1 **(a)** Explain what is meant by *acceleration*.

.....[1]

(b) A ball is kicked from horizontal ground towards the top of a vertical wall, as shown in Fig. 1.1.

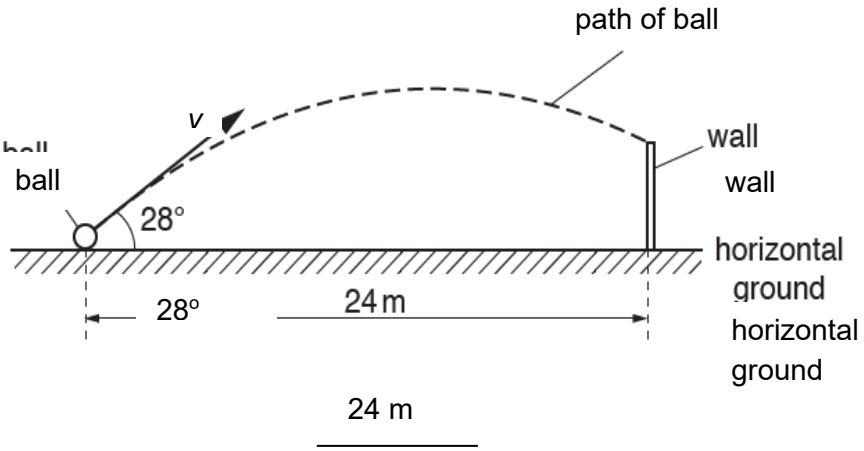


Fig. 1.1 (not to scale)

The horizontal distance between the initial position of the ball and the base of the wall is 24 m. The ball is kicked with an initial velocity v at an angle of 28° to the horizontal. The ball hits the top of the wall after a time of 1.5 s. Air resistance may be assumed to be negligible.

(i) Calculate the initial horizontal component v_X of the velocity of the ball.

v_X = ……m s^{-1} [1]

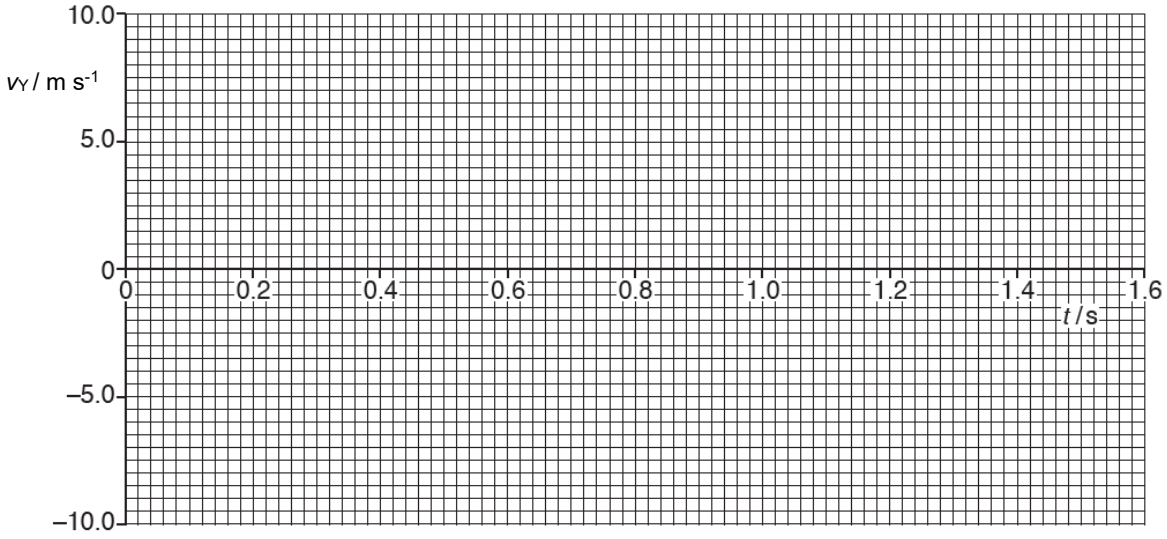
(ii) Show that the initial vertical component v_Y of the velocity of the ball is 8.5 m s^{-1}.

[1]

(iii) Calculate the time taken for the ball to reach its maximum height above the ground.

time = …… s [2]

(iv) The ball is kicked at time $t = 0$. On Fig. 1.2, sketch the variation with time t of the vertical component v_Y of the velocity of the ball until it hits the wall. It may be assumed that velocity is positive when in the upward direction.



[2]

(c) Determine the maximum height of the ball above the ground.

Fig. 1.2

maximum height = …… m [2]

(d) A ball of greater mass is kicked with the same velocity as the ball in **(b)**.

State and explain the effect, if any, of the increased mass on the maximum height reached by the ball. Air resistance is still assumed to be negligible.

……..……...

…….. [1]