

- 3 Three uniform small spheres  $A$ ,  $B$  and  $C$  have equal radii and masses  $5m$ ,  $5m$  and  $3m$  respectively. The spheres are at rest on a smooth horizontal surface, in a straight line, with  $B$  between  $A$  and  $C$ . The coefficient of restitution between each pair of spheres is  $e$ . Sphere  $A$  is projected directly towards  $B$  with speed  $u$ .

- (i) Show that the speed of  $A$  after its collision with  $B$  is  $\frac{1}{2}u(1 - e)$  and find the speed of  $B$ . [3]

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Sphere  $B$  now collides with sphere  $C$ . Subsequently there are no further collisions between any of the spheres.

- (ii) Find the set of possible values of  $e$ . [6]

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