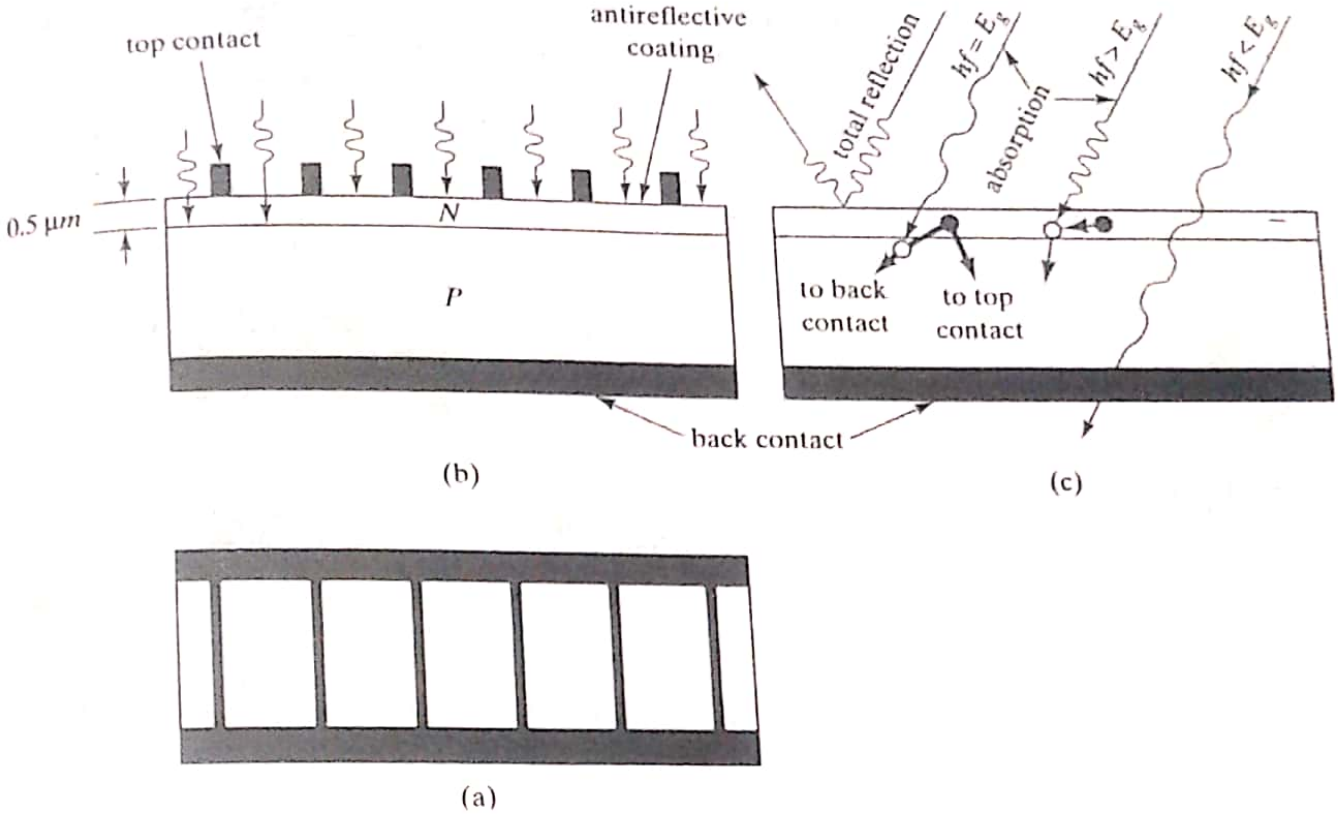

(a)

Figure 14.23 Solar cell (a) cross section, (b) top view, and (c) effects of photons having different amounts of energy.

A typical solar cell is 10cm long and 2.5 cm wide. Assuming that the incident solar radiation at the equator at noon (known as air mass 1-AM1) is $1000 W/m^2$, this device, operating at an efficiency of 15%, delivers less than half a watt of power.

Solar Energy

So that solar energy production can be seriously considered for the generation of large amounts of electrical energy, two obstacles have to be overcome: First, the conversion of solar energy to electrical energy must be carried out economically and, second, the energy must be available at all times and in all places. Not only must these obstacles be overcome, but the cost of solar energy must be competitive with other means of power generation.

The incentive for the development of solar energy has been led by the space program where solar energy provides a continuously available source.

Some general information about solar radiation and conversion is helpful.

On a clear day, it is estimated that solar energy reaches the earth at an approximate rate of one kilowatt per square meter and, in the least sunny part of the United States, enough energy falls on an area of 80 square meters to meet the needs of an average family.

By using silicon to form solar cells, and to excite electrons from the valence band to the conduction band, an energy of 1.12eV at room temperature is needed.