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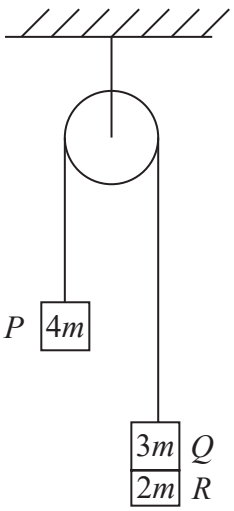

Figure 4

Three particles, P, Q and R, have masses $4m$, $3m$ and $2m$ respectively. Particles P and Q are connected by a light inextensible string that passes over a smooth light fixed pulley. Particle R is attached to particle Q. The system is held at rest with the string taut and the hanging parts of the string vertical, as shown in Figure 4. The system is released from rest.

(a) Find

(i) the acceleration of particle P,

(ii) the tension in the string.

(7)

(b) State how you have used the fact that the string is inextensible.

(1)

At the instant when particle P has moved a distance d upwards from its initial position, particle R separates from particle Q and falls away. In the subsequent motion, particles P and Q continue to move and particle P does not reach the pulley.

At the instant when particles R and Q separate, particle Q is at the point A, and it continues to move downwards. Particle Q then comes to instantaneous rest at the point B.

(c) Find, in terms of d, the distance AB.

(8)

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