

CH 11: QUANTUM PHYSICS:

Energy Gap

- some energies are not allowed for electrons, so they don't exist with that energy
- this energy gap, makes many technologies possible:
- Lasers: an electron from a high orbit falls down to lower energy and emits a photon with a specific energy, i.e. frequency. Then, those photons make other atoms emit photons -> a quantum avalanche, chain reaction. Lasers are used in supermarkets, CD and DVD players
- LEDs: two semiconductors with different energy gaps are connected. When electrons go from one to the other they lose energy and emit a photon of a specific energy, frequency -> emits light.
- transistors: in general two or more connected semiconductors are called transistors.
- Spectral fingerprinting: every element has its own unique energy gaps, so light coming from it has unique frequencies, by which the element can be identified.
- Superconductors have an energy gap such that the electrons cannot change their energy by collisions, so they don't collide with anything, so there is no resistance.

Photoelectric Effect

- When photons hit the surface of a metal they can knock electrons out of it.
- The energy of the emerging electrons depends on the energy of the photons, which depends on its frequency.
- Solar cells: those electrons can be collected and create electricity from light.
- Digital Camera: the emerging electrons are used to record a signal where the light hit it.
- Xerox: the light is only reflected off the white part of a piece of paper. They then knock electrons of a charged piece of selenium. The charge that's left attracts soot and makes an image on a fresh piece of paper, it's then heated so the soot binds to the paper -> the copy.