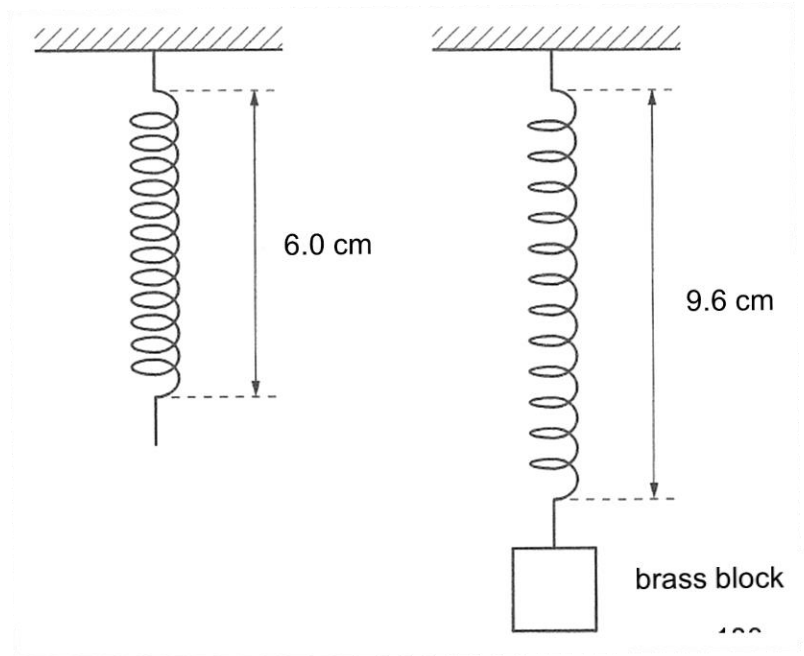


1

A spring has an unstretched length of 6.0 cm. The top of the spring is attached to a fixed point.

A brass block of mass 180 g and volume $2.0 \times 10^{-5} \text{ m}^3$ is suspended from the lower end so that the length of the spring increases to 9.6 cm, shown in Fig. 1.1.



brass block

180

Fig. 1.1

Fig 1.1 is not drawn to scale.

(a)

Calculate the force constant of the spring.

force constant = N m^{-1} [2]

(b)

The percentage uncertainty in the mass is $\pm 2.0\%$. The actual uncertainty in each measurement of the length of the spring is $\pm 1 \text{ mm}$.

Calculate the actual uncertainty in the force constant.

actual uncertainty = N m^{-1} [2]

(c)

The block is submerged in a liquid of density ρ . The length of the spring is now 9.0 cm, as shown in Fig. 1.2.

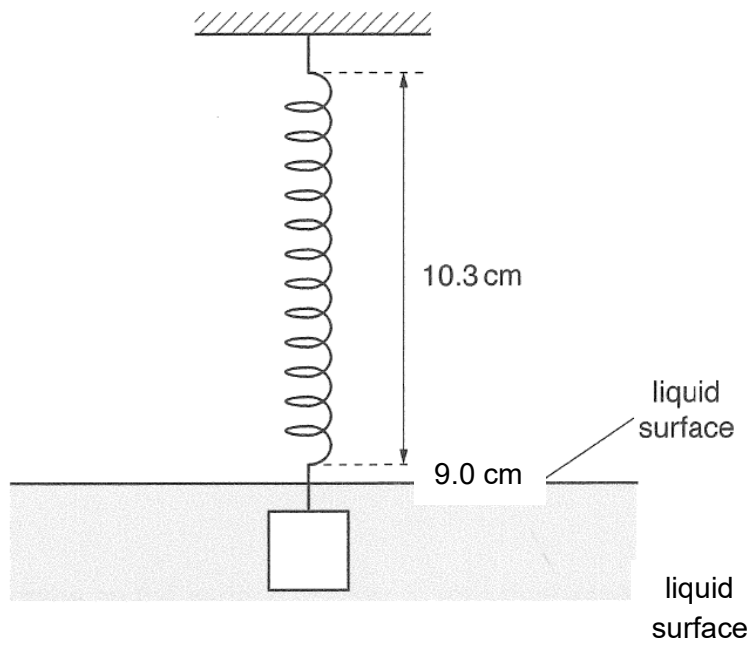


Fig. 1.2

(i)

Using the definitions of pressure and density, show that the hydrostatic pressure p at a depth h below the surface of the liquid is given by

$$p = \rho gh$$

where g is the acceleration of free fall.

[2]

(ii)

Hence, or otherwise, determine ρ .

$$\rho = \dots\dots\dots \text{kg m}^{-3} \text{ [3]}$$

[Total: 9]