**Average energy** of an electron in a metal is determined by the Fermi-Dirac statistics and the density of states. It increases with the Fermi energy and with the temperature (very weak temperature dependent)

**Boltzmann statistics** describes the behavior of a collection of particles in terms of their energy distribution.

**Cathode** is a negative electrode. It emits electrons of attracts positive charges, that is, cations.

**Density of states** is the number of electron states, like wavefunction, per unit energy per unit volume. Thus, is the number of states in the energy range to per unit

**Effective electron mass** represents the inertial resistance of an electron inside a crystal against an acceleration imposed by and external force.

**Electron affinity** is the energy needed to remove an electron from the conduction band of a semiconductor from vacuum

**Fermi-Dirac statistics** determines the probability of an electron occupying a state at an energy level E. This considers that a collection of electrons must obey the Pauli exclusion principles. The Fermi-Dirac function quantifies this probability via Ef is Fermi energy, and if temperature is not 0k, fermi energy is defined as Energy that f(E)=1/2

**Field emission** is the tunneling of an electron from the surface of a metal into vacuum, due to the application of a strong electric field (typically E>10V/m)

**Lattice wave** is a wave in a crystal due to coupled to oscillations of the atoms. Lattice waves may be traveling of stationary waves

**Mode or state of lattice vibration** is a distinct, independent way in which a crystal lattice can vibrate with its own particular and wavevector . There are only a finite number of vibrational modes in a crystal

**Phonon** is a quantum of lattice vibrational energy of magnitude , where is the vibrational angular frequency. A phonon has a momentum where is the wavevector of the lattice wave

**Photoemission** is the emission of an electron from the surface of a metal or a semiconductor due to the absorption of an incident photon

**Seebeck effect** is the development of a built-in potential difference across a material as a result of a temperature gradient.

**State** is a possible wavefunction for the electron that defines its spatial (orbital) and spin properties.

Thermionic emission is the emission of electrons from a surface of a heated metal

**Work function** is the minimum energy needed to free an electron from the metal at a temperature of absolute zero. It is the energy separation of the Fermi level from the vacuum level

**Zero-point energy** is the minimum energy of a harmonic oscillator . Even at 0K, an oscillator in quantum mechanics will have a finite amount of energy which is its zero-point energy.