

8 Superposition — Part 2 — Answers

Answers

8.1 Four times ($I \propto A^2$, and the amplitude doubles).

8.2 $L = \frac{1}{2}\lambda$, so $\lambda = 2 \times 0.60 = 1.2$ m.

8.3 Closed pipe fundamental: $L = \frac{1}{4}\lambda$, so $\lambda = 4 \times 0.25 = 1.0$ m.

8.4 $d = \frac{1}{300}$ mm $= 3.33 \times 10^{-6}$ m; $\sin \theta = \frac{500 \times 10^{-9}}{3.33 \times 10^{-6}} = 0.15$, so $\theta \approx 8.6^\circ$.

8.5 $d = \frac{1}{400}$ mm $= 2.5 \times 10^{-6}$ m.

8.6 Intensity depends on amplitude *squared* ($I \propto A^2$). Two equal waves in phase give amplitude $2A$, and $(2A)^2 = 4A^2$ — so the intensity is four times that of one wave.

8.7 $d \sin \theta = n\lambda$, so $\sin \theta_2 = 2 \times \sin \theta_1 = 2 \times 0.30 = 0.60$, giving $\theta_2 \approx 37^\circ$.