

18 An object of mass 35 kg fell from a boat to the seabed.

(a) The object reached terminal velocity as it fell.

- (i) Show that the drag force acting on the object at terminal velocity was about 200 N.

$$\text{volume of object} = 1.60 \times 10^{-2} \text{ m}^3$$

$$\text{density of seawater} = 1.03 \times 10^3 \text{ kg m}^{-3}$$

(5)

- (ii) The drag force D on the object obeyed the formula

$$D = kv^2$$

where v is the speed of the object.

Determine the terminal velocity of the object.

$$k = 2.2 \text{ N s}^2 \text{ m}^{-2}$$

(2)

Terminal velocity =

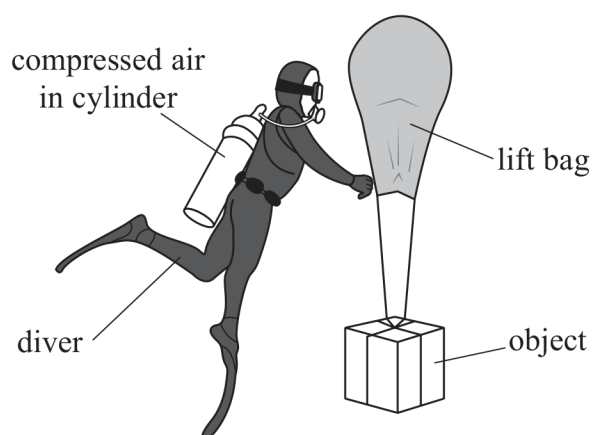


- (iii) Give **two** reasons why Stokes' law could **not** be used to calculate the terminal velocity of the object.

(2)

- (b) To lift the heavy object from the seabed, a diver used a 'lift bag'.

The diver used compressed air from a cylinder to fill the lift bag, as shown.



When released, the lift bag and object accelerated upwards until they reached a maximum velocity.

Explain why the lift bag and object reached a maximum velocity.

(3)