For the double-slits-finite-width setup: “d” is slit-distance, “a” slit-width. Incident light has a wavelength \( \lambda \). Denote \( \phi = k \Delta = k d \theta \) and \( \beta = k a \theta \). The intensity is given by:

\[
\frac{I(\phi, \beta)}{I(0, 0)} = \cos^2 \frac{\phi}{2} \left[ \frac{\sin \frac{\beta}{2}}{\frac{\beta}{2}} \right]^2.
\]

Here the “double-slit \( \phi \)-pattern” oscillates within the “single-slit \( \beta \)-pattern”, while the latter serves as an envelope (dotted distribution above).

If the \( d = 6 \, a \), number of zeros within the dotted central peak is:

A) 6
B) 8
C) 10
D) 12
First minimum of single-slit is at $\beta = 2\pi$, or $\theta_1^s = \frac{2\pi}{ka} = \frac{\lambda}{a}$, that of double-slit is at $\phi = \pi$, or $\theta_1^d = \frac{\pi}{kd} = \frac{\lambda}{2d}$. For $d = 6a$, $\theta_1^d = \frac{1}{12a} = \frac{\theta_1^s}{12}$. For double slits, zeros are at: $\phi = [1, 3, \ldots, 11] \pi$, or $\theta = \pm[\frac{1}{12}, \ldots, \frac{11}{12}] \theta_1^s$. There are $12 (= 2 \times 6)$ zeros within central peak.

Answer D.

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