Momentum & Impulse

Exercise 2

1. Sphere A has mass 1 kg and is projected towards B with speed 2 ms^{-1}. Sphere B has mass 0.5 kg and is already moving in the same direction with speed 1ms^{-1}. After the collision, B has speed 2 ms^{-1}. Find the speed of A. [1.5 ms^{-1}]

2. Sphere C has mass 0.3 kg and is projected towards D with speed 1.6ms^{-1}. Sphere D has mass 0.4 kg and is at rest. After the collision, C is reduced to rest. What is the speed of D after the collision? [1.2 ms^{-1}]

3. Spheres E and F have masses 800 g and 200 g respectively. They are travelling directly towards each other with speeds 0.5 ms^{-1} and 1.5 ms^{-1} respectively. After the collision, the direction of F is reversed and its new speed is 1 ms^{-1}.

   a What is the new speed and direction of E? [0.125 ms^{-1}; reverse direction]

   b Find also the magnitude of the impulse exerted on F by E. [0.5Ns]

4. Spheres G and H have masses 2.0 kg and 2.5 kg respectively. Sphere H is initially at rest and G is projected directly towards it with speed 5u m s^{-1}. The collision reduces the speed of G to $2u$ m s^{-1}; the direction of G remains unchanged. What will be the speed of H after the collision? [2.4$u$ms^{-1}]

5. A particle of mass 300 g is projected with speed 5 ms^{-1} directly towards a particle of mass 700 g moving with speed 2 ms^{-1} in the same direction. After impact the two particles coalesce and move with speed $v$ms^{-1}. Determine:

   a the magnitude of v [2.9ms^{-1}]

   b the loss in kinetic energy due to the collision. [0.945 J]

6. Particle R has mass 4.5 kg and S has mass 0.5 kg. They are joined by a light inextensible string with R being projected with speed 2 ms^{-1} and S being initially at rest.

   a When the string becomes taut, what will be the speed of the two particles? [1.8ms^{-1}]

   b Calculate the loss in kinetic energy after the string becomes taut. [0.9 J]