

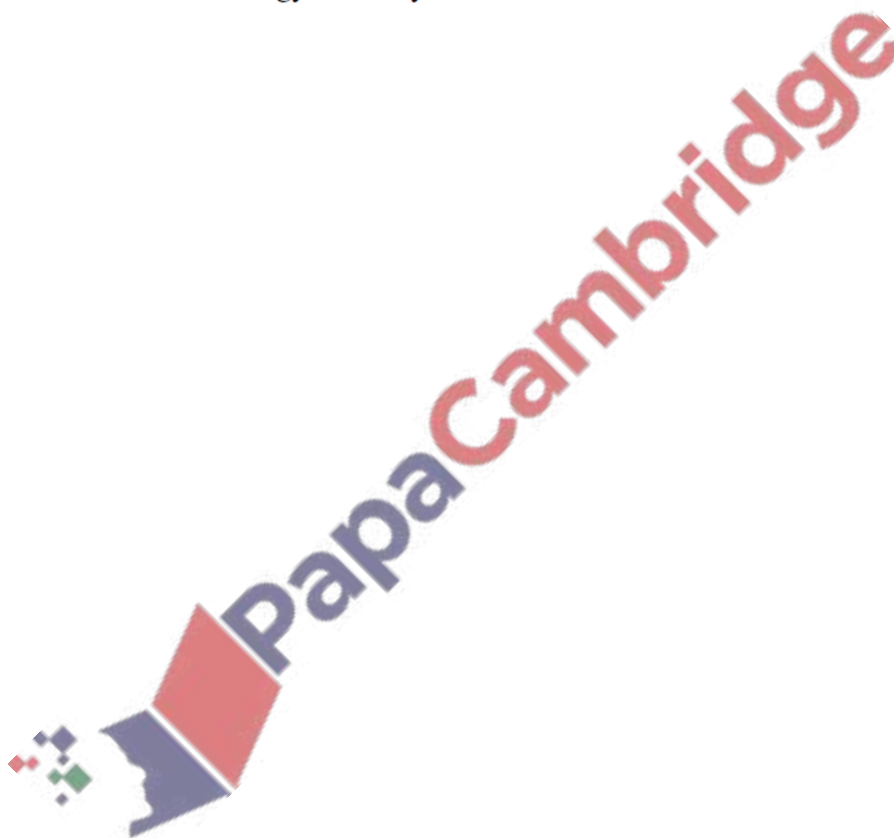
Momentum – 2020 AS

1. Nov/2020/Paper_9709/41/No.1

A particle B of mass 5 kg is at rest on a smooth horizontal table. A particle A of mass 2.5 kg moves on the table with a speed of 6 m s^{-1} and collides directly with B . In the collision the two particles coalesce.

(a) Find the speed of the combined particle after the collision. [2]

(b) Find the loss of kinetic energy of the system due to the collision. [3]



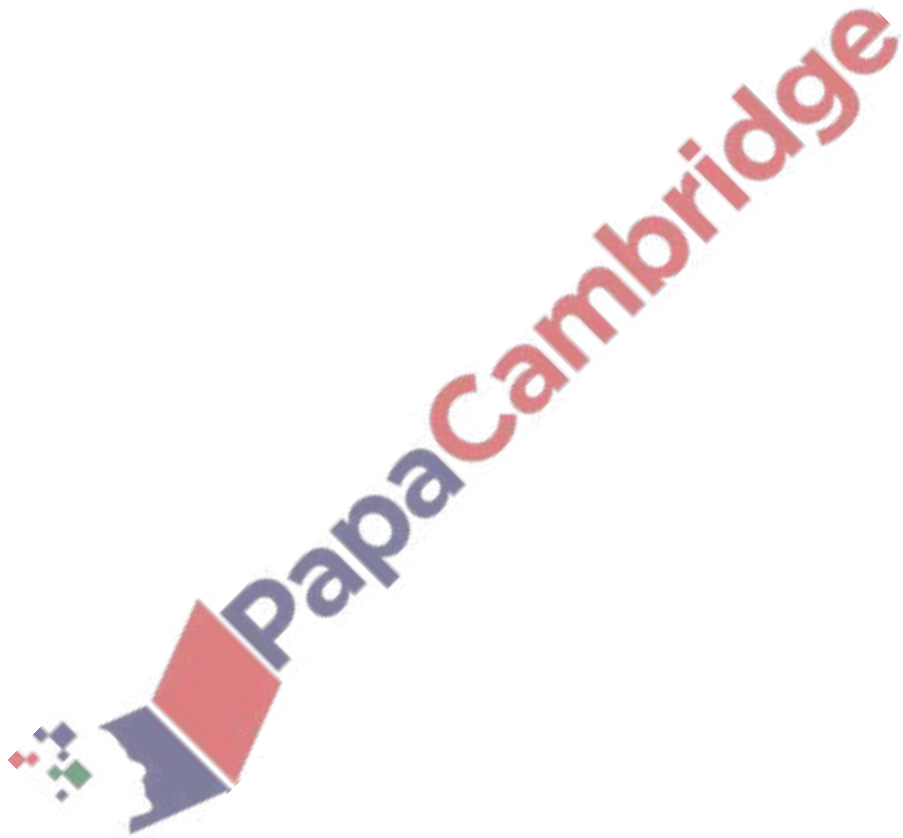
2. Nov/2020/Paper_9709/42/No.1

Two particles P and Q , of masses 0.2 kg and 0.5 kg respectively, are at rest on a smooth horizontal plane. P is projected towards Q with speed 2 m s^{-1} .

(a) Write down the momentum of P . [1]

(b) After the collision P continues to move in the same direction with speed 0.3 m s^{-1} .

Find the speed of Q after the collision. [2]

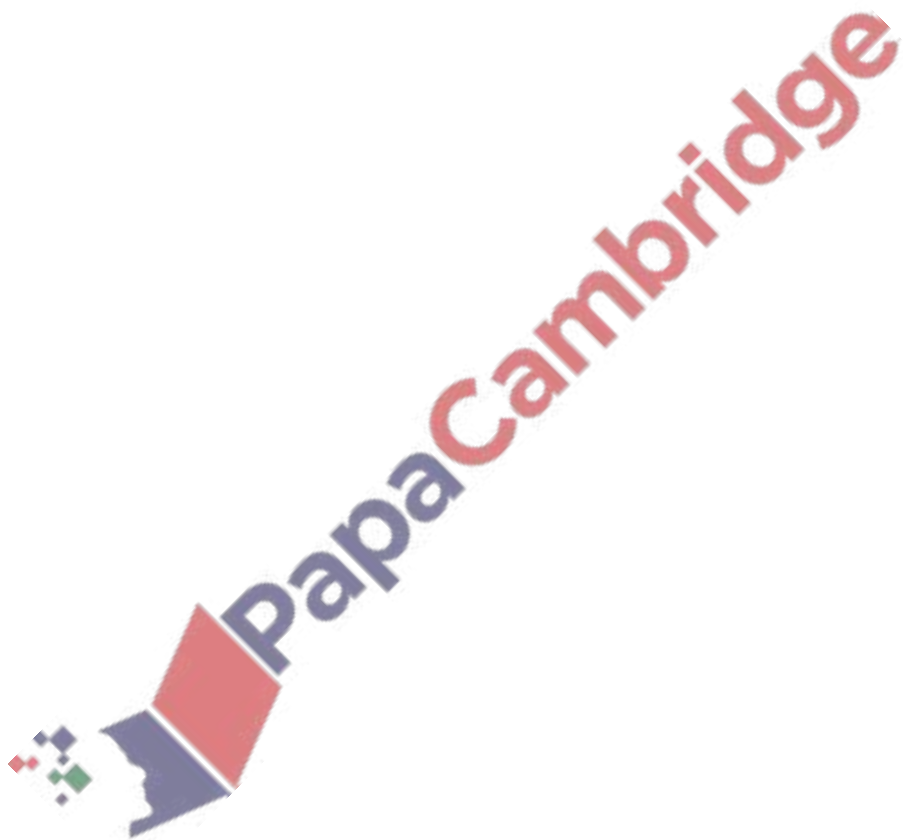


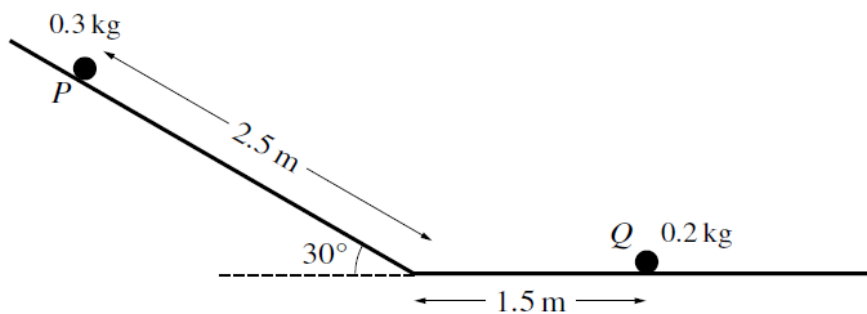
3. Nov/2020/Paper_9709/43/No.4

Two small smooth spheres A and B , of equal radii and of masses 4 kg and $m\text{ kg}$ respectively, lie on a smooth horizontal plane. Initially, sphere B is at rest and A is moving towards B with speed 6 m s^{-1} . After the collision A moves with speed 1.5 m s^{-1} and B moves with speed 3 m s^{-1} .

Find the two possible values of the loss of kinetic energy due to the collision.

[6]





A particle P of mass 0.3 kg, lying on a smooth plane inclined at 30° to the horizontal, is released from rest. P slides down the plane for a distance of 2.5 m and then reaches a horizontal plane. There is no change in speed when P reaches the horizontal plane. A particle Q of mass 0.2 kg lies at rest on the horizontal plane 1.5 m from the end of the inclined plane (see diagram). P collides directly with Q .

- (a) It is given that the horizontal plane is smooth and that, after the collision, P continues moving in the same direction, with speed 2 m s^{-1} .

Find the speed of Q after the collision.

[5]

- (b) It is given instead that the horizontal plane is rough and that when P and Q collide, they coalesce and move with speed 1.2 m s^{-1} .

Find the coefficient of friction between P and the horizontal plane.

[5]

5. June/2020/Paper_9709/42/No.4

Small smooth spheres A and B , of equal radii and of masses 4 kg and 2 kg respectively, lie on a smooth horizontal plane. Initially B is at rest and A is moving towards B with speed 10 m s^{-1} . After the spheres collide A continues to move in the same direction but with half the speed of B .

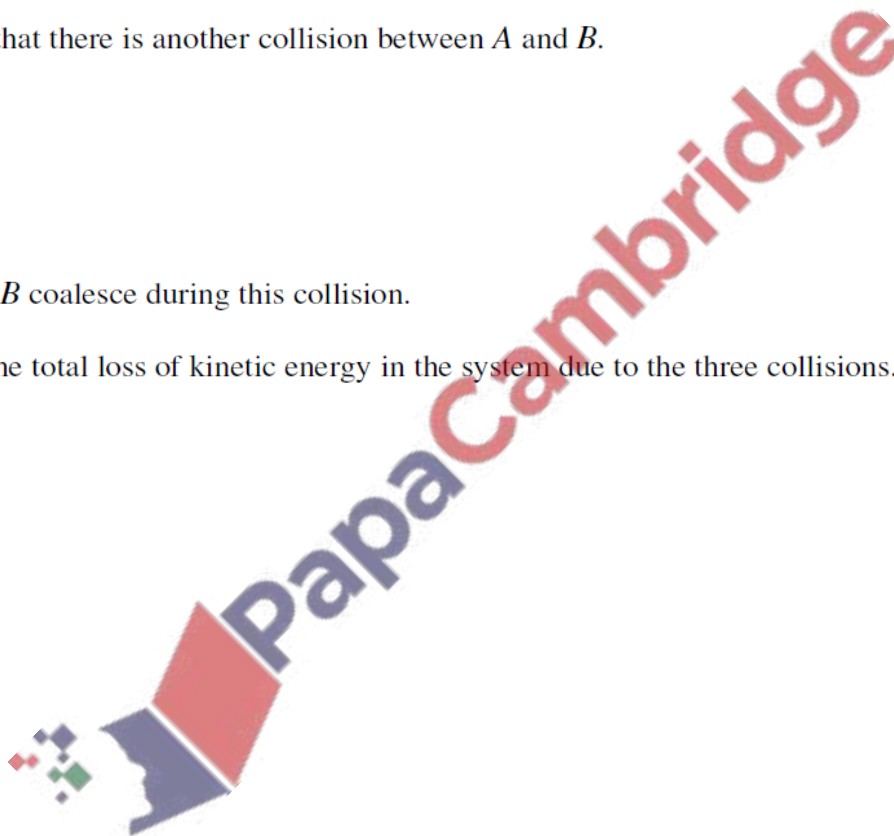
(a) Find the speed of B after the collision. [2]

A third small smooth sphere C , of mass 1 kg and with the same radius as A and B , is at rest on the plane. B now collides directly with C . After this collision B continues to move in the same direction but with one third the speed of C .

(b) Show that there is another collision between A and B . [3]

(c) A and B coalesce during this collision.

Find the total loss of kinetic energy in the system due to the three collisions. [5]



6. June/2020/Paper_9709/43/No.1

Particles P of mass m kg and Q of mass 0.2 kg are free to move on a smooth horizontal plane. P is projected at a speed of 2 m s^{-1} towards Q which is stationary. After the collision P and Q move in opposite directions with speeds of 0.5 m s^{-1} and 1 m s^{-1} respectively.

Find m .

[3]

