



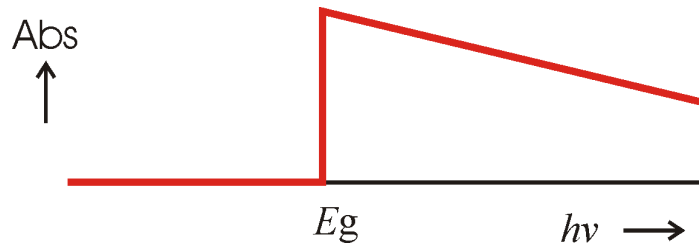
Instrumentation 2008-2009

Problem sheet

Optical Detector

A photo resistor made of a semiconducting material changes conductivity when under illumination by increasing the charge carrier density (absorbing photons and converting the energy to electron-hole pairs). The optimum wavelength response is for photons just above the band gap

<i>material</i>	<i>band gap</i>
Si	1.12 eV
Ge	0.66 eV
GaAs	1.42 eV
C	5.47 eV



- Calculate the optimum response wavelength for Silicon, Germanium, and GaAs, diamond. Which is the best for a visible spectrum detector?

A light sensor has a dark resistance of 100 k Ω , a light resistance of 30 k Ω , with an exponential response with a time constant of 72 ms. It is used in a system to detect light beam interruptions.

- Devise a system to trigger a 3-volt comparator within 10 ms of the beam interruption.