before P strikes the plane. [5]
- (c) Determine the total distance travelled by Q between the instant when the system is released and the instant when Q first comes momentarily to rest. [4]

When this motion is observed in practice, it is found that the total distance travelled by Q between the instant when the system is released and the instant when Q first comes momentarily to rest is less than the answer calculated in part (c).

- (d) State **one** factor that could account for this difference. [1]