FM1 (Year 1) - Inelastic Collisions Exam Questions (Edexcel)

Q1.

Two particles A and B, of mass 2 kg and 3 kg respectively, are moving towards each other in opposite directions along the same straight line on a smooth horizontal surface. The particles collide directly. Immediately before the collision the speed of A is 5 m s^{-1} and the speed of B is 6 m s^{-1}. The magnitude of the impulse exerted on B by A is 14 N s. Find

(a) the speed of A immediately after the collision,

(3)

(b) the speed of B immediately after the collision.

(3)

(Total 6 marks)

(Q01 6677/01/R, June 2013)

Q2.

Two particles P and Q have masses $4m$ and m respectively. The particles are moving towards each other on a smooth horizontal plane and collide directly. The speeds of P and Q immediately before the collision are $2u$ and $5u$ respectively. Immediately after the collision, the speed of P is $\frac{1}{2}u$ and its direction of motion is reversed.

(a) Find the speed and direction of motion of Q after the collision.

(4)

(b) Find the magnitude of the impulse exerted on P by Q in the collision.

(3)

(Total 7 marks)

(Q01 6677/01, Jan 2013)

Q3.

Two particles A and B, of mass $5m$ kg and $2m$ kg respectively, are moving in opposite directions along the same straight horizontal line. The particles collide directly. Immediately before the collision, the speeds of A and B are 3 m s^{-1} and 4 m s^{-1} respectively. The direction of motion of A is unchanged by the collision. Immediately after the collision, the speed of A is 0.8 m s^{-1}.

(a) Find the speed of B immediately after the collision.

(3)

In the collision, the magnitude of the impulse exerted on A by B is 3.3 N s.

(b) Find the value of m.

(3)

(Total 6 marks)

(Q01 6677/01, June 2012)

Q4.

A railway truck P, of mass m kg, is moving along a straight horizontal track with speed 15 ms^{-1}. Truck P collides with a truck Q of mass 3000 kg, which is at rest on the same track. Immediately after the collision the speed of P is 3 ms^{-1} and the speed of Q is 9 ms^{-1}. The direction of motion of P is reversed by the collision.

Modelling the trucks as particles, find

(a) the magnitude of the impulse exerted by P on Q,

(2)

(b) the value of m.

(3)

(Total 5 marks)

(Q01 6677/01, Jan 2012)

Q5.

Particle P has mass 3 kg and particle Q has mass 2 kg. The particles are moving in opposite directions on a smooth horizontal plane when they collide directly. Immediately before the collision, P has speed 3 m s^{-1} and Q has speed 2 m s^{-1}. Immediately after the collision, both particles move in the same direction and the difference in their speeds is 1 m s^{-1}.

(a) Find the speed of each particle after the collision.

(5)

(b) Find the magnitude of the impulse exerted on P by Q.

(3)

(Total 8 marks)

(Q01 6677/01, June 2011)

Q6.

Two particles A and B, of mass 0.3 kg and m kg respectively, are moving in opposite directions along the same straight horizontal line so that the particles collide directly. Immediately before the collision, the speeds of A and B are 8 m s^{-1} and 4 m s^{-1} respectively. In the collision the direction of motion of each particle is reversed and, immediately after the collision, the speed of each particle is 2 m s^{-1}. Find

(a) the magnitude of the impulse exerted by B on A in the collision,

(3)

(b) the value of m.

(4)

(Total 7 marks)

(Q01 6677/01, June 2007)

Q7.
Two particles A and B have masses 4 kg and m kg respectively. They are moving towards each other in opposite directions on a smooth horizontal table when they collide directly. Immediately before the collision, the speed of A is 5 m s^{-1} and the speed of B is 3 m s^{-1}. Immediately after the collision, the direction of motion of A is unchanged and the speed of A is 1 m s^{-1}.

(a) Find the magnitude of the impulse exerted on A in the collision.

(2)

Immediately after the collision, the speed of B is 2 m s^{-1}.

(b) Find the value of m.

(4)

(Total 6 marks)

(Q01 6677/01, Jan 2008)

Q8.
Two particles A and B are moving on a smooth horizontal plane. The mass of A is $2m$ and the mass of B is m. The particles are moving along the same straight line but in opposite directions and they collide directly. Immediately before they collide the speed of A is $2u$ and the speed of B is $3u$. The magnitude of the impulse received by each particle in the collision is $\frac{7mu}{2}$.

Find

(a) the speed of A immediately after the collision,

(3)

(b) the speed of B immediately after the collision.

(3)

(Total 6 marks)

(Q01 6677/01, June 2009)

Q9.
Particle P of mass m and particle Q of mass km are moving in opposite directions on a smooth horizontal plane when they collide directly. Immediately before the collision the speed of P is $5u$ and the speed of Q is u. Immediately after the collision the speed of each particle is halved and the direction of motion of each particle is reversed.

Find

(a) the value of k,

(3)

(b) the magnitude of the impulse exerted on P by Q in the collision.

(3)

(Total for question = 6 marks)

(Q01 6677/01, June 2015)

Q10.

A particle P of mass 0.4 kg is moving on rough horizontal ground when it hits a fixed vertical plane wall. Immediately before hitting the wall, P is moving with speed 4 m s^{-1} in a direction perpendicular to the wall. The particle rebounds from the wall and comes to rest at a distance of 5 m from the wall. The coefficient of friction between P and the ground is $\frac{1}{8}$.

Find the magnitude of the impulse exerted on P by the wall.

(7)

(Total for question = 7 marks)

(Q01 6677/01, June 2016)

Q11.

Two particles A and B are moving on a smooth horizontal plane. The mass of A is km, where $2 < k < 3$, and the mass of B is m. The particles are moving along the same straight line, but in opposite directions, and they collide directly. Immediately before they collide the speed of A is $2u$ and the speed of B is $4u$. As a result of the collision the speed of A is halved and its direction of motion is reversed.

(a) Find, in terms of k and u, the speed of B immediately after the collision.

(3)

(b) State whether the direction of motion of B changes as a result of the collision, explaining your answer.

(3)

Given that $k = \frac{7}{3}$,

(c) find, in terms of m and u, the magnitude of the impulse that A exerts on B in the collision.

(3)

(Total 9 marks)

(Q01 6677/01, Jan 2009)