Mobility:

As the name implies it describes a movement or mobile property. How quickly an electron or hole moves through a metal or semiconductor in the presence of an electric field. The capability of movement is connected with a parameter called drift velocity. When an external electric field is applied across a piece of semiconductor, free electrons and holes are accelerated by the electric field and acquire a velocity component (superimposed on their thermal motion) called drift velocity. Drift velocity (V) is directly proportional to the electric field (E).

$$\mathbf{V=uE}$$

where u = quantitative parameter called mobility and units are $cm^2/(V.s)$

- Mobility depends upon temperature, electric field (E), impurity concentration, defect concentration, electron and hole concentration
- Electrons are faster particles than holes for Si u_n=1500 u_p=475
- At higher temperatures, mobility decreases because collisions are inelastic, due to this average energy decreases, speed decreases and the number of carriers increases due to ionization
- Mobility increases as electric field intensity decrease u=V/E
- Higher mobility leads to better performance in electronic devices

Conductivity:

A property of charge carriers describing its capacity of conduction.

Doping or impurity concentration enhances the number of charge carriers and hence, the electrical conductivity of semiconductors.

It is similar to the conductivity of metals. But conductivity for semiconductors depends upon entirely different parameters. The conductivity of semiconductors is directly proportional to the following factors

- Charge carriers (q)
- The concentration of carriers (n)
- Mobility of carriers (u)

$$\textbf{Conductivity } \sigma = qnu$$