1 A small pellet of mass 8.00×10^{-3} kg is projected at an angle θ above the horizontal, as shown in Fig.1.1. The speed of projection is u.
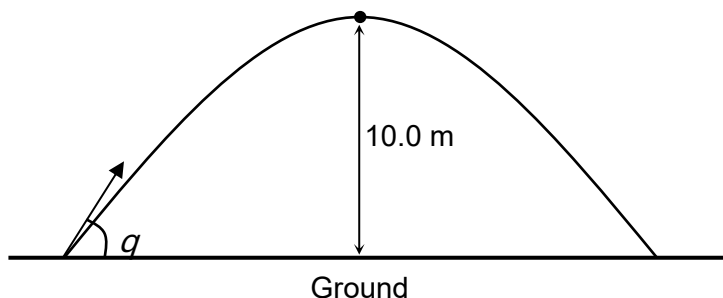

Fig. 1.1

The pellet reaches a maximum height of 10.0 m and travels at a speed of 5.00 m s^{-1} at maximum height.

(a) Air resistance is negligible.

    (i) Using energy conservation, show that the initial speed of projection is 14.9 m s^{-1}.

[1]

    (ii) Calculate the angle of projection θ.

θ = ………………… ° [2]

    (iii) Determine the time taken by the pellet from launch to impact with the ground.

time = ………………… s [2]

(iv) Determine the average rate of change of momentum of the pellet from the instant of projection to the instant before it hits the ground.

rate of change of momentum = ……………… N [1]

(b) Fig. 1.2. shows part of the graph (up to the maximum height) of the variation with time of the vertical displacement of the pellet when air resistance is not negligible.

Complete the graph from the maximum height to the instant the pellet hits the ground. Numerical values are not required. [2]
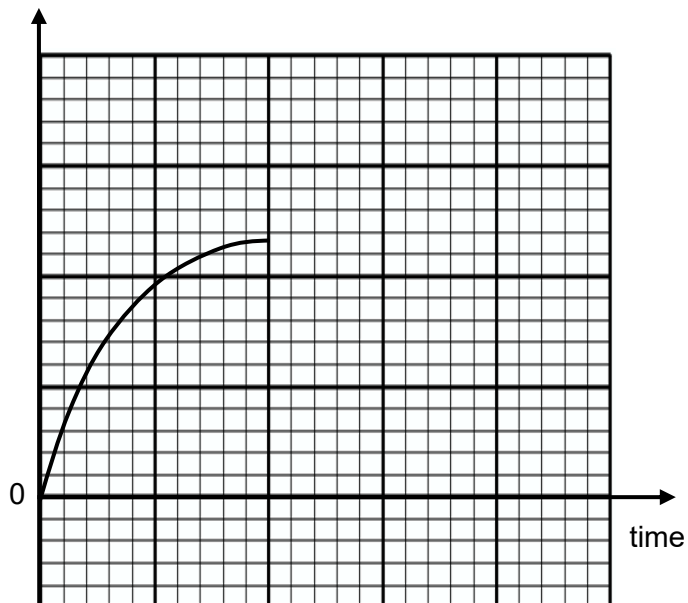
Vertical displacement

Fig. 1.2