Vertically polarized light is incident on a polarizer whose axis is at a (non-zero) angle θ to the vertical. The intensity of the light after the polarizer is

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B) unchanged

C) unchanged as long as $\theta < 90°$

D) diminished by a factor of $\cos\theta$

E) diminished by a factor of $(\cos\theta)^2$

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see detailed explanation in lecture notes

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Quick question #1 (30 seconds)

Do any photons come through?

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Quick question #4 (30 seconds)

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If another polarizer placed at 45 degrees were to placed in the light beam, there would be no further reduction in intensity. Therefore all the photons which do through must be polarized at 45 degrees.

A beam of light polarized at 0 degrees is incident on a 45-degrees-oriented polarizer. If the first photon is observed to pass through the polarizer, the probability that the second will pass through is:

A) 50 percent

B) greater than 50 percent

C) less than 50 percent

D) we can't predict the probability since it's completely random

E) I don't know what probability means

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each photon approaching the polarizer is independent, like consecutive coin tosses. What happens to it does not depend on what happened to the previous photons.

Let's go back to our more general case of vertically polarized light incident on a polarizer at some angle θ to the vertical. The probability of each individual photon making it through the polarizer is

A) 1

B) 0

C) $\cos \theta$

D) $\cos^2\theta$

E) not enough information, we need to know more about the quantum nature of photons!

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The probability must match the decrease in the light intensity, just like it did for the specific example with θ = 45 degrees before.