

AS Level Physics A
H156/02 Depth in physics

Question Set 18

1 (a)

A student measures the diameter of a ball in different directions.

The student's results are:

2.43 cm 2.54 cm 2.59 cm

(i) State the name of a suitable measuring instrument to measure the diameter of the ball.

[1]

(ii) Calculate the mean diameter d of the ball.
Include the absolute uncertainty in d .

$d =$ \pm cm

[2]

(iii) Show that the volume of the ball is about $8.4 \times 10^{-6} \text{ m}^3$.

[1]

(iv) The mass of the ball is 23 ± 1 g.
Determine the density ρ of the ball.
Give your answer to an appropriate number of significant figures.

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

(v) Determine the percentage uncertainty in ρ .

percentage uncertainty = % [2]

(b)

The 23 g mass ball from (a) is used in an experiment with a spring.

The student measures the unstretched length L_0 of a spring as shown in Fig. 3.1.

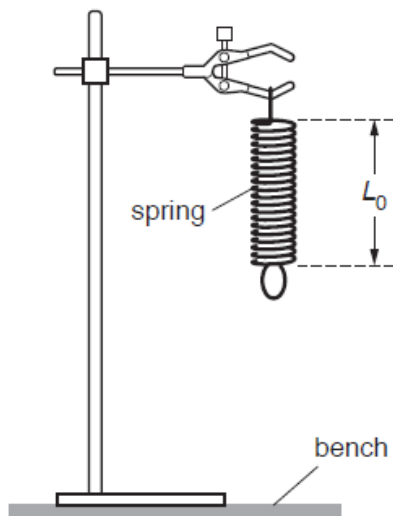


Fig. 3.1

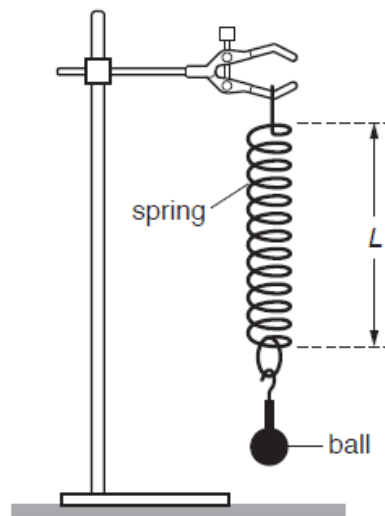


Fig. 3.2

The student's results are:

$$L_0 = 0.078 \text{ m} \quad \text{and} \quad L = 0.096 \text{ m}$$

Calculate the force constant k of the spring.

$k =$

Nm^{-1}

[3]

(c)

The 23g mass ball from (a) and the spring from (b) are now used in an experiment to investigate upthrust.

The ball attached to the spring is lowered into a beaker containing a liquid so that it is totally submerged. The student measures the new length L_N of the spring, as shown in Fig. 3.3.

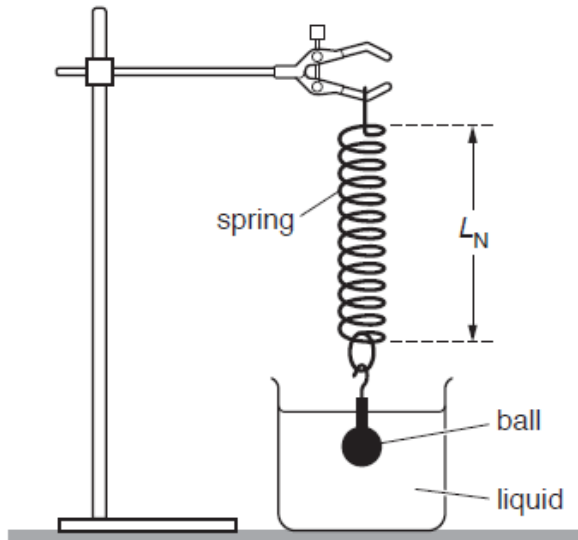


Fig. 3.3

The length L_N of the spring is now 0.088 m.

(i) Calculate the upthrust on the submerged ball.

upthrust = _____ N [2]

(ii) Calculate the density of the liquid.

density of liquid = _____ kg m^{-3} [2]

Total Marks for Question Set 18: 15

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