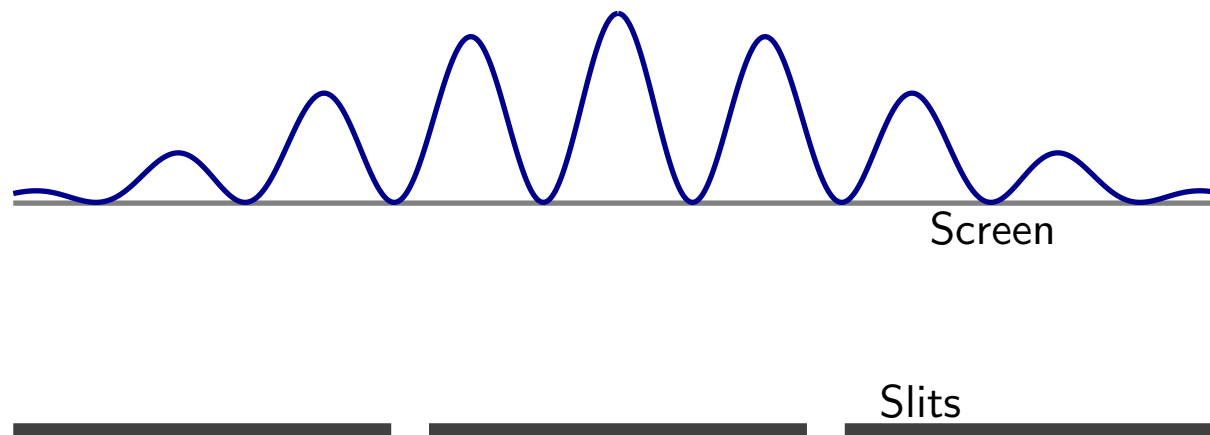


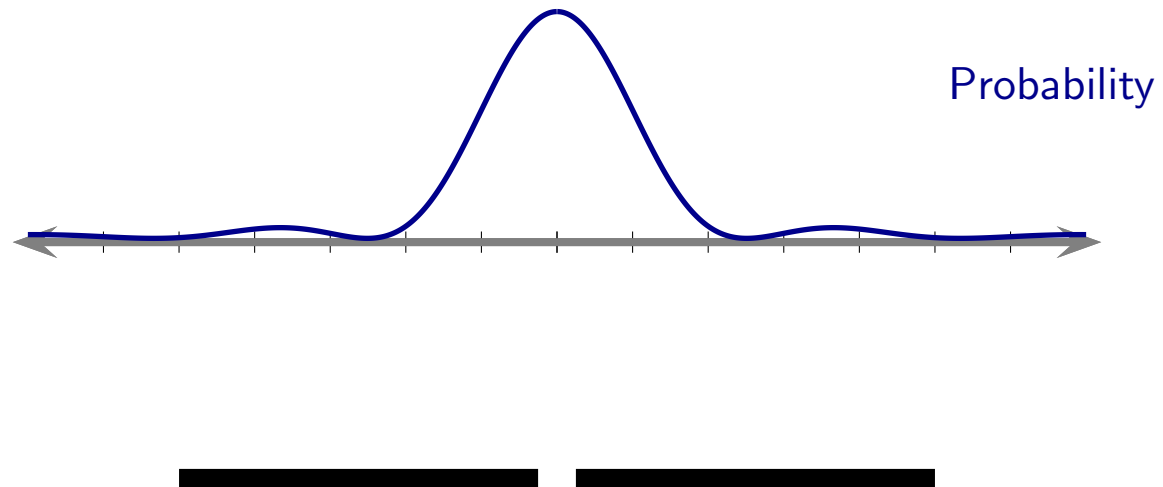
Photon Interference: Double Slits

Probability of arrival of photons at various screen locations.



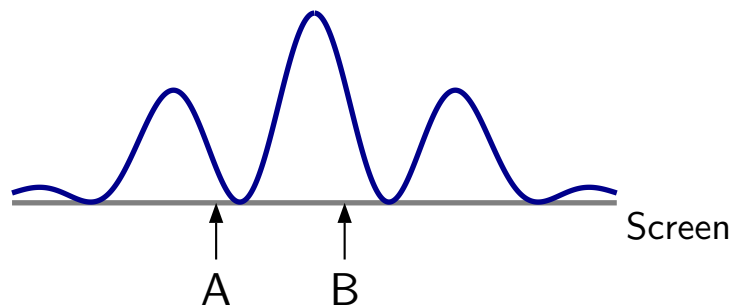
Photon Interference: Single Slit

Probability of arrival at various screen locations.



Question 1

Photons are fired toward a screen. The probability distribution for arrival at various locations is as illustrated. Consider the two illustrated locations.

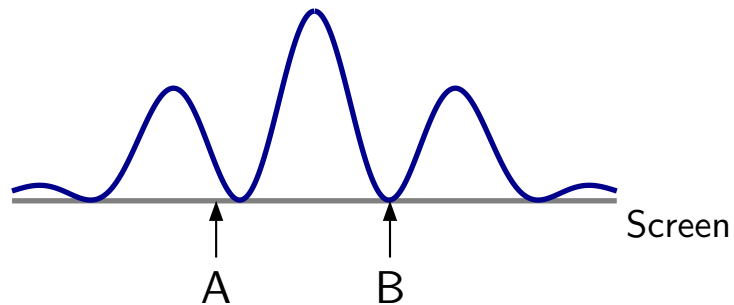


Which of the following is true?

1. Photons will never arrive at A but will sometimes arrive at B.
2. Photons will never arrive at B but will sometimes arrive at A.
3. Photons could arrive at either A or B; they are more likely to arrive at A.
4. Photons could arrive at either A or B; they are more likely to arrive at B.
5. Photons will always arrive at B.

Question 2

Photons are fired toward a screen. The probability distribution for arrival at various locations is as illustrated. Consider the two illustrated locations.



Which of the following is true?

1. Photons will never arrive at A but will sometimes arrive at B.
2. Photons will never arrive at B but will sometimes arrive at A.
3. Photons could arrive at either A or B; they are more likely to arrive at A.
4. Photons could arrive at either A or B; they are more likely to arrive at B.
5. Photons will always arrive at B.

Question 3

Two beams of light, one green and one red, are incident on a screen. The probability with which a photon is detected at a small detector on the screen is 0.30. Suppose that green beam contains 2000 photons and the red beam 1000 photons.

Which of the following is true regarding the likely number of photons that arrive in the detector?

1. 2000 green; 1000 red.
2. 600 green; 600 red.
3. 300 green; 300 red.
4. 300 green; 600 red.
5. 600 green; 300 red.

Question 4

Two light sources produce red light of exactly the same color, corresponding to wavelength 650 nm. Light source A produces 10000 photons every second and light source B produces 10 photons every second.

Which of the following is true?

1. The energy of each photon produced by A is the same as that of each photon produced by B.
2. The energy of each photon produced by A is 10000 times that of each photon produced by B.
3. The energy of each photon produced by A is 1000 times that of each photon produced by B.
4. The energy of each photon produced by A is less than that of each photon produced by B.

Question 5

A Xenon lamp equipped with a filter that transmits light of wavelength 400 nm.

The power (total energy per second) emitted by the light is increased. Which of the following is true?

1. The energy of each photon is unchanged and the rate of photon emission is unchanged.
2. The energy of each photon is unchanged and the rate of photon emission increases.
3. The energy of each photon increases and the rate of photon emission is unchanged.
4. The energy of each photon increases and the rate of photon emission increases.