1 A parachutist of mass 85 kg steps out of the doorway and falls from an aircraft.

The variation with time t of vertical speed v of the parachutist is shown in Fig. 1.1.

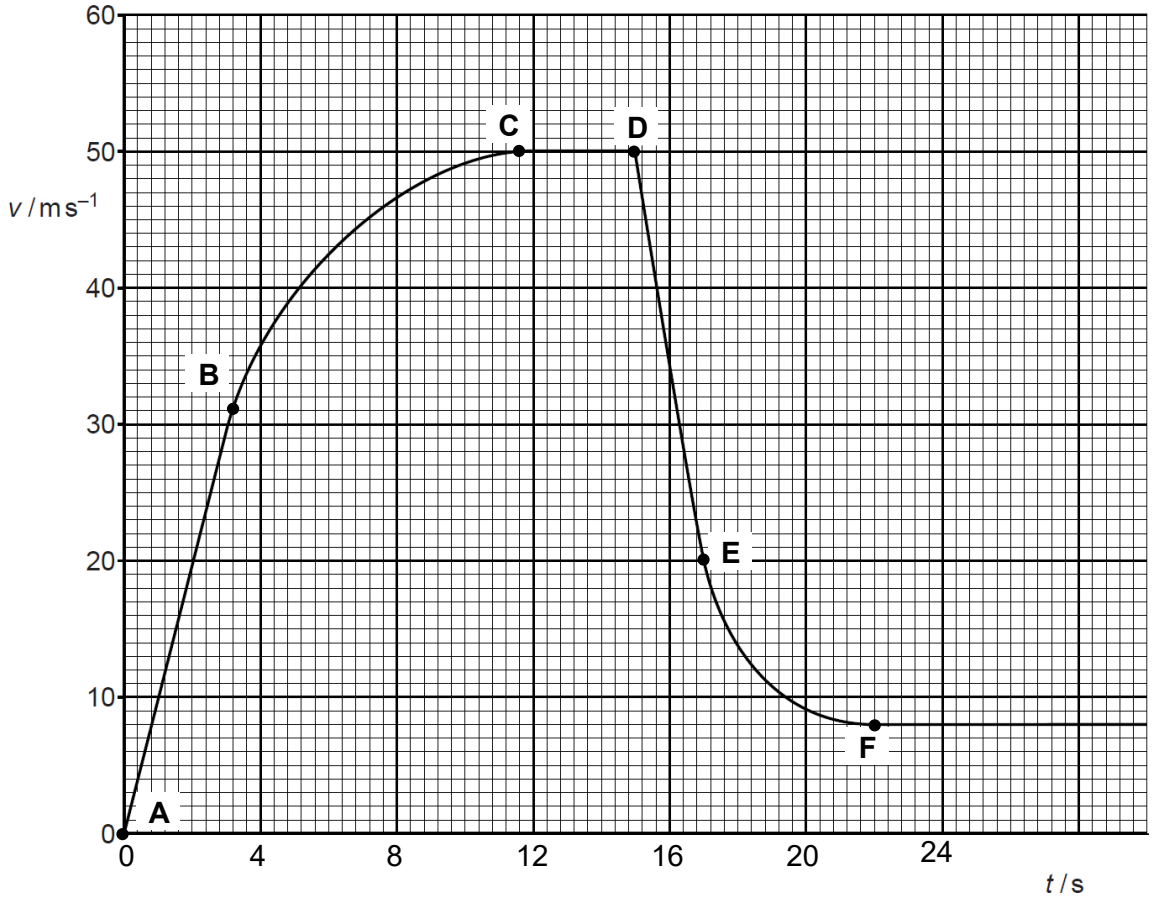

Fig. 1.1

(a) The parachutist activates his parachute at some point during the fall.

State the point (**A, B, C, D, E or F**) on the graph at which the parachute was activated.

point ..... [1]

(b) For the parachutist between t = 15 s (point **D**) and t = 17 s (point **E**),

(i) calculate the average vertical deceleration,

deceleration = …….. m s^{-2} [2]

(ii) determine the vertical distance fallen by the parachutist,

distance = …….. m [2]

(iii) determine the average vertical air resistance acting on the parachutist.

average vertical air resistance = …….. N [2]

(c) Explain why the vertical velocity decreases from t = 17 s (point **E**) to t = 22 s (point **F**) and reaches a constant velocity after point F.

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…….....[3]

(d) After point **F**, the parachutist continues to fall at the same constant speed and reaches the ground some time later. Upon first contact with the ground, he executes the parachute landing fall and goes from an upright position to a horizontal position by buckling his body while rotating to the side as shown in Fig. 1.2.

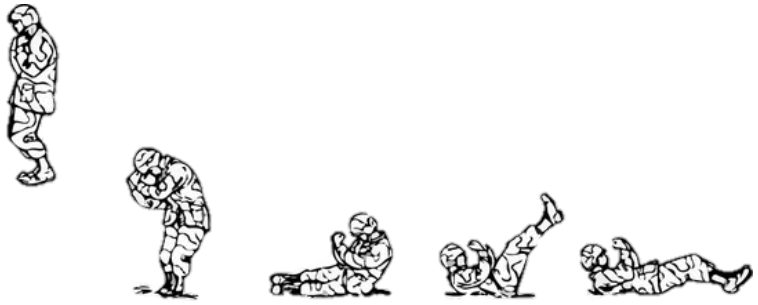

Fig. 1.2

(i) Explain two ways in which the parachute landing fall helps to prevent injury to the parachutist.

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…… [2]

(ii) By considering the principle of conservation of linear momentum, state and explain whether momentum is conserved in this landing.

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……..[2]

[Total: 14]