1 The drag force F_D acting on an object falling through air is given by

$$F_D = \frac{1}{2} C\rho A v^2$$

where A is the cross-sectional area of the object,
v is the velocity of the object in the air,
ρ is the density of the air and
C is a constant called the drag coefficient.

(a) Use SI base units to show that the drag coefficient has no units.

[3]

(b) Fig. 1.1 shows a sphere falling at terminal velocity in air.

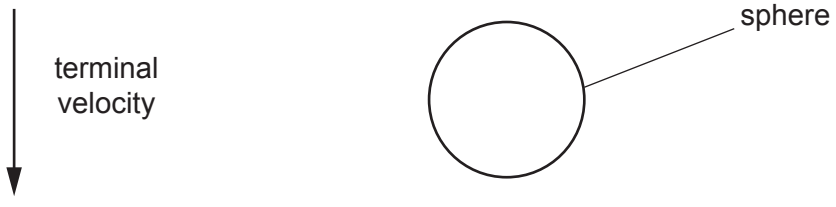

Fig. 1.1

Assume that the upthrust on the sphere is negligible.

On Fig. 1.1, draw and label arrows to show the directions of the **two** forces acting on the sphere. [2]

(c) The mass of the sphere is 49 g.

Calculate the drag force F_D acting on the sphere.

F_D = ... N [2]

(d) The sphere is falling in air at a terminal velocity of 25 in SI base units.
The density of the air is 1.2 in SI base units.
The diameter of the sphere is 0.060 in SI base units.

Use your answer in **(c)** to calculate the drag coefficient *C* for the sphere.

C = ... [3]

[Total: 10]