2 A skydiver jumps from an aircraft at time $t = 0$ and falls vertically downwards. The variation with t of her velocity v is shown in Fig. 2.1.

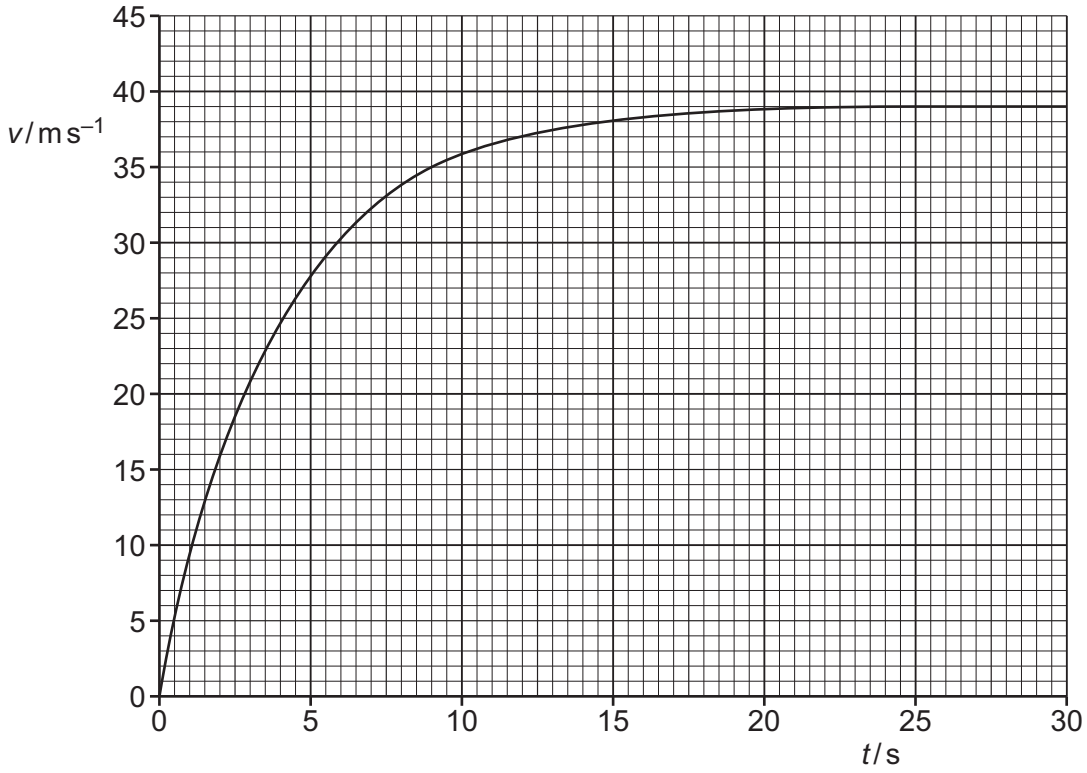

Fig. 2.1

(a) (i) Using Fig. 2.1, state the terminal velocity of the skydiver.

terminal velocity = ...m s^{-1} [1]

(ii) By drawing a suitable line on Fig. 2.1, determine the acceleration of the skydiver at time $t = 9.0$ s.

acceleration = ...m s^{-2} [2]

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(b) The mass of the skydiver and her equipment is 68 kg. The upthrust on the skydiver is negligible.

After reaching terminal velocity, the skydiver opens her parachute at time t_1. A total drag force of 1800 N acts on the skydiver.

Determine the magnitude and direction of the acceleration of the skydiver at time t_1.

acceleration = ... $m\,s^{-2}$

direction = ...

[3]

(c) The parachute is fully open at time t_2. At a later time t_3 the skydiver reaches a constant velocity of 5.7 $m\,s^{-1}$.

(i) Describe and explain the variation with time of the magnitude of her acceleration between time t_2 and time t_3.

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..... [2]

(ii) Calculate the change in momentum of the skydiver between time t_1 and time t_3.

change in momentum = ... N s [2]

[Total: 10]