MPHYCC-7 ELECTRONICS I

Unit 1: SEMICONDUCTOR

Dr. Kumar Balwant Singh

Department of Physics, L. S. College, Muzaffarpur,

B. R. A. Bihar University, Muzaffarpur-842001

Email: kbsphysics@yahoo.co.in

Whatsapp: 9835033155

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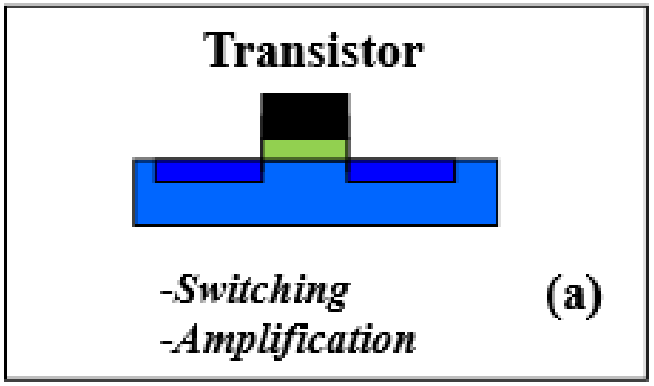
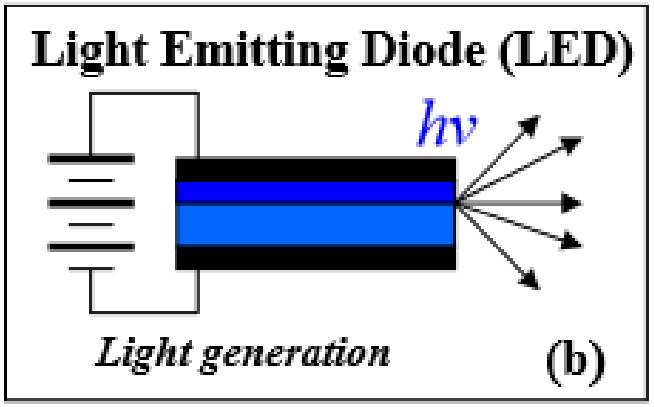
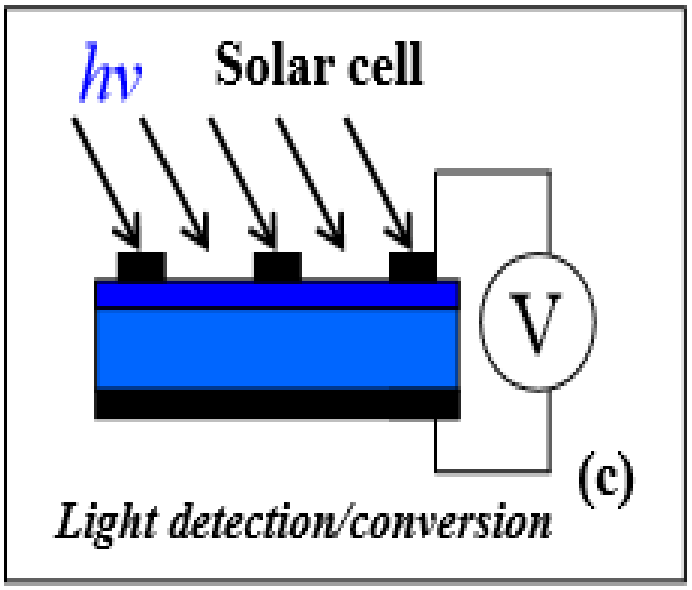
How semiconductors are used?

It can be safely assumed that with the exception of the most rudimentary ones, all instruments and any equipment which uses electricity to operate require semiconductor elements to be functional. From the most complex outer space instrumentation, weaponry, or information processing circuitry, to simple everyday tools and gadgets semiconductors are the foundation upon which the operation of almost everything electronic and photonic is based.





In order to implement the desired operations, semiconductor material is processed into a device which can perform in a controlled and predetermined fashion electronic (e.g. diode, transistor, monolithic integrated circuit), or photonic (e.g. Light Emitting Diode, or LED, laser) functions. Among many classes of semiconductor devices a select three, deemed the most important in terms of function, are shown in Fig. 3. A transistor (Fig. 3a) is a device designed to amplify and/or switch an electrical signal and as such is a cornerstone of semiconductor device engineering. The transistor is a basic building block of all integrated



circuits (IC), and hence, has been developed into by far the most complex and most important semiconductor device. Other than transistor, semiconductor diodes that can be used to either emit light of desired wavelengths (light-emitting diode in Fig. 3b) or convert light into electricity, as it is done in solar cells (Fig. 3c), are the other key semiconductor devices.

Fig. 3 *Key semiconductor devices (a) transistor used for switching and amplification of electric signal, (b) p-n junction diode acting as a light emitter, and (c) p-n junction diode acting as a solar cell.*