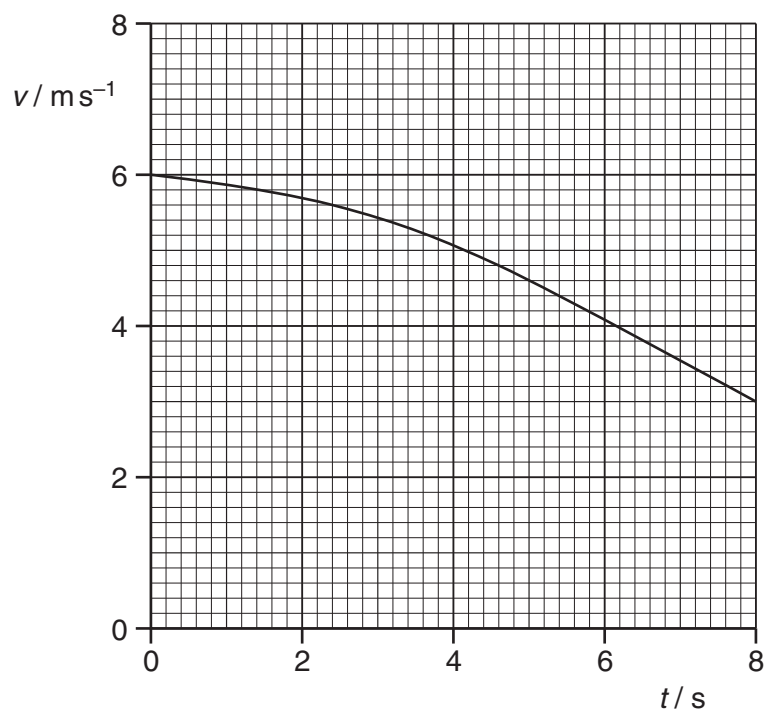


- 3 A cyclist is moving up a slope that has a constant gradient. The cyclist takes 8.0 s to climb the slope.  
The variation with time  $t$  of the speed  $v$  of the cyclist is shown in Fig. 3.1.



**Fig. 3.1**

- (a) Fig. 3.1 to determine the total distance moved up the slope.

distance = ..... m [3]

- (b) The bicycle and cyclist have a combined mass of 92 kg.  
The vertical height through which the cyclist moves is 1.3 m.

(i) the movement of the bicycle and cyclist between  $t = 0$  and  $t = 8.0$  s,

1. use Fig. 3.1 to calculate the change in kinetic energy,

change = ..... J [2]

2. calculate the change in gravitational potential energy.

change = ..... J [2]

- (ii) The cyclist pedals continuously so that the useful power delivered to the bicycle is 75 W.

Calculate the useful work done by the cyclist climbing up the slope.

work done = ..... J [2]

(c) Some energy is used in overcoming frictional forces.

(i) Use your answers in (b) to show that the total energy converted in overcoming frictional forces is approximately 670 J.

[1]

(ii) Determine the average magnitude of the frictional forces.

average force = .....N [1]

(d) Suggest why the magnitude of the total resistive force would not be constant.

.....  
.....  
.....[2]