

4C Collisions & Kinetic Energy

1. Two spheres have equal radii and masses 3kg and 5kg respectively. A and B move towards each other along the same straight line on a smooth horizontal surface with velocities 3ms^{-1} and 2ms^{-1} respectively.

a) If the coefficient of restitution is $\frac{3}{5}$, find the velocities of the spheres after the collision

b) Find the loss of kinetic energy due to the impact

2. A gun of mass 600kg fires a shell of mass 12kg horizontally, with velocity 20ms^{-1} .

a) Find the velocity of the gun after the shell has been fired

b) Find the total kinetic energy generated on firing

c) Show that the ratio of the energy of the gun to the energy of the shell is equal to the ratio of the speed of the gun to the speed of the shell

3. Two particles, A and B, of mass 200g and 300g respectively, are connected by a light inextensible string. The particles are side-by-side on a smooth floor and A is projected with speed 6ms^{-1} away from B. When the string become taut, particle B is jerked into motion and A and B then move a common speed in the direction of A's original motion.

Find:

- a) The common speed of the particles after the string becomes taut

- b) The loss of kinetic energy as a result of the jerk