**2** A metal block, of 15 cm height, was partially submerged in water of density $1.0 \times 10^3$ kg $m^{-3}$. The block has a uniform density, $\rho$, and a uniform cross-sectional area, $A$. The block is held up by an inelastic cord tied to a mass hanger, through two frictionless pulleys, as shown in
Fig. 2.1.

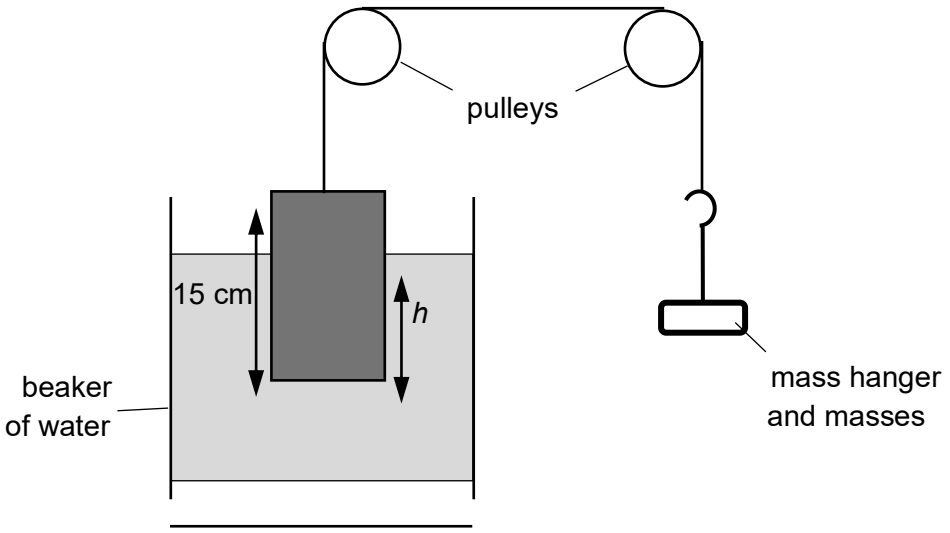


**Fig. 2.1**

Different quantities of masses were added to the mass hanger and the corresponding submerged height, $h$, of the block was measured.

The variation of total mass $m$ of mass hanger and masses added, with the submerged height, $h$, is shown in Fig. 2.2.

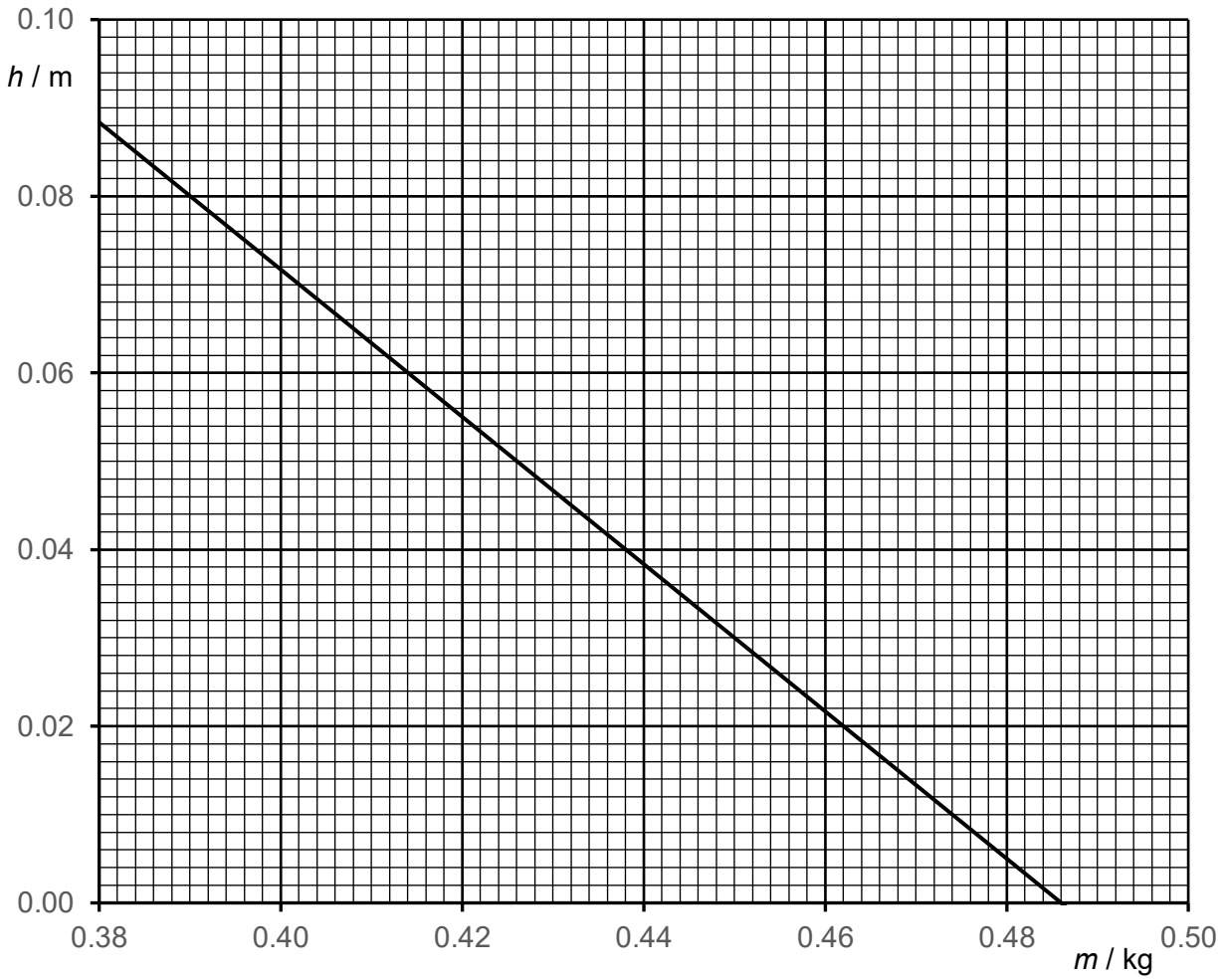


**Fig. 2.2**

**(a)** Using Fig. 2.2, determine the total mass $m$ required to remove the metal block from the water.

$m$ = ..... kg [1]

**(b)** By considering the forces acting on the metal block, show that the gradient of the graph in Fig. 2.2 is represented by $-\left(\frac{1}{1.0\times10^{3}A}\right)$.

[2]

**(c)** Hence, determine the cross-sectional area, $A$.

$A$ = ..... $m^2$ [2]

**(d)** Determine the density of the metal block, $\rho$.

$\rho$ = ..... kg $m^{-3}$ [2]

[Total: 7]