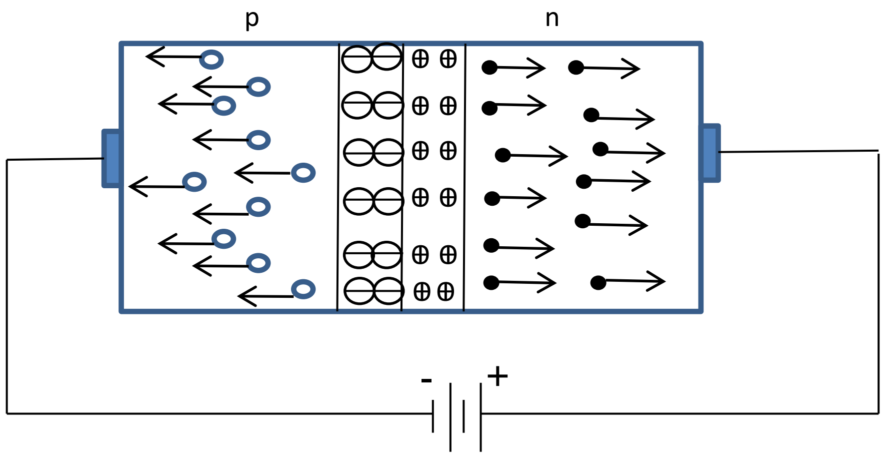
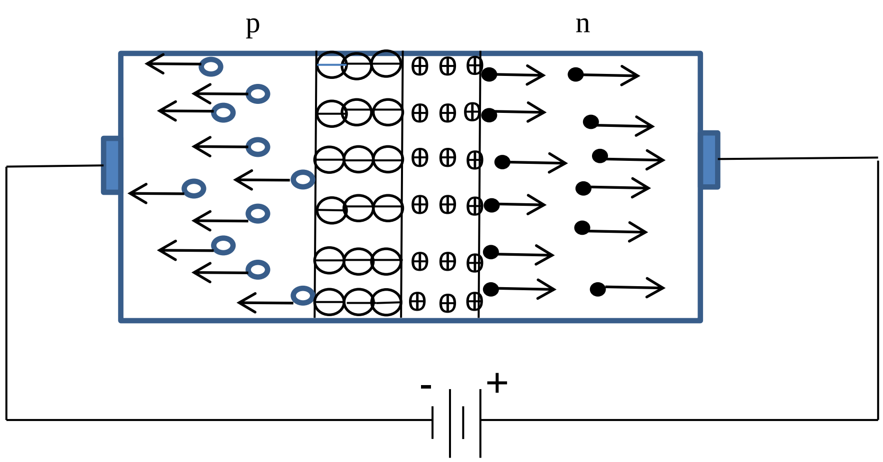
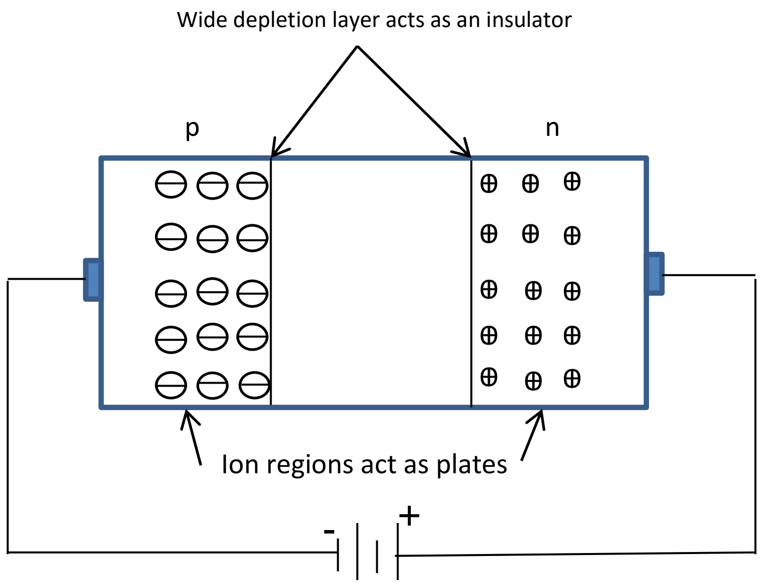
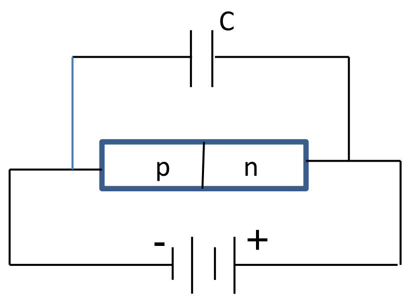


- The depletion layer widens until the potential difference across it equals the total external bias voltage.
- The initial movement of majority carriers away from the junction is called “transient current” and lasts for a very short time upon application of reverse bias.



- When the diode is reverse-biased, the depletion layer effectively acts as an insulator between the layers of oppositely charged ions, this forms an effective capacitor.
- Since the depletion layer widens with increased biased voltage, the capacitance decreases and vise versa.





Reverse Leakage Current

- A very small leakage current produced by minority carriers during reverse bias.
- A relatively small number of thermally produced electron-hole pairs exist in the depletion region. Under the influence of the external voltage, some electrons may manage to diffuse across the pn junction before recombination. This process establishes a small minority carriers current.

Ideal Diodes

The diode equation gives an expression for the current through a diode as a function of voltage. T he ideal diode law expressed as:

$$I = I_o\left(e^{\frac{qV}{KT}} - 1\right)$$

Where

I Is the net current flowing through the diode.

I_o Is the “dark saturation current’’ , the diode leakage density in the absence of light

V Applied voltage across the terminals of the diode

q Absolute value of electron charge

T Absolute Temperature

I_o Differentiate a diode from another, a diode with larger recombination will have a larger I_o .

I_o Increases as T increases.

At 300 K, $KT/q = 25.85\ mV$ "The Thermal Voltage''

For Non-Ideal diode,

$$I = I_o\left(e^{qV/nKT} - 1\right)$$

n Is the ideality factor between 1-2 in which it typically increases as current decreases.