

- 6 A ball is thrown vertically upwards from ground level. Air resistance is **not** negligible. The variation with time t of the vertical velocity v of the ball is shown in Fig. 6.1.

For
Examiner's
Use

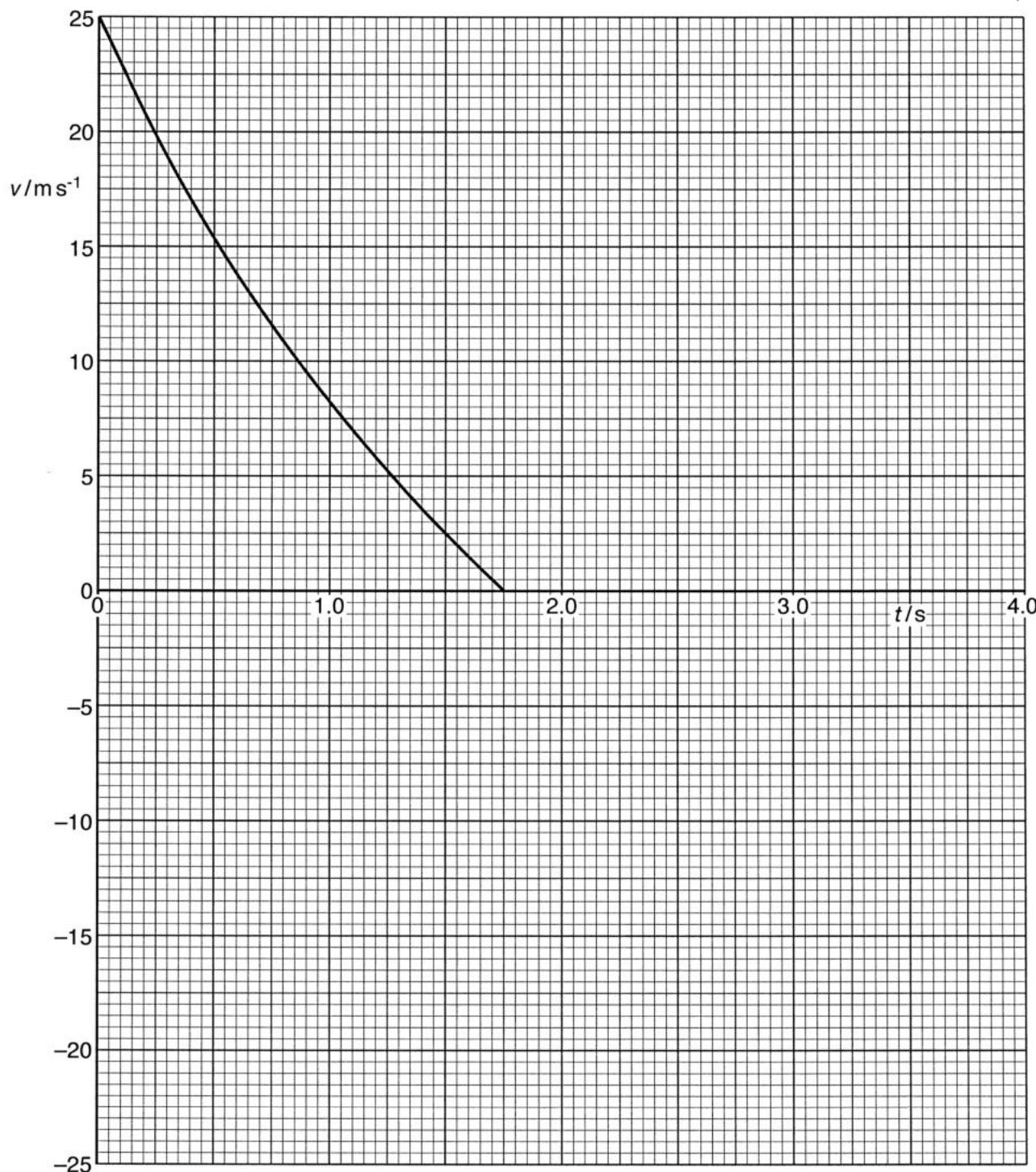


Fig. 6.1

- (a) Use Fig. 6.1 to explain how it may be deduced that air resistance varies with speed.

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[2]

- (b) State and explain, without any calculation, the feature of Fig. 6.1 that enables the magnitude of the acceleration of free fall to be determined.

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[2]

- (c) (i) Use Fig. 6.1 to determine the maximum height reached by the ball.

height = m [4]

- (ii) Use your answer in (i) to calculate the ratio

energy lost from the ball due to air resistance during the ball's upward motion
initial kinetic energy of the ball

ratio = [4]

- (d) The ball has mass 350 g.
For the instant when this ball is travelling at 10 m s^{-1} ,
- (i) use Fig. 6.1 to show that the acceleration of the ball is approximately -13 m s^{-2} ,

[2]

- (ii) calculate the magnitude of the force due to air resistance on the ball.

force = N [3]

- (e) On Fig. 6.1, sketch the graph to show the variation with time t of the velocity v of the ball as it falls back to ground level. [3]