

1. (a) (i) What do you understand by the terms 'systematic errors' and 'random errors'?

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[2 marks]

- (ii) Explain the difference between precision and accuracy.

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[3 marks]

- (b)

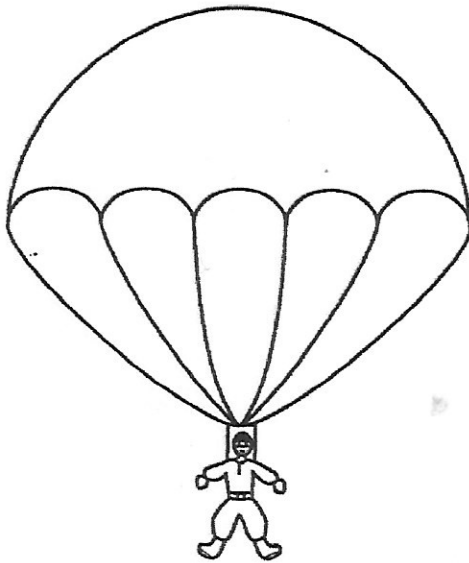


Figure 1

A parachutist falls at his terminal velocity. At the terminal velocity the drag force balances the force due to gravity by the equation

$$mg = \frac{1}{2}\rho AC_d v^2$$

where  $m$  is the mass of the man and parachute,  $\rho$  is the density of the air,  $A$  is the area,  $C_d$  is the drag coefficient and  $v$ , the terminal velocity.

Given that

$$m = 120 \pm 1.5 \text{ kg}$$

$$\rho = 1.3 \pm 0.1 \text{ kg m}^{-3}$$

$$A = 4.00 \pm 0.05 \text{ m}^2$$

$$C_d = 0.6$$

Calculate the

- (i) terminal velocity

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[3 marks]

- (ii) uncertainty associated with the terminal velocity.

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[2 marks]

**Total 10 marks**

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