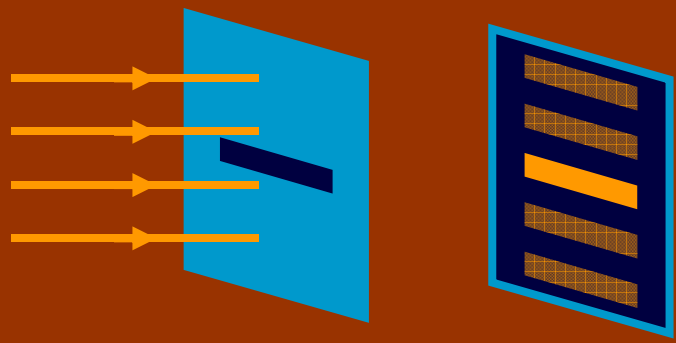
Diffraction I

The diffraction pattern below arises from a single slit. If we would like to sharpen the pattern, i.e., make the central bright spot narrower, what should we do to the slit width?

1) narrow the slit
2) widen the slit
3) enlarge the screen
4) close off the slit



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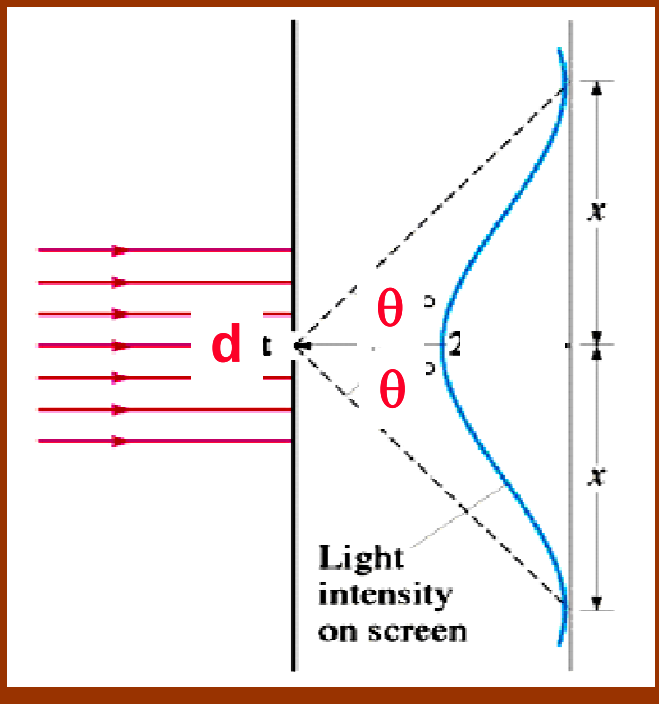
The angle at which one finds the first minimum is:

$$\sin\theta = \lambda / d$$

The central bright spot can be narrowed by having a smaller angle. This in turn is accomplished by widening the slit.



Diffraction II

Blue light **of wavelength λ passes through a single slit of width *d* and forms a diffraction pattern on a screen. If the *blue light* is replaced by *red light* of wavelength 2λ, the original diffraction pattern can be reproduced if the slit width is changed to:**

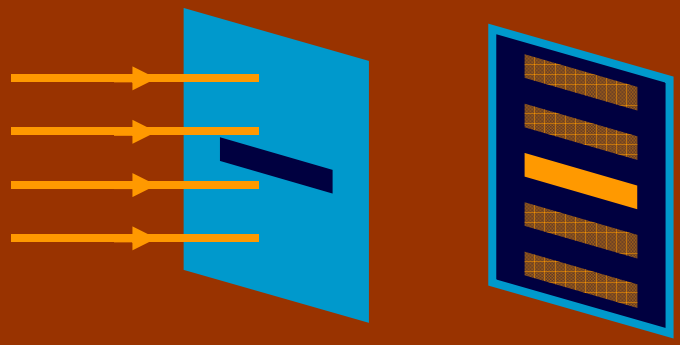
1) *d*/4

2) *d*/2

3) no change needed

4) 2 *d*

5) 4 *d*



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2) *d*/2
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$$d \sin\theta = m\lambda \quad \text{(minima)}$$

If $\lambda \rightarrow 2\lambda$ then we must have $d \rightarrow 2d$ for $\sin\theta$ to remain unchanged (and thus give the same diffraction pattern).