

[Home](#)

Shiny object turns black viewed through linear polarizer and quarter wave plate

(E)Optics - E+45: Polarization and Birefringence

A polarizer is placed on top of a quarter wave plate and a shiny object is placed beneath both on a white background. The light from above strikes the polarizer and is polarized, travels through the quarter wave plate and is circularly polarized, strikes the shiny object and undergoes a 180 degree phase shift, travels back through the circular polarizer and is returned to linear polarization at 90 degrees from its original orientation, and then travels through the linear polarizer again and is extinguished. The white background is completely visible but the shiny object is completely black once the light has passed through the whole system. Note: The fast axis of the quarter wave plate and the polarizer must be correctly aligned for this demonstration to work. A camera above the demo works well to show it to an entire classroom.

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E+45+61

Demo Diagram:



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