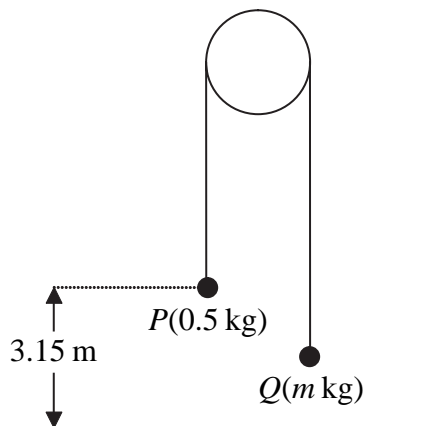


Leave blank

6.

Figure 4



Two particles P and Q have mass 0.5 kg and $m\text{ kg}$ respectively, where $m < 0.5$. The particles are connected by a light inextensible string which passes over a smooth, fixed pulley. Initially P is 3.15 m above horizontal ground. The particles are released from rest with the string taut and the hanging parts of the string vertical, as shown in Figure 4. After P has been descending for 1.5 s , it strikes the ground. Particle P reaches the ground before Q has reached the pulley.

- (a) Show that the acceleration of P as it descends is 2.8 m s^{-2} . (3)
- (b) Find the tension in the string as P descends. (3)
- (c) Show that $m = \frac{5}{18}$. (4)
- (d) State how you have used the information that the string is inextensible. (1)

When P strikes the ground, P does not rebound and the string becomes slack. Particle Q then moves freely under gravity, without reaching the pulley, until the string becomes taut again.

- (e) Find the time between the instant when P strikes the ground and the instant when the string becomes taut again. (6)



