

Linear Momentum and Impulse

Question Paper

Level	Pre U
Subject	Maths
Exam Board	Cambridge International Examinations
Topic	Mechanics- Linear Momentum and Impulse
Booklet	Question Paper

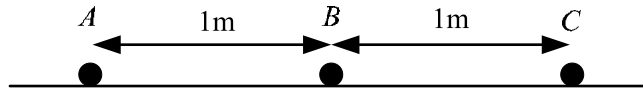
Time Allowed: 34 minutes

Score: /28

Percentage: /100

Grade Boundaries:

1



Three particles A , B and C , having masses of 1 kg, 2 kg and 5 kg respectively, are placed 1 metre apart in a straight line on a smooth horizontal plane (see diagram). The particles B and C are initially at rest and A is moving towards B with speed 14 ms^{-1} . The coefficient of restitution between each pair of particles is 0.5.

- (i) Find the velocity of B immediately after the first impact and show that A comes to rest. [4]
- (ii) Show that B reversed direction after the impact with C . [3]
- (iii) Find the distances between B and C at the instant that B collides with A for the second time. [3]

2

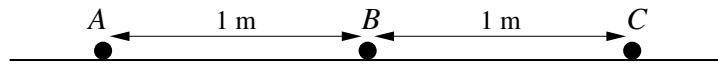
A particle A of mass $4m$, on a smooth horizontal plane, is moving with speed u directly towards another particle B , of mass $2m$, which is at rest. The coefficient of restitution between the two particles is e .

- (i) Show that, after the collision, the velocity of A is $\frac{1}{3}(2 - e)u$ and find the velocity of B . [4]
- (ii) Hence write down their velocities in the case when $e = \frac{1}{2}$. [1]

Particle B now collides directly with a third particle C , of mass m , which is at rest. The coefficient of restitution in both collisions is $\frac{1}{2}$.

- (iii) Use your answers to part (ii) to find the velocities of A , B and C after the second collision has taken place. [2]
- (iv) Explain briefly whether any further collisions take place. [1]

3



Three particles A , B and C , having masses 1 kg, 2 kg and 5 kg, respectively, are placed 1 metre apart in a straight line on a smooth horizontal plane (see diagram). The particles B and C are initially at rest and A is moving towards B with speed 14 m s^{-1} . The coefficient of restitution between each pair of particles is 0.5.

- (i) Find the velocity of B immediately after the first impact and show that A comes to rest. [4]
- (ii) Show that B reverses direction after an impact with C . [3]
- (iii) Find the distance between B and C at the instant that B collides with A for the second time. [3]