# Materials and Current

Materials are classified as:

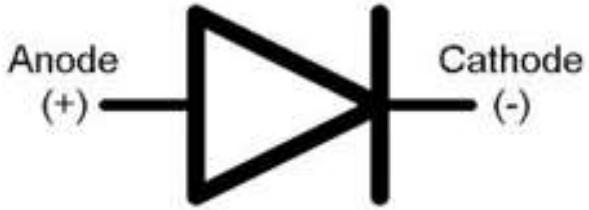
Conductors, Insulators and Semiconductors (Intrinsic and Extrinsic).

Drift and Diffusion Current:

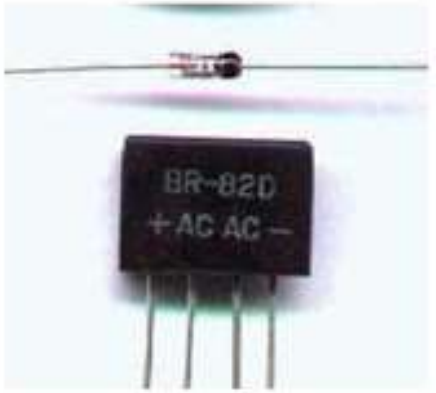
When a conductor is subjected to an external voltage, free electrons move from (-)ve to (+)ve terminal with a steady velocity, constituting a current – Drift Current.

Diffusion Current- Due to diffusion phenomenon, due to flow of charge carriers from the region of higher concentration to the region of lower concentration.

# P-N Junction Diode







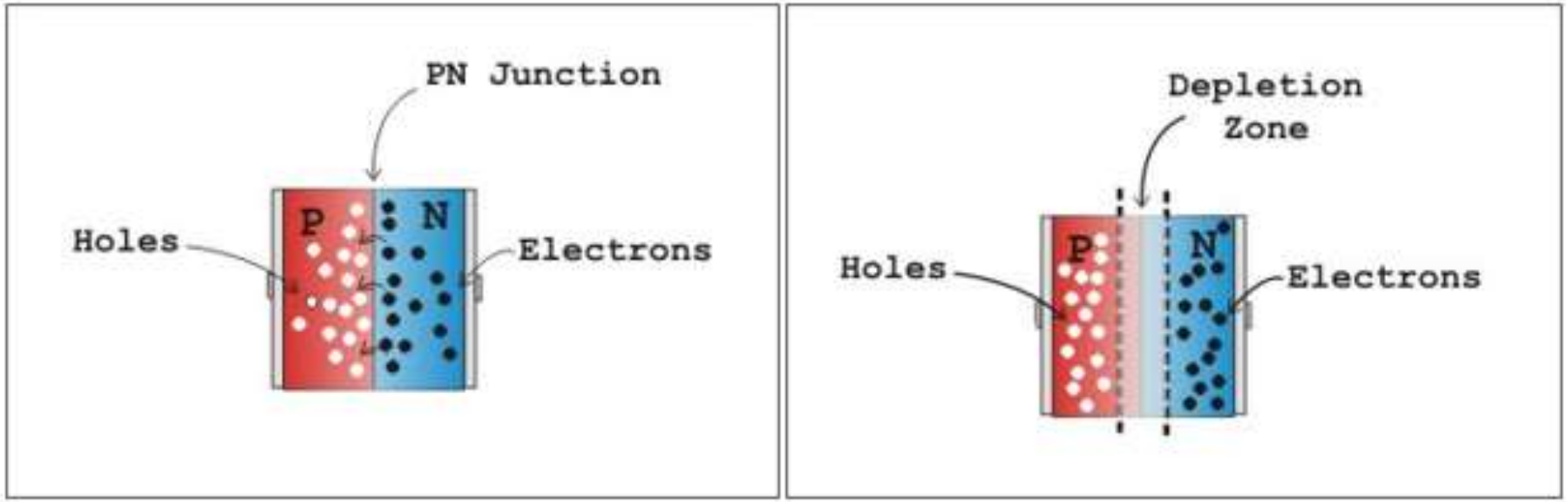

***Common practical diodes available in market***

# P-N Junction Diode- conti…

Used in numerous applications

- Switch,
- Rectifier,
- Regulator,
- Voltage multiplier,
- Clipping,
- Clamping, etc.

# P-N Junction Diode- conti…

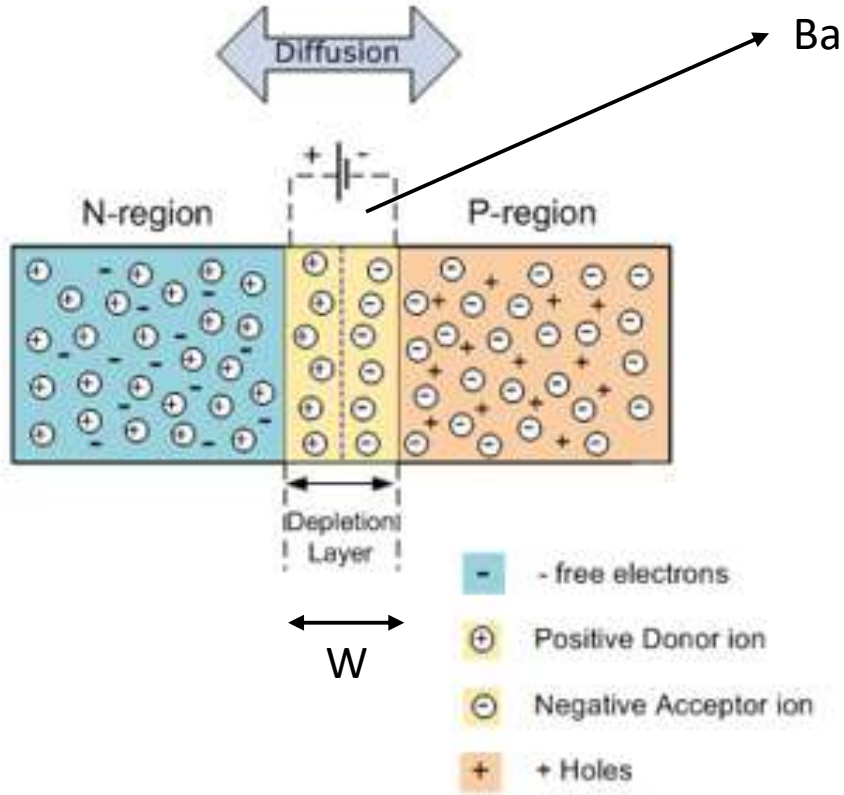



***P-N junction (a) in contact (b) formation of depletion region***

**[http://www.imagesco.com/articles/photovoltaic/photovoltaic-pg3.html].**

# P-N Junction Diode under Zero bias condition

**Unbias condition**



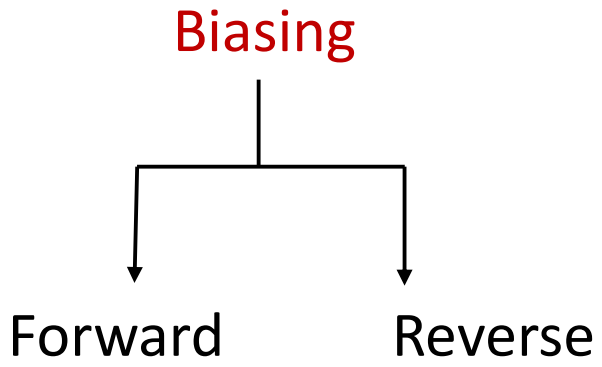

***Diode under zero bias condition***

# Biasing of P-N Junction Diode

Biasing: Applying external voltage to any electronic device

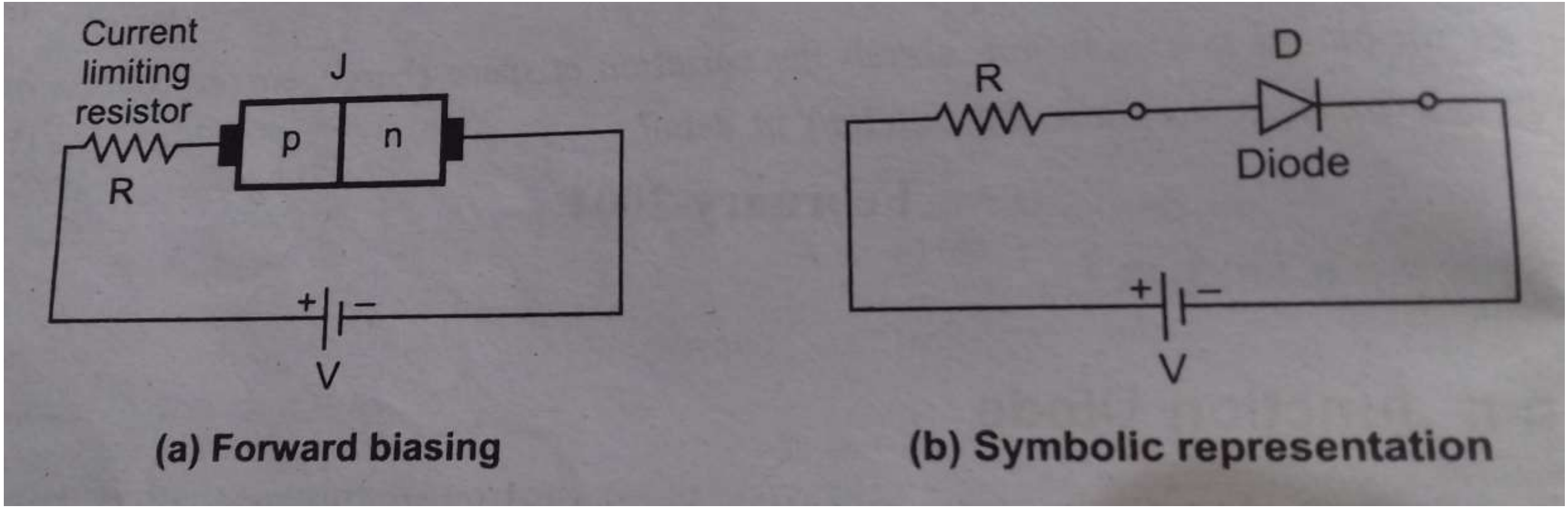
there is no current flow in the un biased P-N junction diode

Biasing allows current flow only in one direction

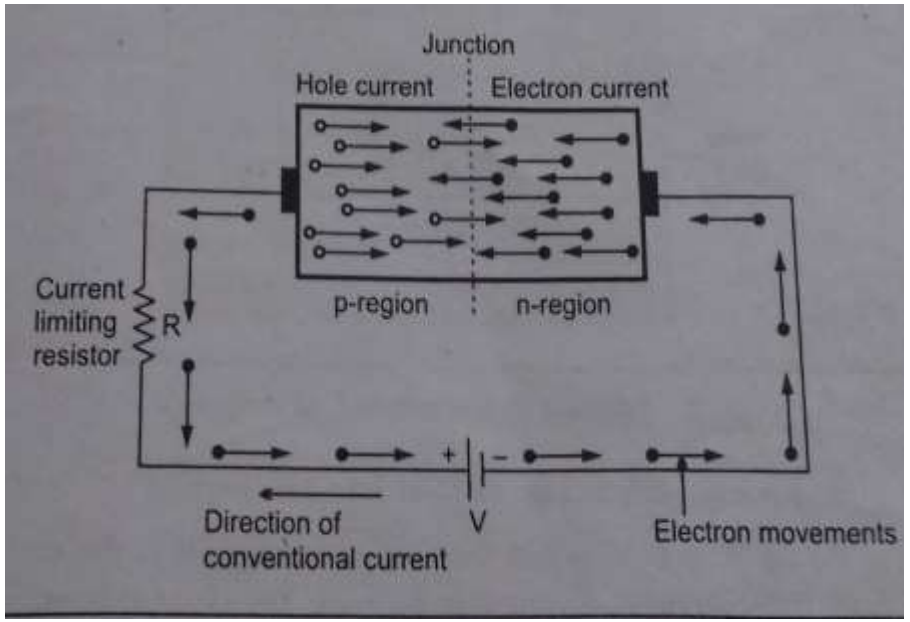


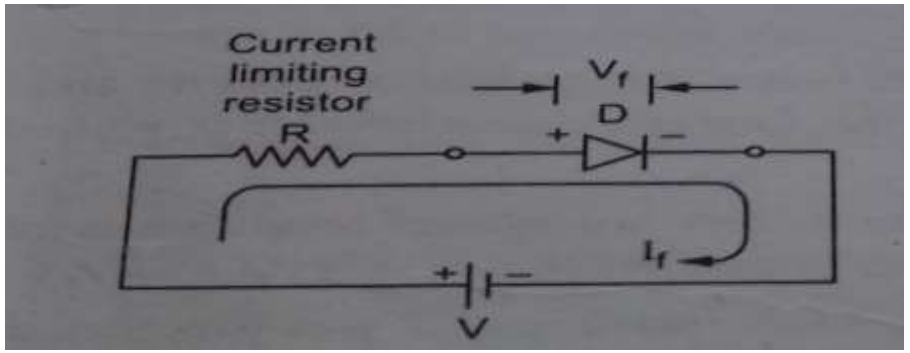
# Forward bias

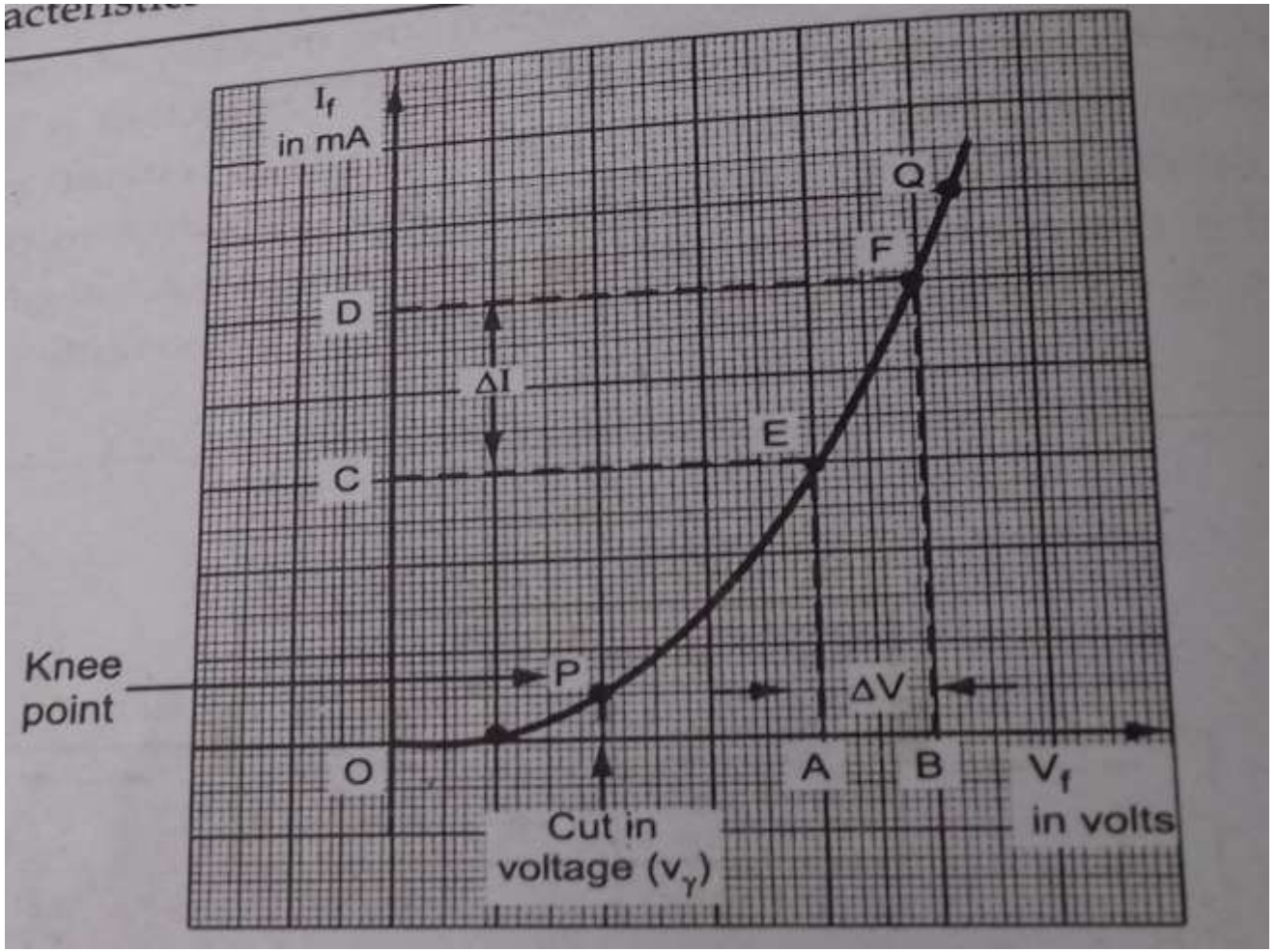
- Positive of battery connected to p-type (anode)
- Negative of battery connected to n-type (cathode)



# Forward bias



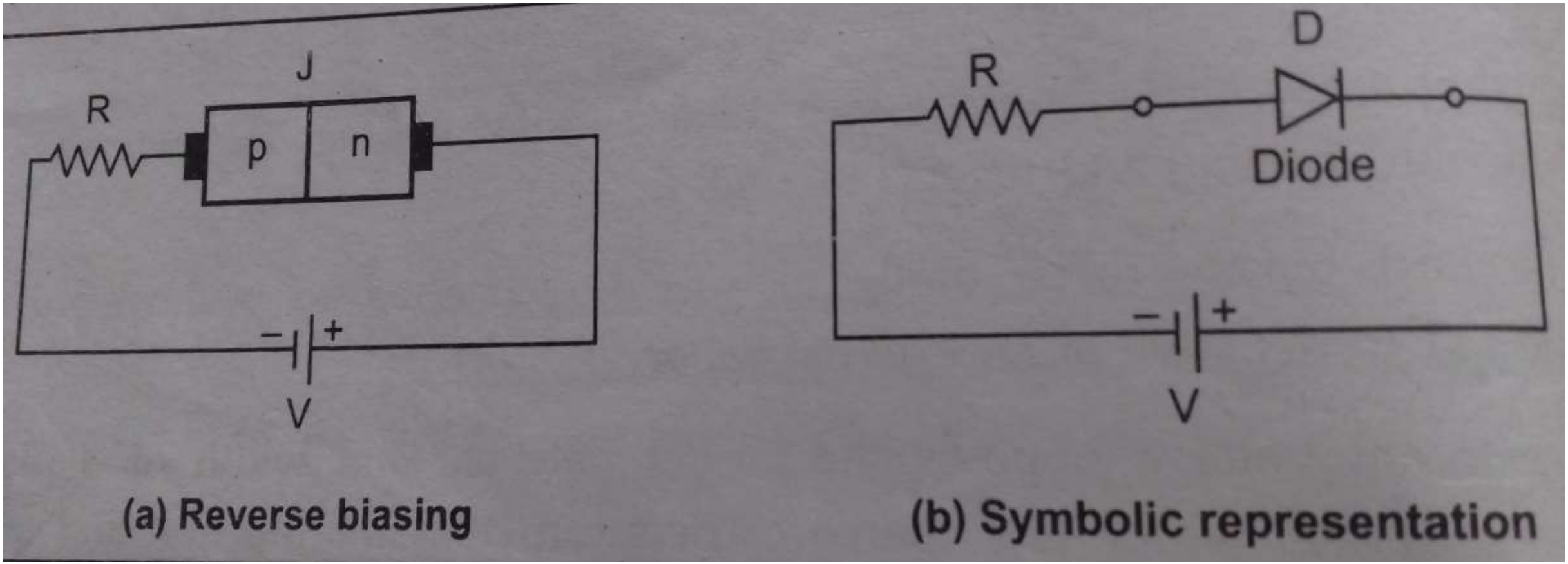



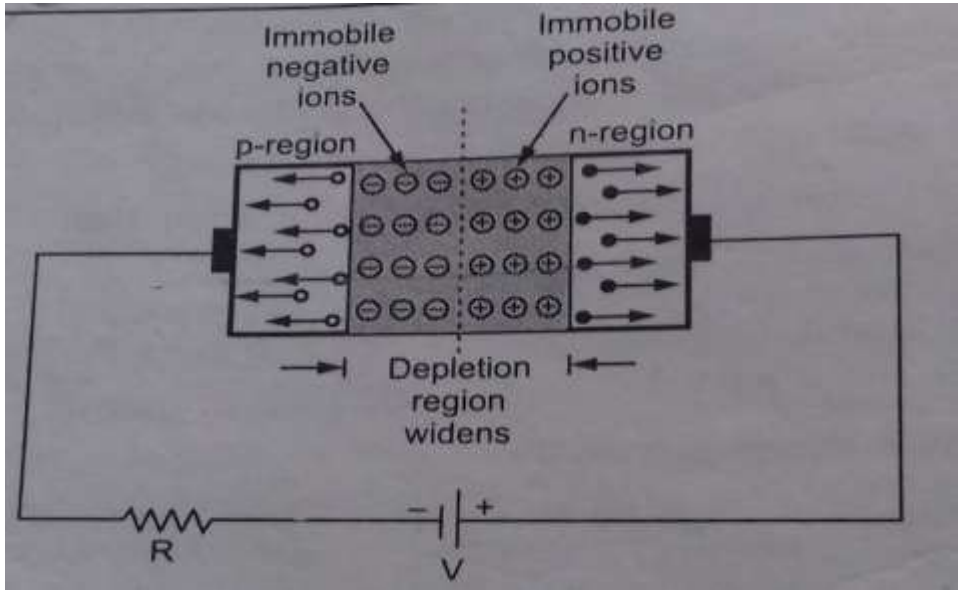

Forward Characteristics

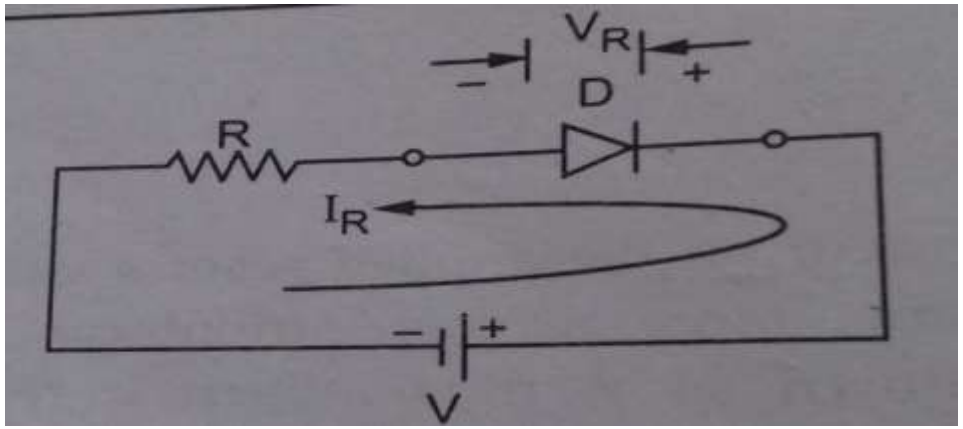
# Reverse bias

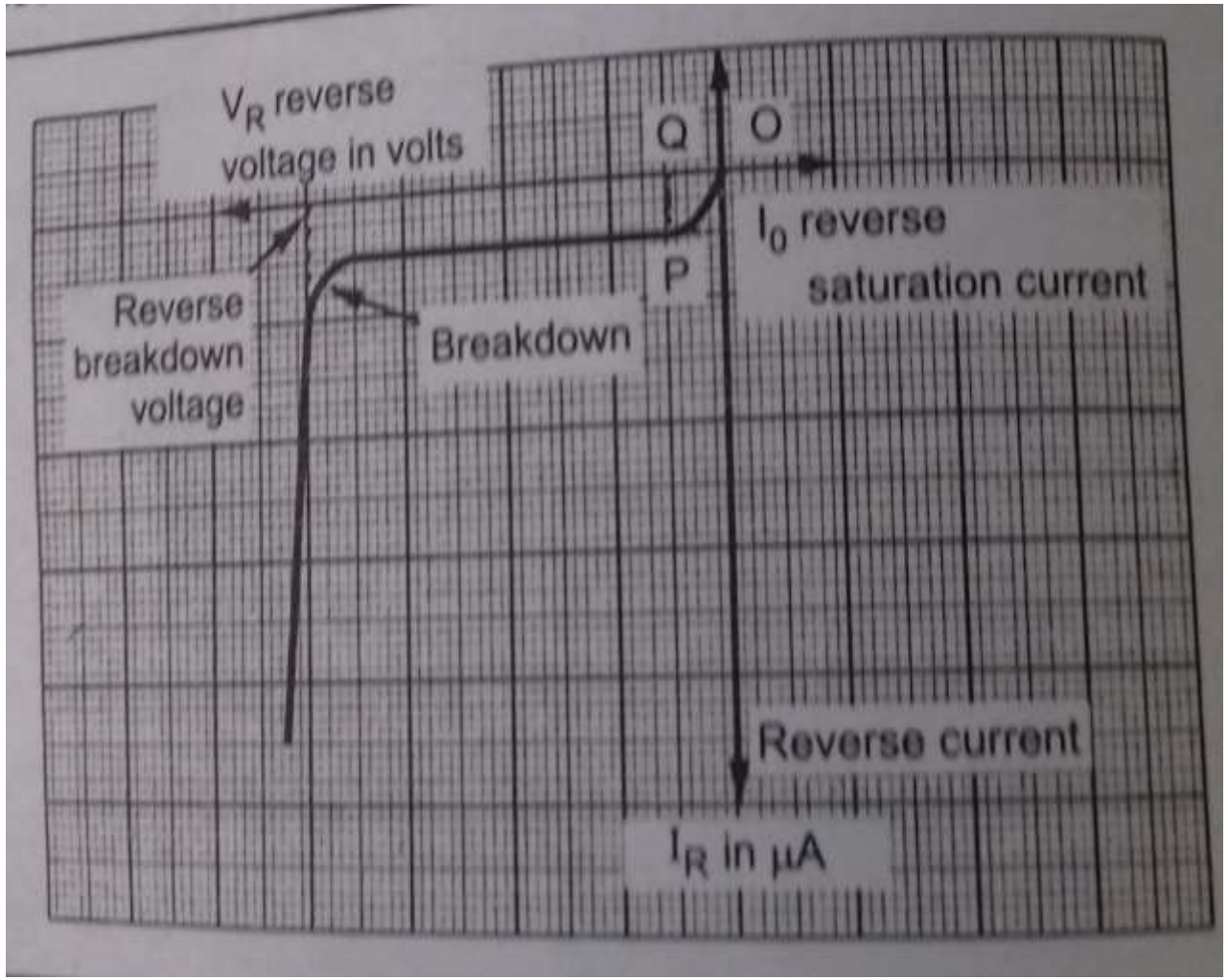
- Positive of battery connected to n-type material (cathode)
- Negative of battery connected to p-type material (anode)



# Reverse bias

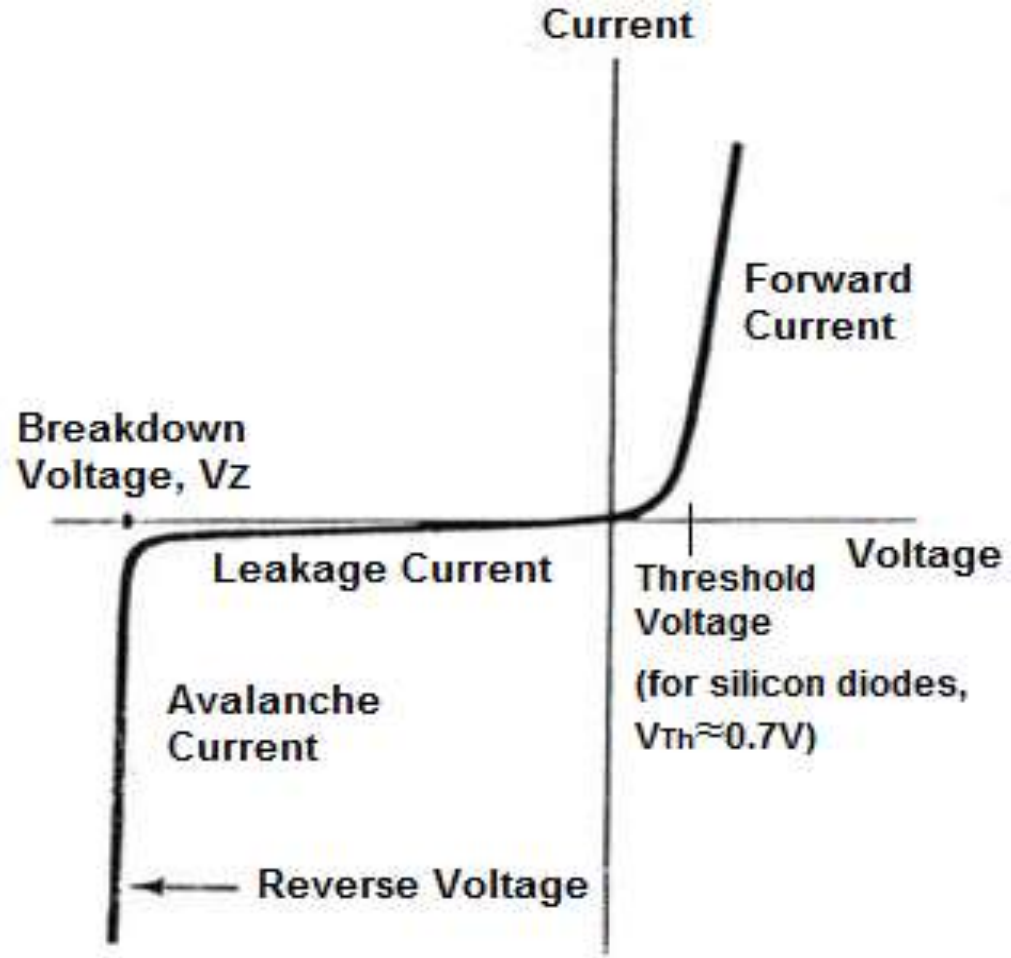



Reverse Characteristics

# V-I characteristic of diode

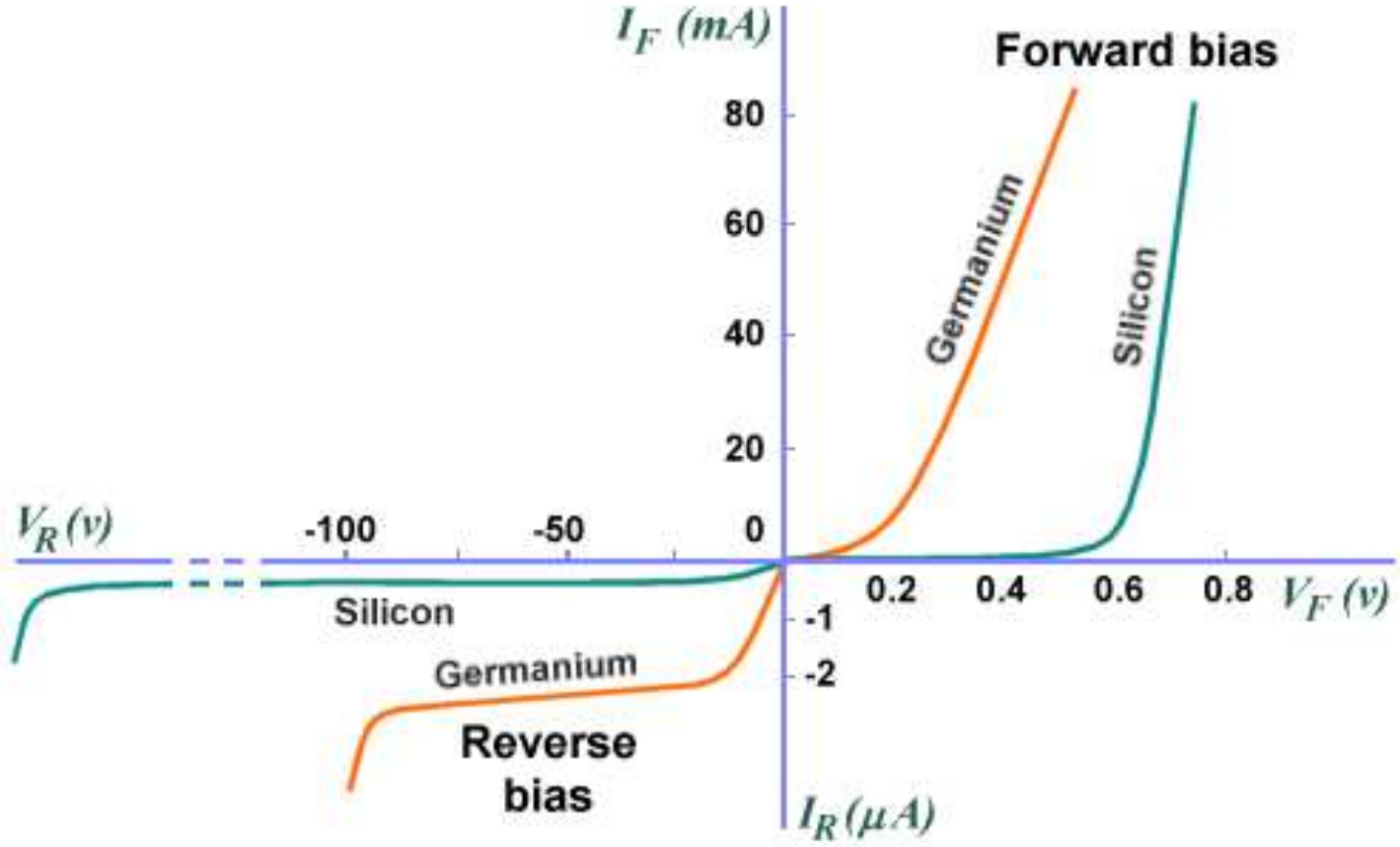



***V-I characteristic of diode***

**$V_\gamma$ is 0.6 ~ 0.7 V for Si**

**0.2 ~ 0.3 V for Ge**

# Silicon (vs) Germanium




**V-I characteristic of silicon and germanium practical diode**

**http://www.technologyuk.net/physics/electrical_principles/the_diode.shtml**