Overlapping Waves from a Double Slit

Light Intensity

Light

Barrier
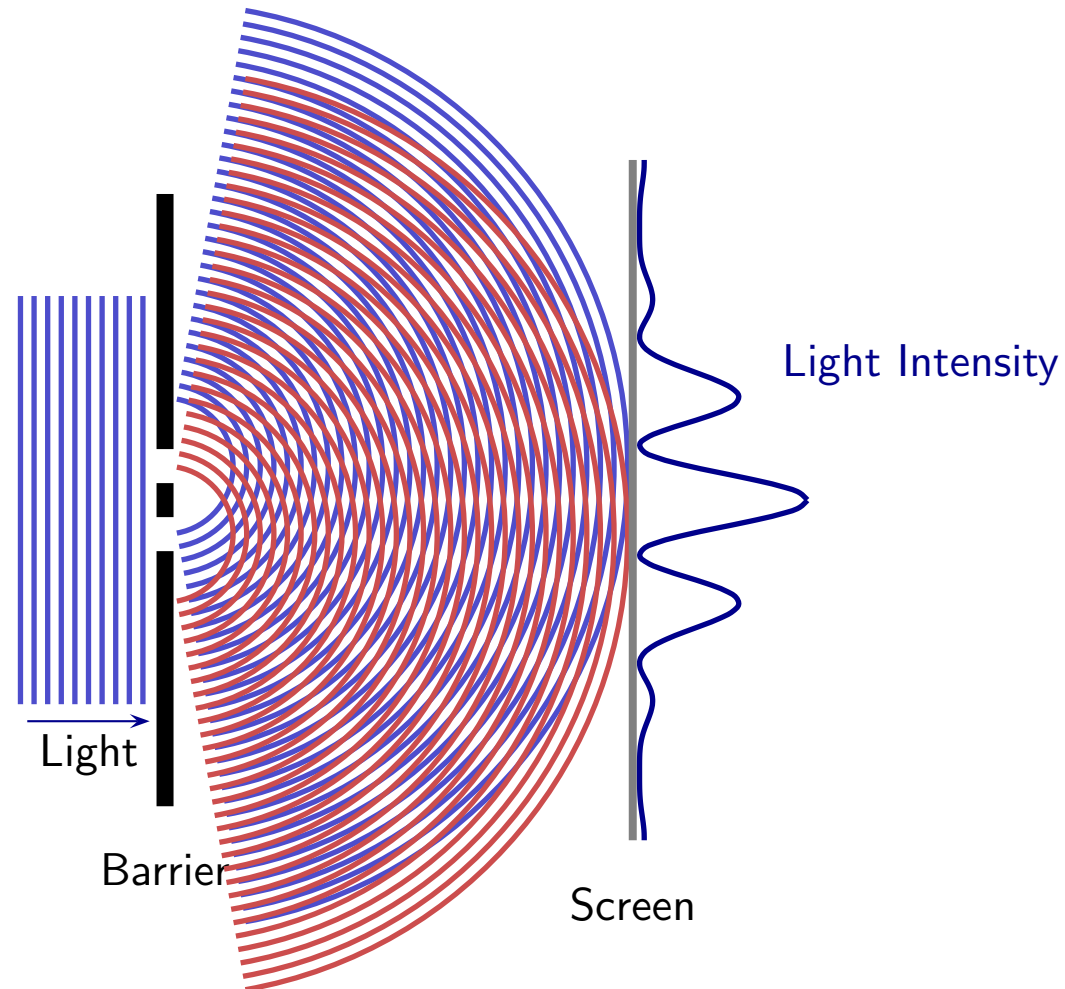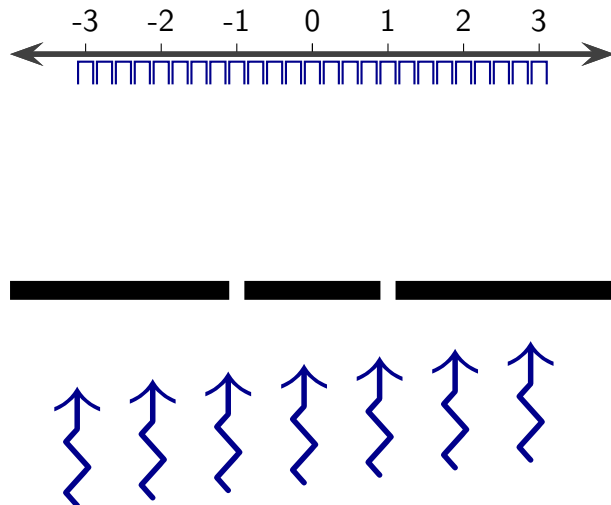
Screen

Question 1

Light consisting of photons is incident on a double slit. The screen consists of a collection of photon detectors, each ideally with zero width. A stream of photons is fired toward the barrier.
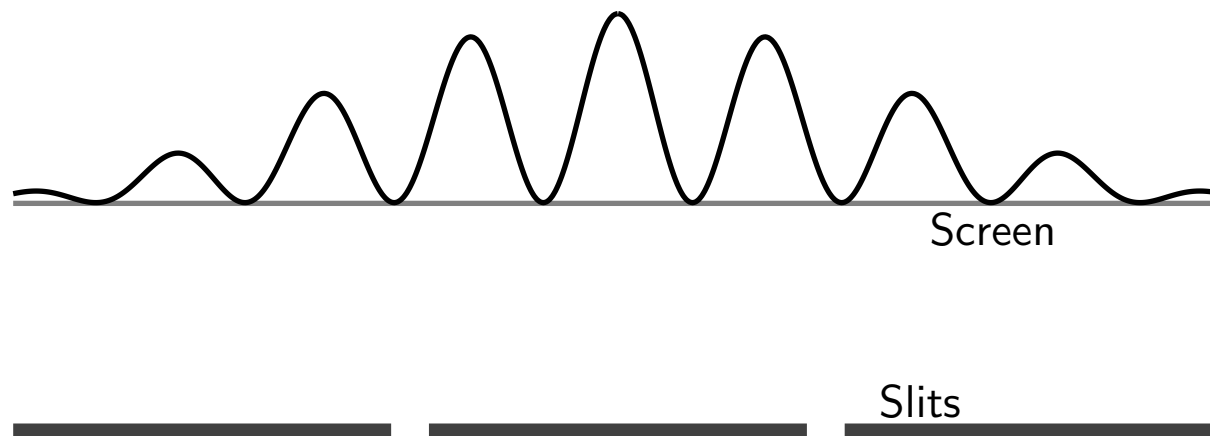

Which of the following is true about the detectors at which photons could possibly arrive?

1. Only at that next to "0".

2. Only at those next to "-1" and "1".

3. Only at that next to "-1", "1" and "0".

4. Photons could arrive at most of the detectors.
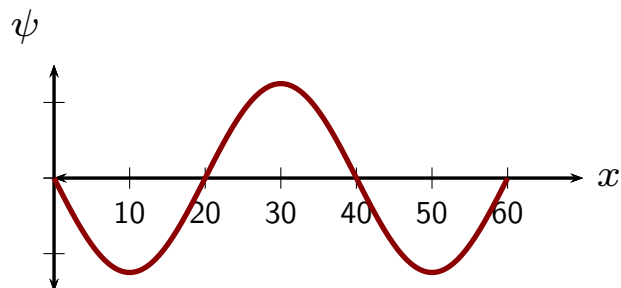
5. None of the above.

Photon Interference: Double Slits

Probability of arrival of photons at various screen locations.

Screen

Slits

Question 2

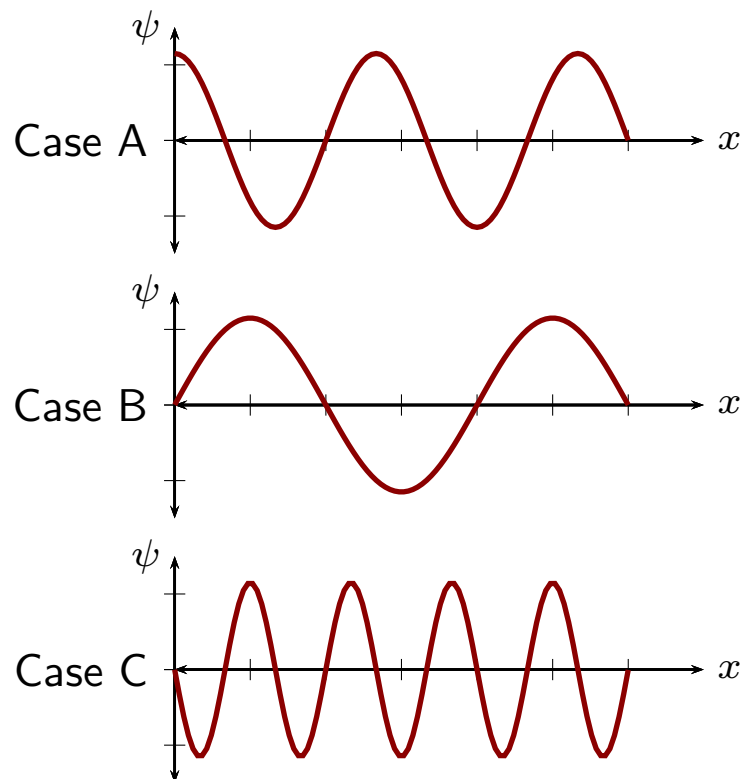A snapshot of a wave at one instant is illustrated (horizontal units are in meters).

Which of the following best represents the wavenumber?

1. $k = 30\,\mathrm{m}^{-1}$

2. $k = 40\,\mathrm{m}^{-1}$

3. $k = \dfrac{2\pi}{20}\,\mathrm{m}^{-1}$

4. $k = \dfrac{2\pi}{30}\,\mathrm{m}^{-1}$

5. $k = \dfrac{2\pi}{40}\,\mathrm{m}^{-1}$

Question 3

Snapshots of various waves at one instant are illustrated.

Rank the waves in order of **wavenumber.**

1. $k_A = k_B = k_C$

2. $k_B < k_A < k_C$

3. $k_C < k_A < k_B$

Sinusoidal Wave: Phase Shifts

Waves of the form $\psi(x,t) = A\cos(kx - \omega t - \phi)$ at $t = 0$. In these examples $\lambda = 4$.