1B Conservation of Momentum

1. A particle of mass 2kg is moving with speed $3ms^{-1}$ on a smooth horizontal plane. Particle Q of mass 3kg is at rest on the plane. Particle P collides with Q and after the collision Q moves away with a speed of $2^1/_3 ms^{-1}$. Find:

a) The speed and direction of the motion of P after the collision

b) The magnitude of the impulse received by P and by Q in the collision

2. Two particles, P and Q of mass 2kg and 4kg respectively are moving towards each other along the same straight line on a smooth horizontal plane. The particles collide. Before the collision, the speeds of P and Q are $3ms^{-1}$ and $2ms^{-1}$. Given that the magnitude of the impulse due to the collision is 7Ns, find:

a) The speed and direction of P after the collision

b) The speed and direction of Q after the collision

3. Two particles, A and B, of masses 8kg and 2kg respectively, are connected by a light inextensible string. The particles are at rest on a smooth horizontal plane with the string slack. Particle A is projected directly away from B with speed $4ms^{-1}$.

a) Find the speed of the particles when the string goes taut

b) Find the magnitude of the impulse transmitted through the string when it goes taut