6. Two particles, P of mass $9m$ and Q of mass $3m$, are at rest on a smooth horizontal surface.

Particle P is projected with speed $4u$ towards Q and P collides with Q.

The coefficient of restitution between the particles is e.

(a) Show that the speed of Q immediately after the collision is $3u(1 + e)$.

(5)

The total kinetic energy lost in the collision between P and Q is kmu^2

Given that $e = \frac{2}{3}$

(b) find the value of k.

(4)

After being struck by P, particle Q goes on to hit a fixed vertical wall. The wall is perpendicular to the direction of motion of Q.

In the collision with the wall, Q receives an impulse of magnitude $21mu$.

(c) Find the coefficient of restitution between Q and the wall.

(3)

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(Total for Question 6 is 12 marks)