

4 (a) State the two conditions required for a body to be in a state of equilibrium.

1.
 2.
- [2]

(b) Two smooth spheres M_1 and M_2 , both of mass 2.0 kg, are connected by an inextensible bar of negligible mass to form a rigid body. The spheres rest on smooth surfaces inclined at 40° as shown in Fig. 4.1.

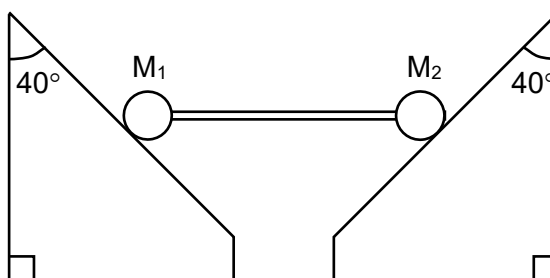


Fig. 4.1

- (i) The system consisting of two spheres and the bar as one rigid body is in a state of equilibrium when the bar is horizontal. Draw and label clearly the forces acting on the system in Fig 4.1. [2]
- (ii) Calculate the contact force that the incline exerts on the sphere M_1 .

force = N [2]

(c) Sphere M_2 is now replaced by another sphere M_3 , of mass 4.0 kg.

- (i) Explain why the contact forces that the inclines exert on M_1 and M_3 must be equal in magnitude, for the system to be in a state of equilibrium.

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..... [1]

- (ii) Explain why, for this system to be in a state of equilibrium, the bar cannot be horizontal.

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..... [2]

- (iii) Sketch on Fig. 4.2 the system consisting of the spheres M_1 and M_3 and the bar on the inclined surface when it is in a state of equilibrium. Label M_1 and M_3 clearly in your diagram

[1]

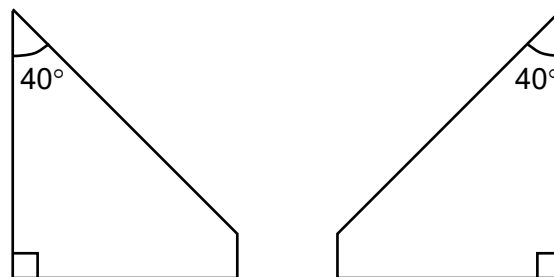


Fig. 4.2