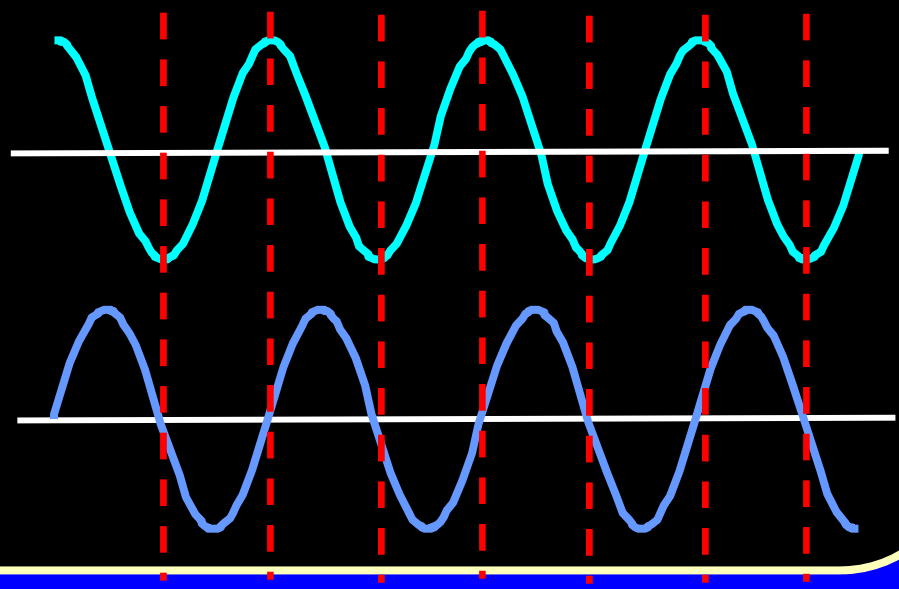
ConcepTest 34.2a Phase Difference I

The two waves shown are

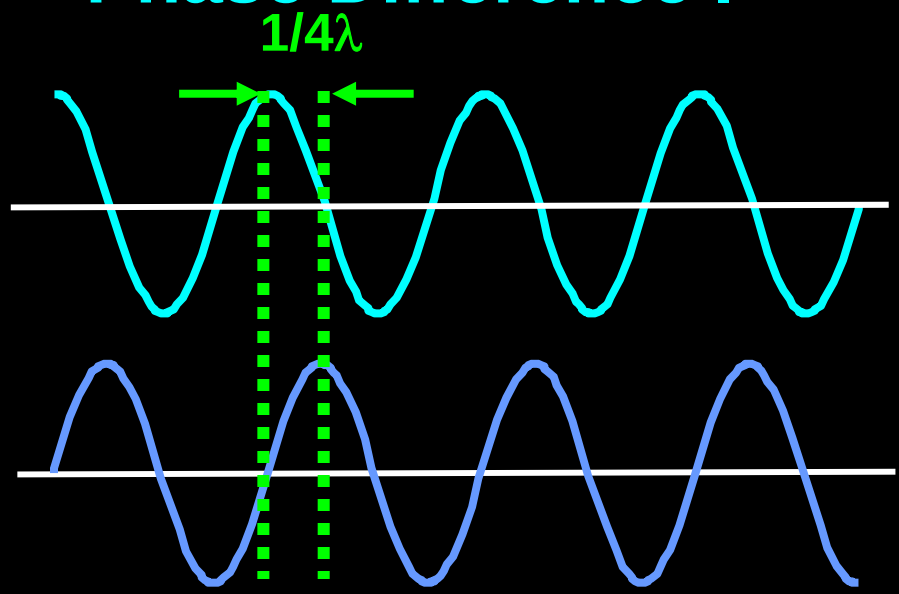
1) out of phase by 180°
2) out of phase by 90°
3) out of phase by 45°
4) out of phase by 360°
5) in phase



ConcepTest 34.2a Phase Difference I

The two waves shown are

1) out of phase by 180°
2) out of phase by 90°
3) out of phase by 45°
4) out of phase by 360°
5) in phase



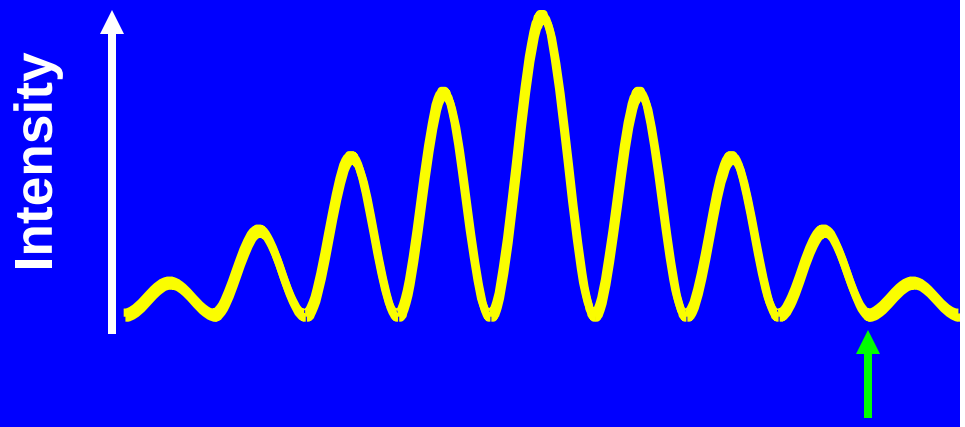
The two waves are out of phase by **1/4 wavelength** (as seen in the figure), which corresponds to a phase difference of **90°**.

Follow-up: What would the waves look like for (4) to be correct?

ConcepTest 34.4 Path Difference

In a double-slit experiment, what *path difference* have the waves from each slit traveled to give a minimum at the indicated position?

1) there is no difference
2) half a wavelength
3) one wavelength
4) three wavelengths
5) more than three wavelengths



ConcepTest 34.4 Path Difference

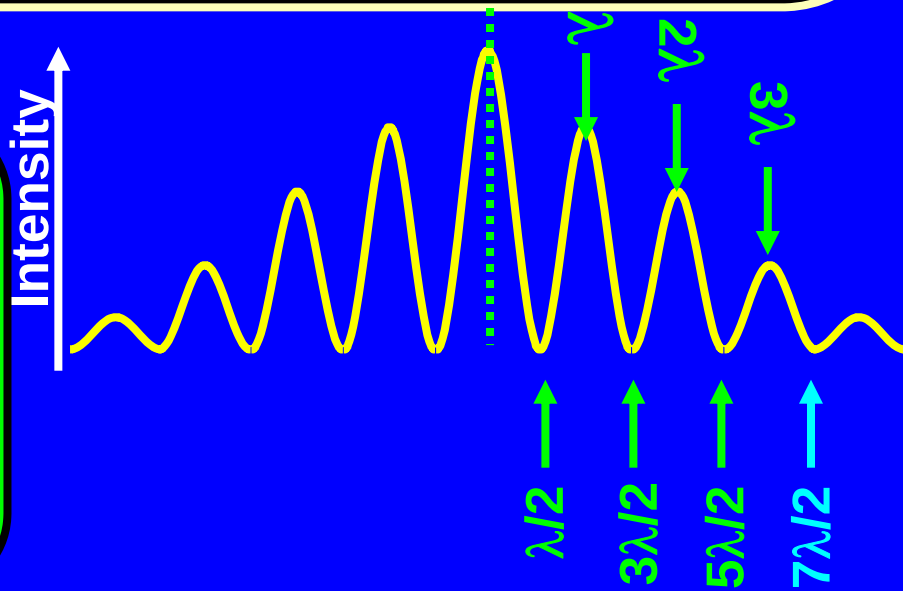
In a double-slit experiment, what *path difference* have the waves from each slit traveled to give a minimum at the indicated position?

1) there is no difference
2) half a wavelength
3) one wavelength
4) three wavelengths
5) more than three wavelengths

For destructive interference

$\delta = 1/2\ \lambda,\ 3/2\ \lambda,\ 5/2\ \lambda,\ 7/2\ \lambda, \ldots$

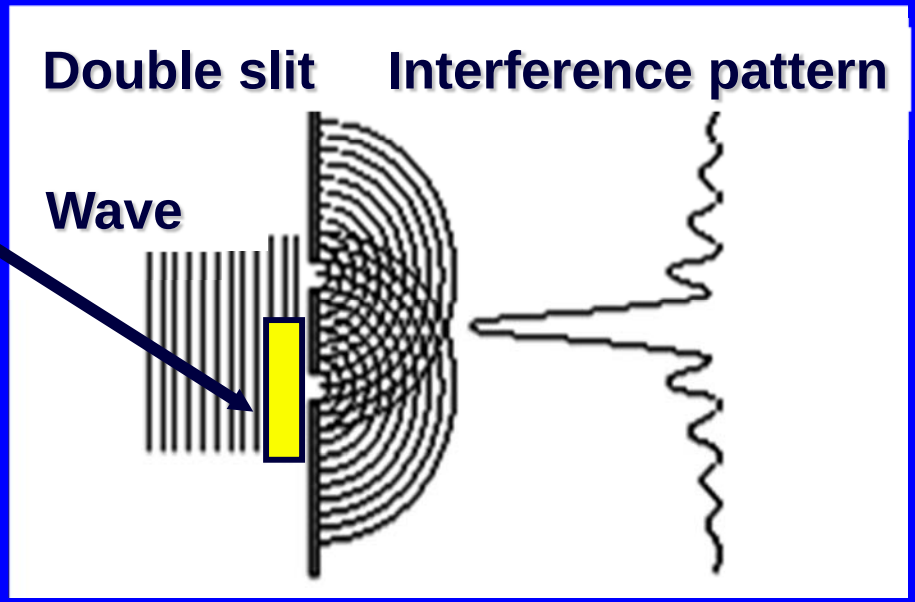
$= (m + 1/2)\ \lambda$



ConcepTest 34.5 Interference Pattern

An interference pattern is seen from two slits. Now cover one slit with glass, introducing a ***phase difference of 180° (1/2 wavelength)*** at the slits. How is the pattern altered?

1) pattern vanishes
2) pattern expands
3) bright and dark spots are interchanged
4) pattern shrinks
5) no change at all

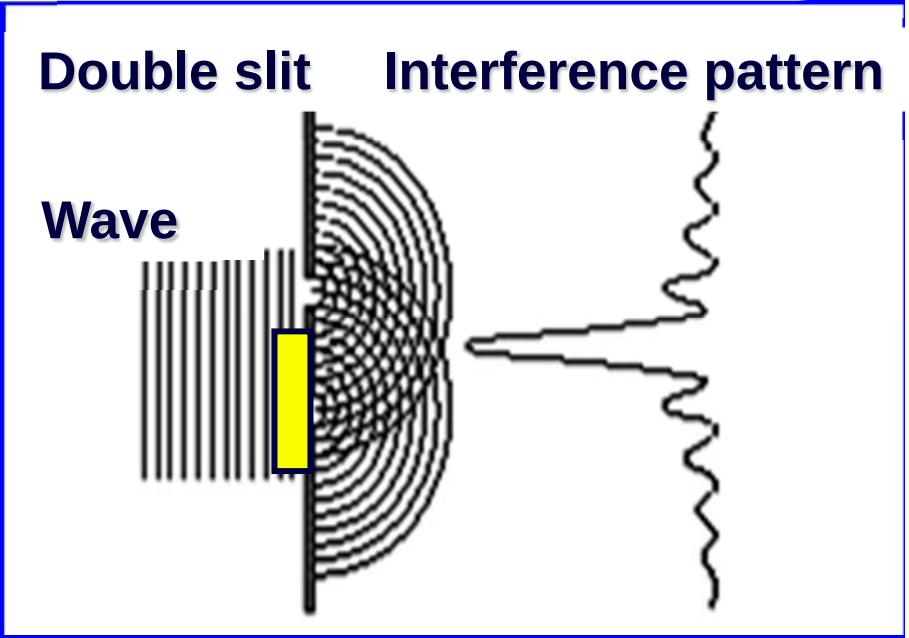


ConcepTest 34.5 Interference Pattern

An interference pattern is seen from two slits. Now cover one slit with glass, introducing a *phase difference of 180° (1/2 wavelength)* at the slits. How is the pattern altered?

1) pattern vanishes
2) pattern expands
3) bright and dark spots are interchanged
4) pattern shrinks
5) no change at all

If the waves originating from the two slits have a **phase difference of 180°** when they start off, the central spot will now be **dark**!! To the left and the right, there will be bright spots. Thus, **bright and dark spots are interchanged**.



Follow-up: What happens when the phase difference is 90°?

ConcepTest 34.1 Superposition

If waves A and B are superposed (that is, their amplitudes are *added*) the resultant wave is

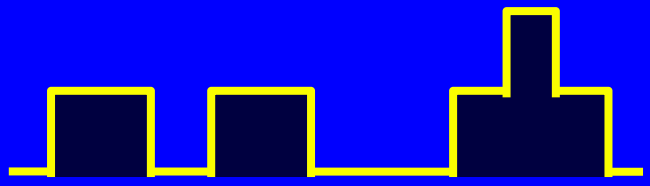
A

B

1)

2)

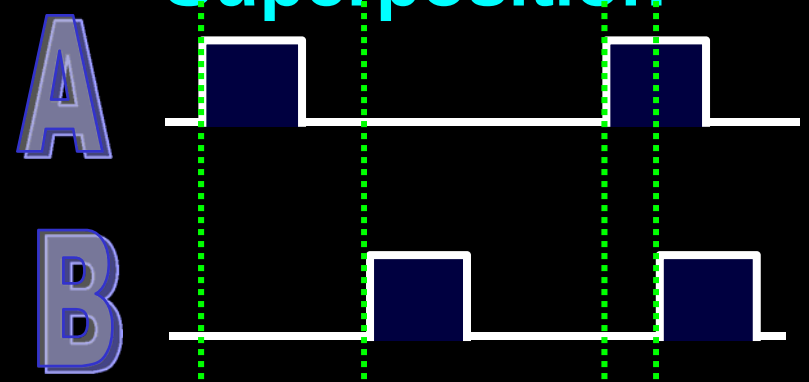
3)



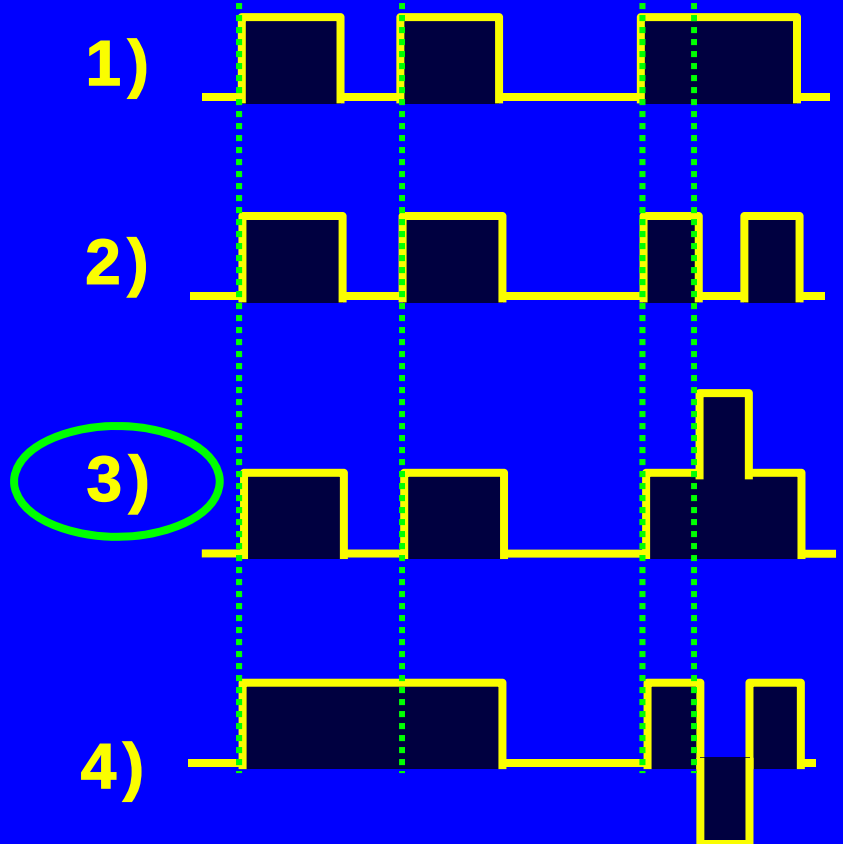
4)

ConcepTest 34.1 Superposition

If waves A and B are superposed (that is, their amplitudes are *added*) the resultant wave is



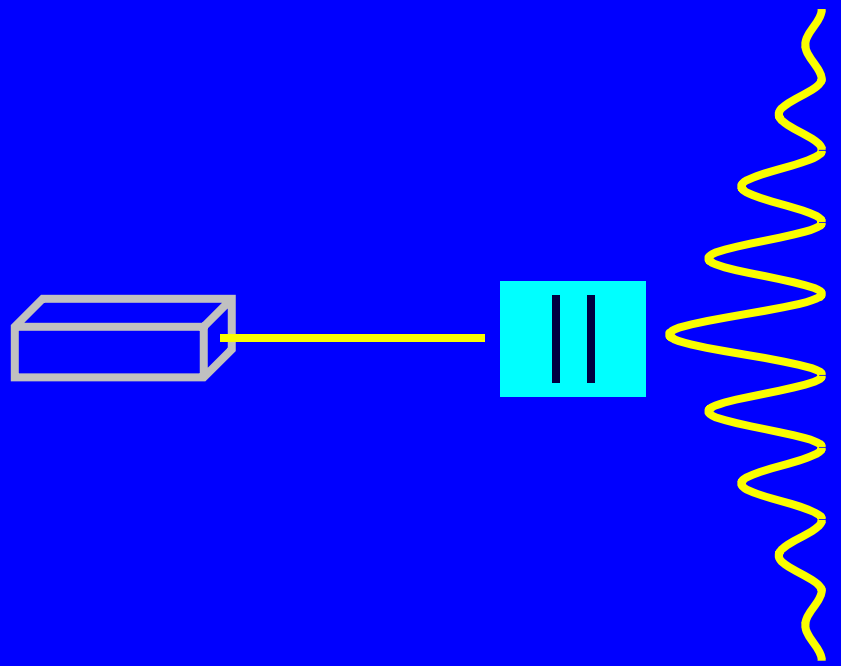
The amplitudes of waves A and B have to be added at each point!



ConcepTest 34.3a Double Slits I

In a double-slit experiment, when the wavelength of the light is increased, the interference pattern

1) spreads out
2) stays the same
3) shrinks together
4) disappears



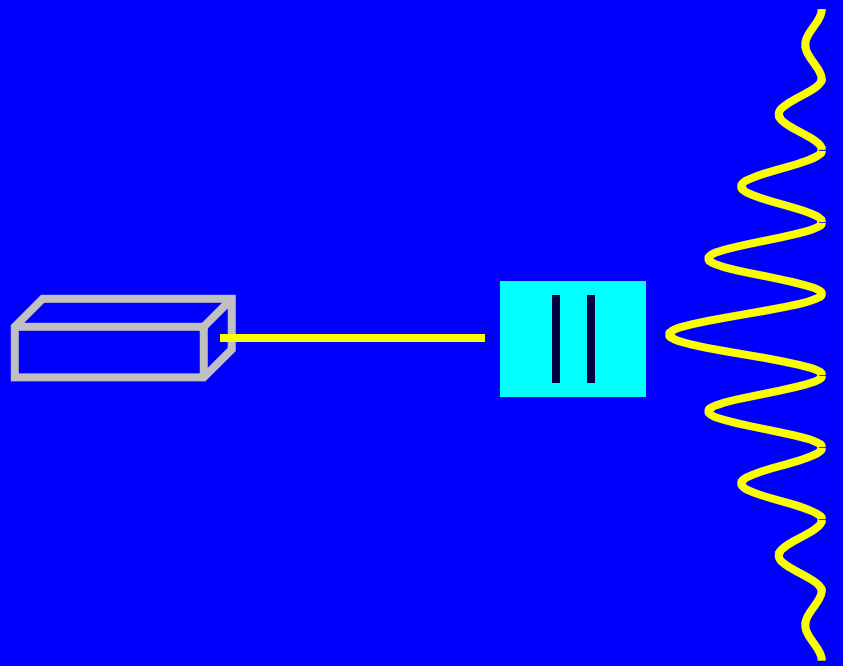
ConcepTest 34.3a Double Slits I

In a double-slit experiment, when the wavelength of the light is increased, the interference pattern

1) spreads out
2) stays the same
3) shrinks together
4) disappears

$d \sin\theta = m\lambda$

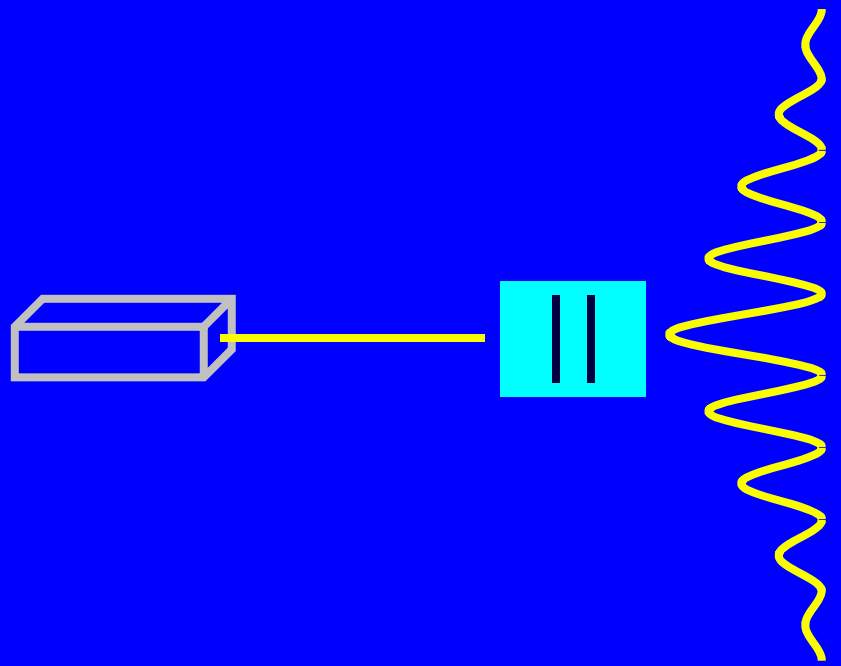
If λ is increased and d does not change, then θ must increase, so the pattern spreads out.



ConcepTest 34.3b Double Slits II

If instead the slits are moved farther apart (without changing the wavelength) the interference pattern

1) spreads out
2) stays the same
3) shrinks together
4) disappears



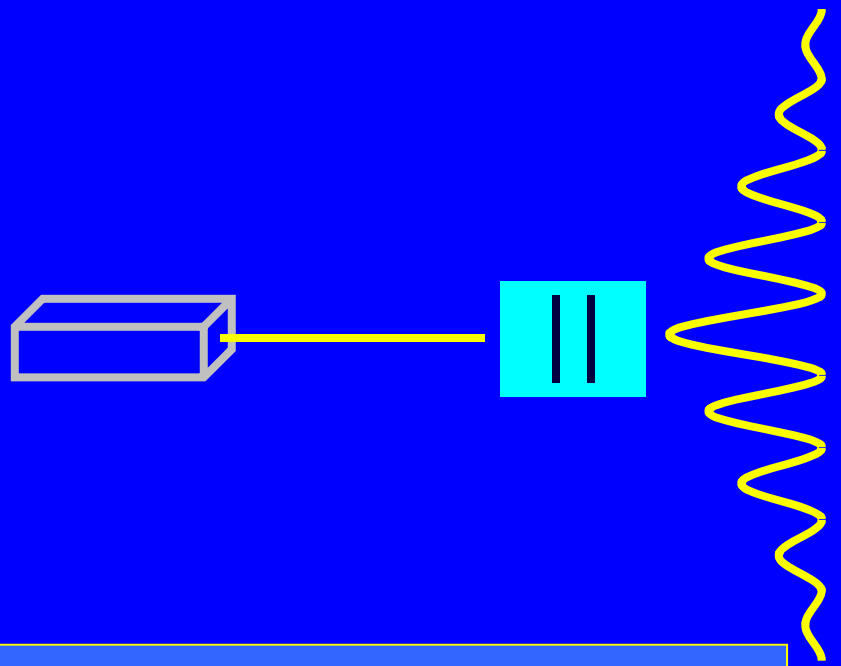
ConcepTest 34.3b Double Slits II

If instead the slits are moved farther apart (without changing the wavelength) the interference pattern

1) spreads out
2) stays the same
3) shrinks together
4) disappears

$d \sin\theta = m\lambda$

If instead d is increased and λ does not change, then θ must decrease, so the pattern shrinks together.



Follow-up: When would the interference pattern disappear?