

- 2 (a) Fig. 2.1 shows the velocity–time graph for an object moving in a straight line.

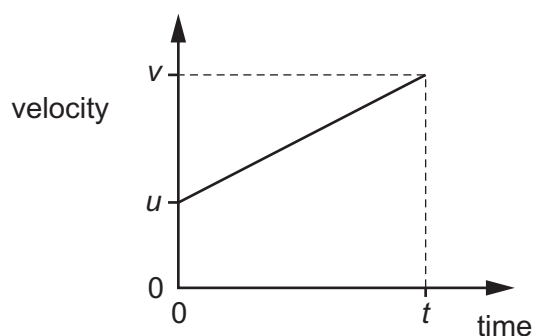


Fig. 2.1

- (i) Determine an expression, in terms of u , v and t , for the area under the graph.

area = [1]

- (ii) State the name of the quantity represented by the area under the graph.

..... [1]

- (b) A ball is kicked with a velocity of 15 m s^{-1} at an angle of 60° to horizontal ground. The ball then strikes a vertical wall at the instant when the path of the ball becomes horizontal, as shown in Fig. 2.2.

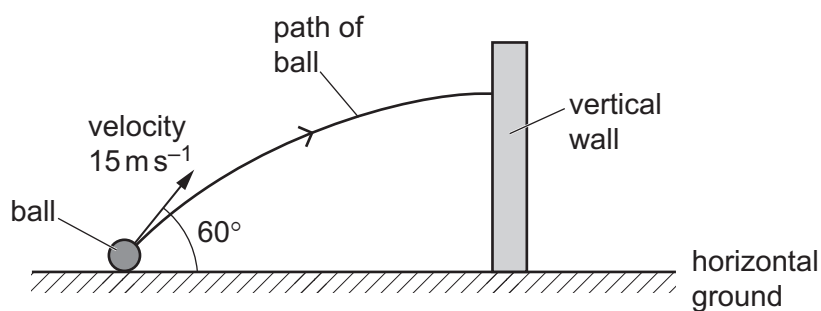


Fig. 2.2 (not to scale)

Assume that air resistance is negligible.

- (i) By considering the vertical motion of the ball, calculate the time it takes to reach the wall.

time = s [3]

- (ii) Explain why the horizontal component of the velocity of the ball remains constant as it moves to the wall.

.....
..... [1]

- (iii) Show that the ball strikes the wall with a horizontal velocity of 7.5 m s^{-1} .

[1]

- (c) The mass of the ball in (b) is 0.40 kg . It is in contact with the wall for a time of 0.12 s and rebounds horizontally with a speed of 4.3 m s^{-1} .

- (i) the information from (b)(iii) to calculate the change in momentum of the ball due to the collision.

change in momentum = kg m s^{-1} [2]

- (ii) Calculate the magnitude of the average force exerted on the ball by the wall.

average force = N [1]

[Total: 10]