

3. (a) The condition for a minimum in a single-slit diffraction pattern is given by $a \sin \theta = m\lambda$, where a is the slit width, λ is the wavelength, and m is an integer. For $\lambda = \lambda_a$ and $m = 1$, the angle θ is the same as for $\lambda = \lambda_b$ and $m = 2$. Thus $\lambda_a = 2\lambda_b$.
- (b) Let m_a be the integer associated with a minimum in the pattern produced by light with wavelength λ_a , and let m_b be the integer associated with a minimum in the pattern produced by light with wavelength λ_b . A minimum in one pattern coincides with a minimum in the other if they occur at the same angle. This means $m_a \lambda_a = m_b \lambda_b$. Since $\lambda_a = 2\lambda_b$, the minima coincide if $2m_a = m_b$. Consequently, every other minimum of the λ_b pattern coincides with a minimum of the λ_a pattern.