1. A tennis ball of mass m moving horizontally with speed u strikes a vertical tennis racket. The ball bounces back with a horizontal speed v.

The magnitude of the change in momentum of the ball is

A. $m(u + v)$.

B. $m(u - v)$.

C. $m(v - u)$.

D.   zero.

B

2. A gas atom strikes a wall with speed v at an angle θ to the normal to the wall. The atom rebounds at the same speed v and angle θ.

Which of the following gives the magnitude of the momentum change of the gas atom?

A.   zero

B. $2mv \sin\theta$

C. $2mv$

D. $2mv \cos\theta$

D

3. This question is about collisions.

(a)   State the principle of conservation of momentum.

…………………$\Delta P = m(v1\text{-}v2) = 0$……………………

(2)

(b)   In an experiment, an air-rifle pellet is fired into a block of modelling clay that rests on a table.

(not to scale)

The air-rifle pellet remains inside the clay block after the impact.

As a result of the collision, the clay block slides along the table in a straight line and comes to rest. Further data relating to the experiment are given below.

Mass of air-rifle pellet	= 2.0 g
Mass of clay block	= 56 g
Velocity of impact of air-rifle pellet	= 140 m s^{-1}
Stopping distance of clay block	= 2.8 m

(i)   Show that the initial speed of the clay block after the air-rifle pellet strikes it is 4.8 m s^{-1}.

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(2)

(ii) Calculate the average frictional force that the surface of the table exerts on the clay block whilst the clay block is moving.

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(4)

4. Two carts of different mass m and M are connected by a spring. They are pushed together such that the spring is compressed.

After the carts are released, the cart of mass m moves with velocity v. The change in the momentum of mass M is

A. mv.

B. $-mv$.

C. Mv.

D. $-Mv$.

(Total 1 mark)