2007 **5.** **(a)** A smooth sphere P, of mass 2 kg, moving with speed 9 m/s collides directly with a smooth sphere Q, of mass 3 kg, moving in the same direction with speed 4 m/s.
The coefficient of restitution between the spheres is e.

(i) Find, in terms of e, the speed of each sphere after the collision.

(ii) Show that the magnitude of the momentum transferred from one sphere to the other is $6(1+e)$.

(*i*) PCM $2(9) + 3(4) = 2v_1 + 3v_2$ — 5

NEL $v_1 - v_2 = -e(9-4)$ — 5

$v_1 = \dfrac{30-15e}{5}$ or $6-3e$

$v_2 = \dfrac{30+10e}{5}$ or $6+2e$ — 5

(*ii*) Impulse $= 2(9) - 2(6-3e)$
$= 6 + 6e$
$= 6(1+e)$ — 5

OR

Impulse $= 3(4) - 3(6+2e)$
$= -6 - 6e$
$= -6(1+e)$

20