3 (a) Define *power*.

....

.... [1]

(b) A cyclist travels along a horizontal road. The variation with time *t* of speed *v* is shown in Fig. 3.1.
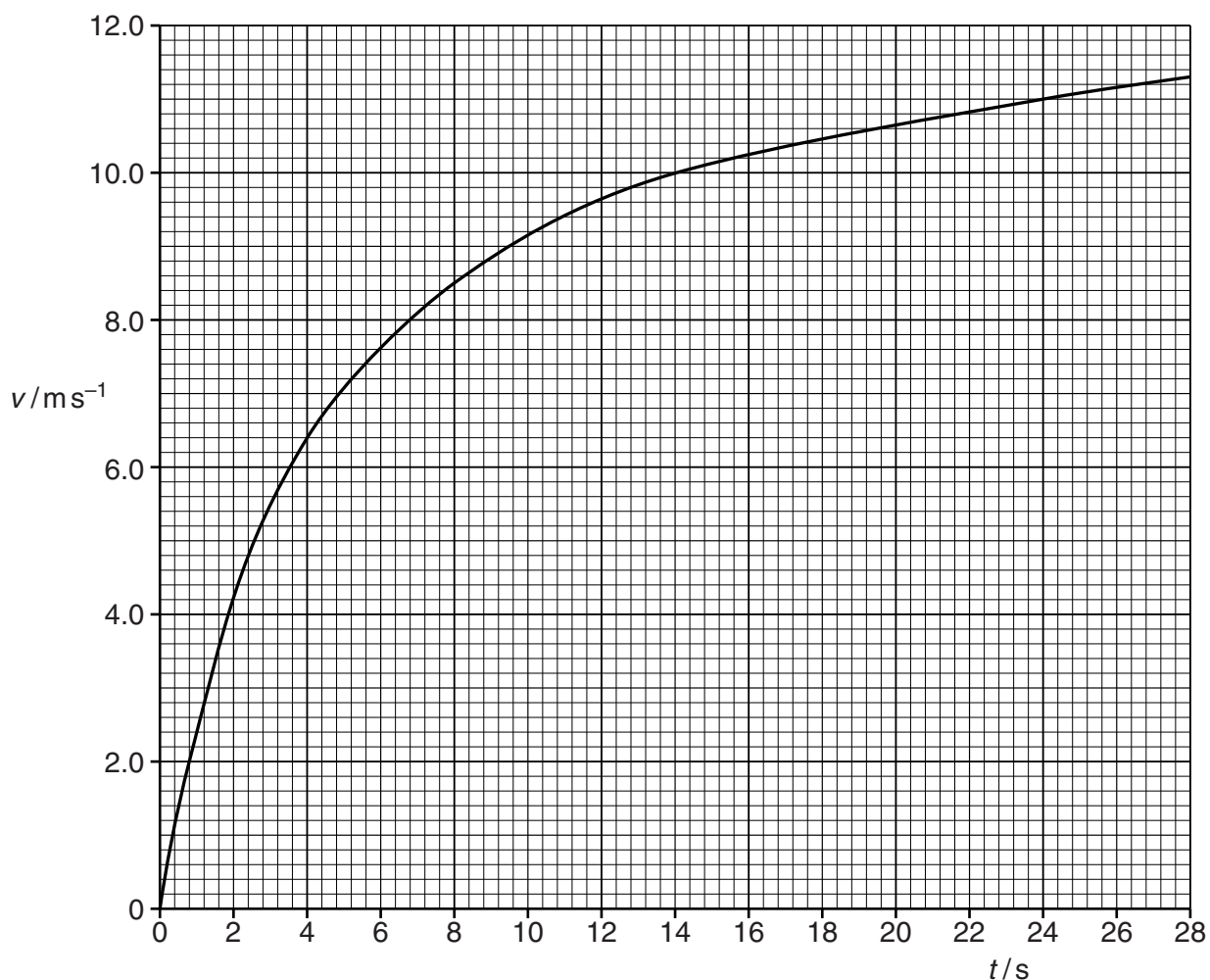

Fig. 3.1

The cyclist maintains a constant power and after some time reaches a constant speed of 12 m s^{-1}.

(i) Describe and explain the motion of the cyclist.

....

....

....

....

.... [3]

         [Turn over

(ii) When the cyclist is moving at a constant speed of $12\,\text{m}\,\text{s}^{-1}$ the resistive force is $48\,\text{N}$. Show that the power of the cyclist is about $600\,\text{W}$. Explain your working.

[2]

(iii) Use Fig. 3.1 to show that the acceleration of the cyclist when his speed is $8.0\,\text{m}\,\text{s}^{-1}$ is about $0.5\,\text{m}\,\text{s}^{-2}$.

[2]

(iv) The total mass of the cyclist and bicycle is $80\,\text{kg}$. Calculate the resistive force R acting on the cyclist when his speed is $8.0\,\text{m}\,\text{s}^{-1}$. Use the value for the acceleration given in **(iii)**.

R = ... N [3]

(v) Use the information given in **(ii)** and your answer to **(iv)** to show that, in this situation, the resistive force R is proportional to the speed v of the cyclist.

[1]