1. June/2023/Paper_9709/41/No.1

Two particles P and Q, of masses m kg and 0.3 kg respectively, are at rest on a smooth horizontal plane. P is projected at a speed of $5\,\text{m s}^{-1}$ directly towards Q. After P and Q collide, P moves with a speed of $2\,\text{m s}^{-1}$ in the same direction as it was originally moving.

(a) Find, in terms of m, the speed of Q after the collision. [2]

After this collision, Q moves directly towards a third particle R, of mass 0.6 kg, which is at rest on the plane. Q is brought to rest in the collision with R, and R begins to move with a speed of $1.5\,\text{m s}^{-1}$.

(b) Find the value of m. [2]

2. June/2023/Paper_9709/42/No.2

Two particles A and B, of masses 3.2 kg and 2.4 kg respectively, lie on a smooth horizontal table. A moves towards B with a speed of $v\,\text{m s}^{-1}$ and collides with B, which is moving towards A with a speed of $6\,\text{m s}^{-1}$. In the collision the two particles come to rest.

(a) Find the value of v. [2]

(b) Find the loss of kinetic energy of the system due to the collision. [2]

3. June/2023/Paper_9709/43/No.1

Two particles P and Q, of masses 0.1 kg and 0.4 kg respectively, are free to move on a smooth horizontal plane. Particle P is projected with speed $4\,\text{m}\,\text{s}^{-1}$ towards Q which is stationary. After P and Q collide, the speeds of P and Q are equal.

Find the two possible values of the speed of P after the collision. [3]