25 Practical Physics

1. An experiment is performed to find the refractive index of glass using a travelling microscope. In this experiment distances are measured by
(a) a screw gauge provided on the microscope
(b) a vernier scale provided on the microscope
(c) a standard laboratory scale
(d) a meter scale provided on the microscope.
(2008)

2. While measuring the speed of sound by performing a resonance column experiment, a student gets the first resonance condition at a column length of 18 cm during winter. Repeating the same experiment during summer, she measures the column length to be x cm for the second resonance. Then
(a) $36 > x > 18$ (b) $18 > x$
(c) $x > 54$ (d) $54 > x > 36$.
(2008)

3. Two full turns of the circular scale of a screw gauge cover a distance of 1 mm on its main scale. The total number of divisions on the circular scale is 50. Further, it is found that the screw gauge has a zero error of – 0.03 mm. While measuring the diameter of a thin wire, a student notes the main scale reading of 3 mm and the number of circular scale divisions in line with the main scale as 35. The diameter of the wire is
(a) 3.38 mm (b) 3.32 mm
(c) 3.73 mm (d) 3.67 mm.
(2008)

Answer Key

1. (b) **2.** (c) **3.** (a)

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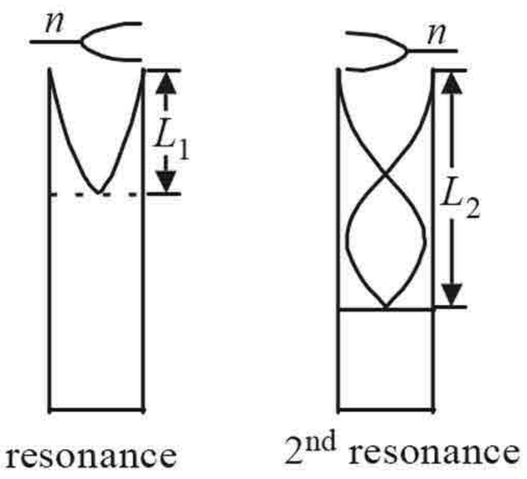
EXPLANATIONS

1. **(b) :** A travelling microscope moves horizontally on a main scale provided with a vernier scale, provided with the microscope.

2. **(c) :** $v_1 = \sqrt{\frac{\gamma RT}{M}}$ assuming M is the average molar mass of the air (*i.e.*, nitrogen) and γ is also for nitrogen.



1st resonance 2nd resonance

$v_1 = \sqrt{\frac{\gamma RT_1}{M}}$; $v_2 = \sqrt{\frac{\gamma RT_2}{M}}$ where T_1 and T_2 stand for winter and summer temperatures.

$L_1 = \frac{v_1}{n} = \frac{\lambda}{4} = 18$ cm. At temperature T_1

At T_2, summer, $v_2 > v_1$.

$L_2 = \frac{v_2}{n} = \frac{3\lambda}{4} > 3 \times 18.$

$\therefore \; L_2 > 54$ cm.

3. **(a) :** Least count of the screw gauge

$$= \frac{0.5 \text{ mm}}{50} = 0.01 \text{ mm}$$

Main scale reading = 3 mm.

Vernier scale reading = 35

$\therefore$ Observed reading = 3 + 0.35 = 3.35

zero error = –0.03

$\therefore$ actual diameter of the wire = 3.35 – (–0.03)

= 3.38 mm.