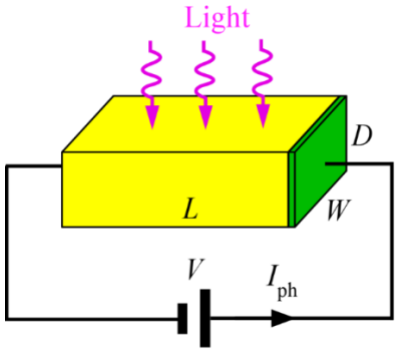
Activity 7

Photoconductivity

Consider a cadmium sulfide (CdS) direct band gap semiconductor that is intended for use as a detector of blue light. For the circuit to work, a photocurrent greater than 5.00 mA must be generated when the CdS is illuminated with 450 nm light at 1 mW/m^2 intensity. If the CdS detector is designed as in the figure below with L = 1.00 mm and $W = D$ = 0.100 mm, and a bias of V = 50.0 V is applied, will the detector meet the minimum current requirement?



Properties of this CdS system:

E_g = 2.60 eV, μ_e = 0.0340 m^2 V^{-1} s^{-1}, μ_h = 0.00180 m^2 V^{-1} s^{-1}

Recombination time, τ = 1.00 ms.

Assume all photons are absorbed with a quantum efficiency (η) of 1.