2 Water leaves the end of a hose pipe at point P with a horizontal velocity of 6.6 m s⁻¹, as shown in Fig. 2.1.
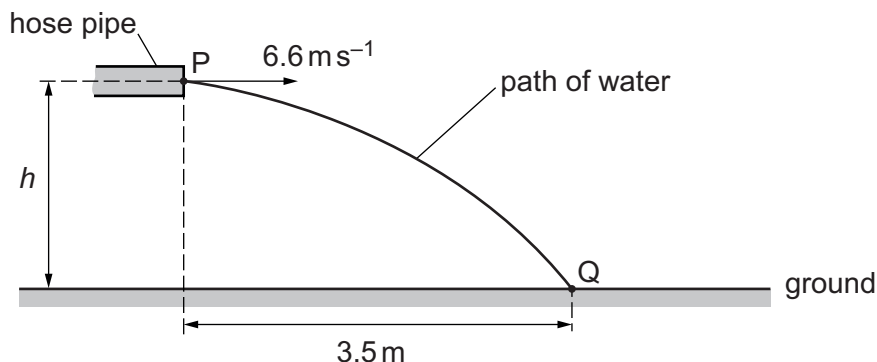

Fig. 2.1 (not to scale)

Point P is at height h above the ground. The water hits the ground at point Q. The horizontal distance from P to Q is 3.5 m.

Air resistance is negligible. Assume that the water between P and Q consists of non-interacting droplets of water and that the only force acting on each droplet is its weight.

(a) Explain, briefly, why the horizontal component of the velocity of a droplet of water remains constant as it moves from P to Q.

....

.... [1]

(b) Show that the time taken for a droplet of water to move from P to Q is 0.53 s.

[1]

(c) Calculate height h.

$h =$ .... m [2]

(d) For the movement of a droplet of water from P to Q, state and explain whether the displacement of the droplet is less than, more than or the same as the distance along its path.

....

....

.... [1]

(e) Calculate the magnitude of the displacement of a droplet of water that moves from P to Q.

displacement = ...m [2]