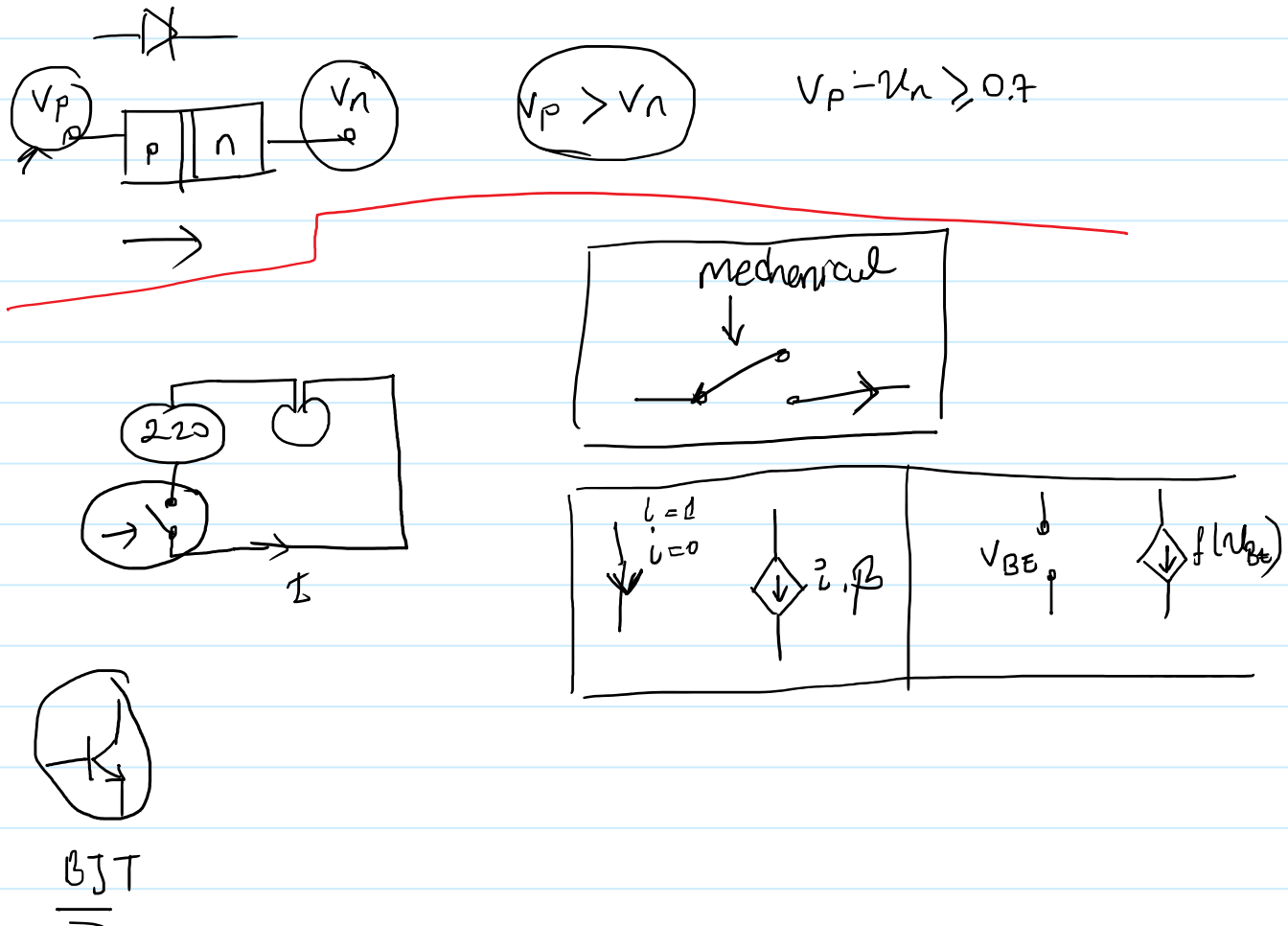


Reading & Discussion

Adel S. Sedra and Kenneth C. Smith, **Microelectronic Circuits** 7th Edition, Oxford University Press, 2014.

- Chapter 6.1





Recap

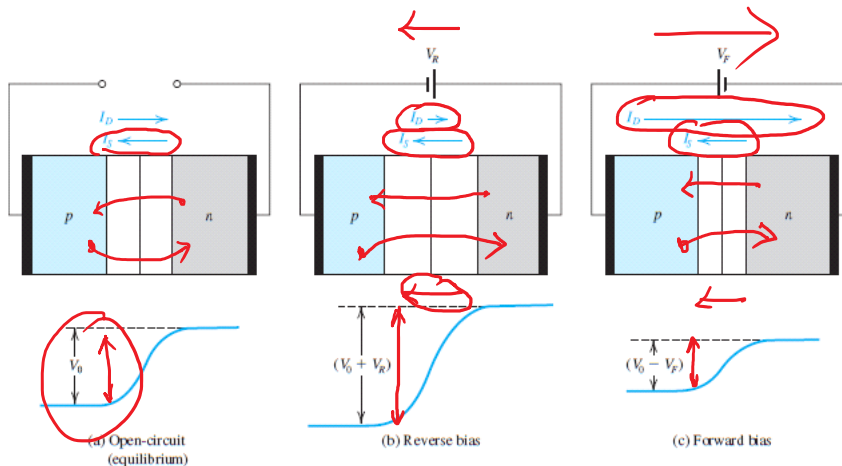
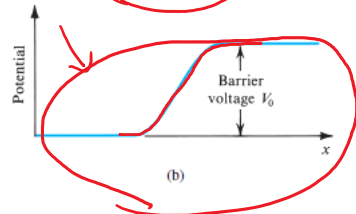
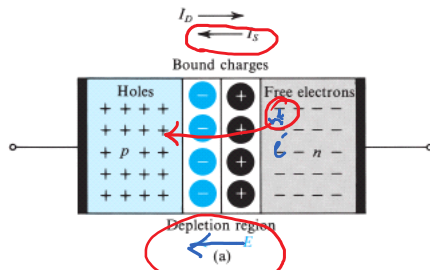
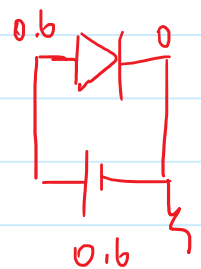
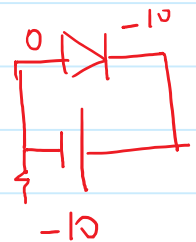
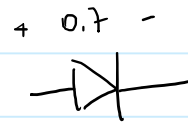


Figure 3.11 The pn junction in: (a) equilibrium; (b) reverse bias; (c) forward bias.



Analogy for Diffusion Current

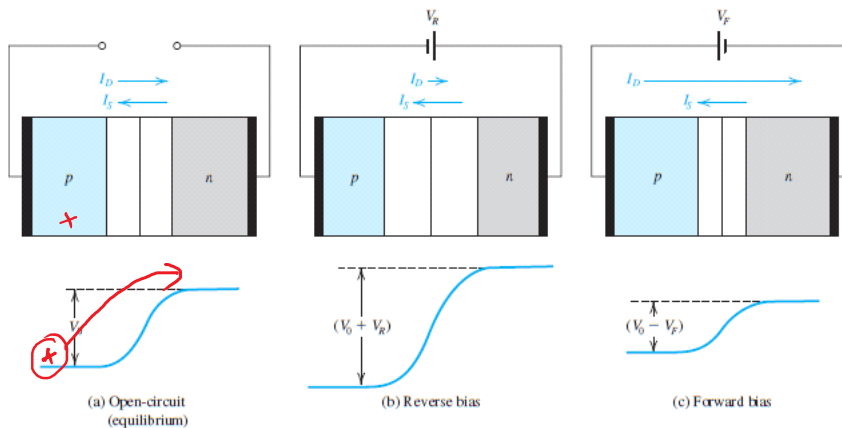
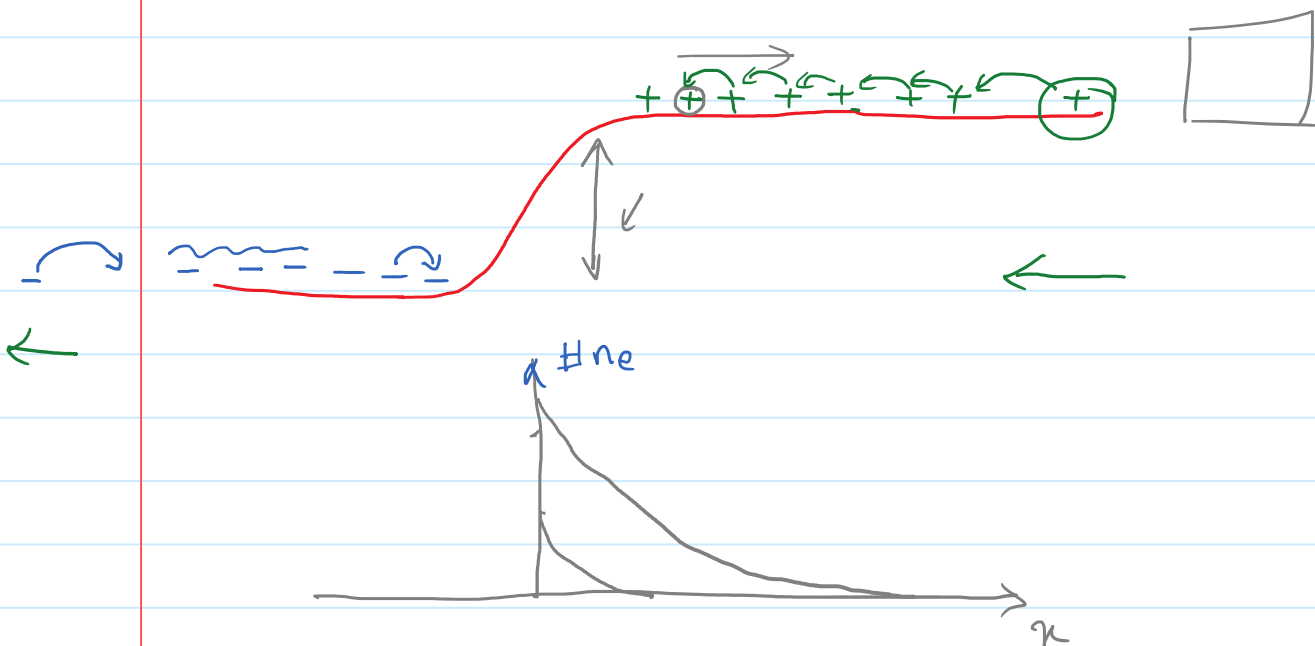
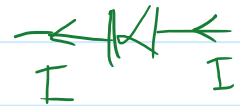
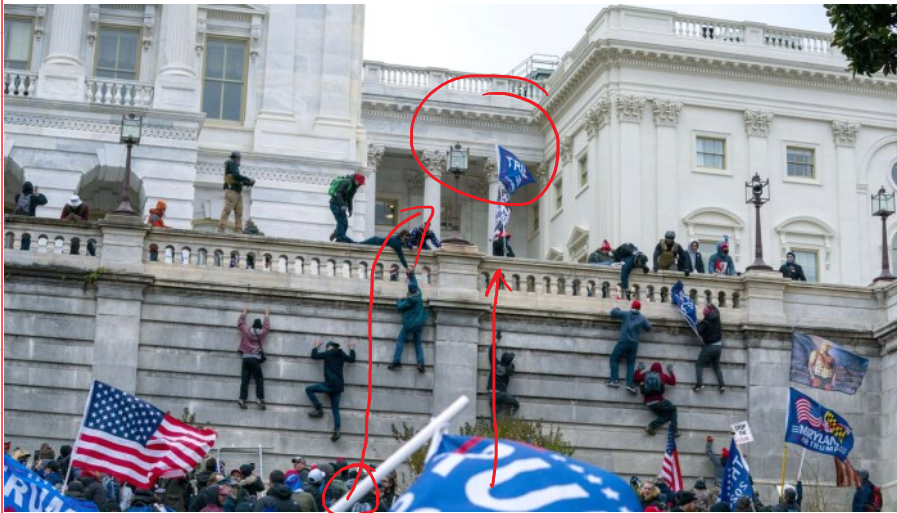
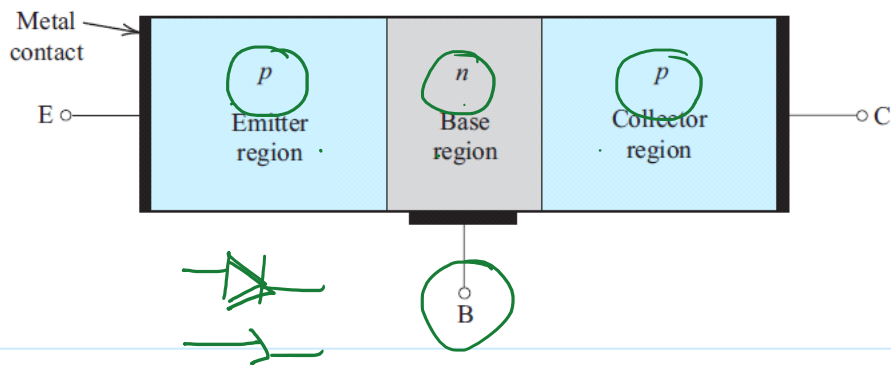
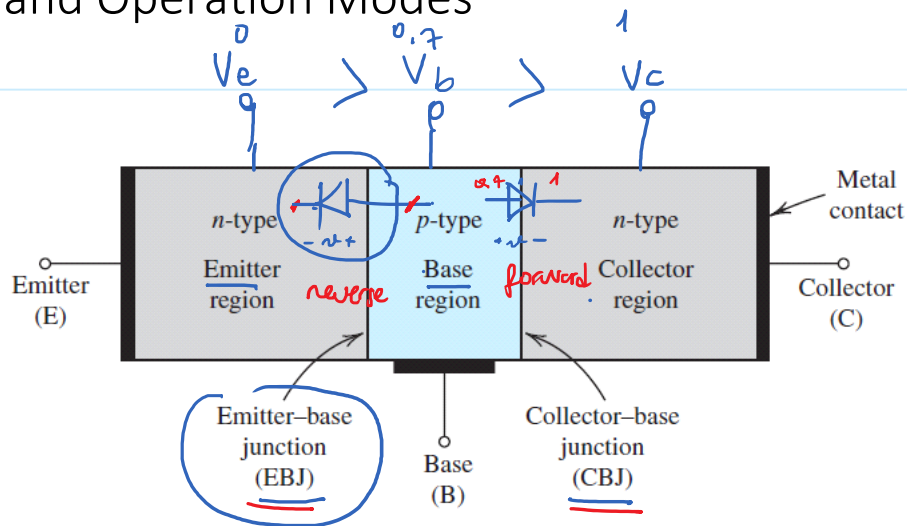


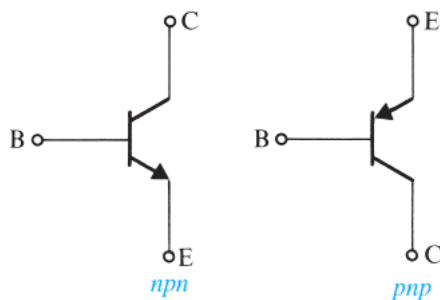
Figure 3.11 The pn junction in: (a) equilibrium; (b) reverse bias; (c) forward bias.



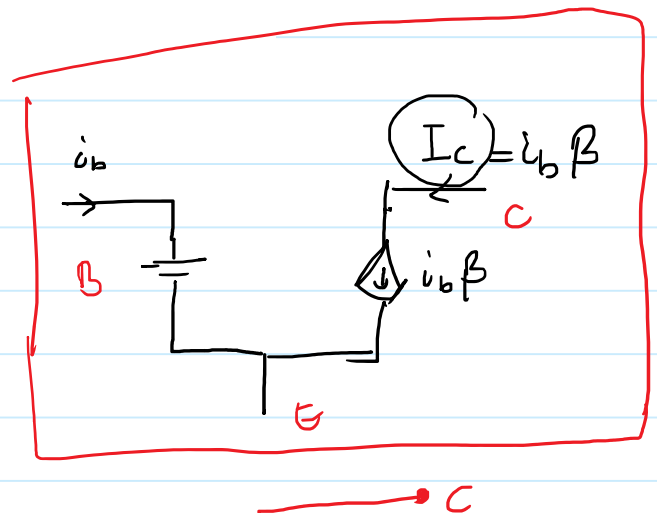
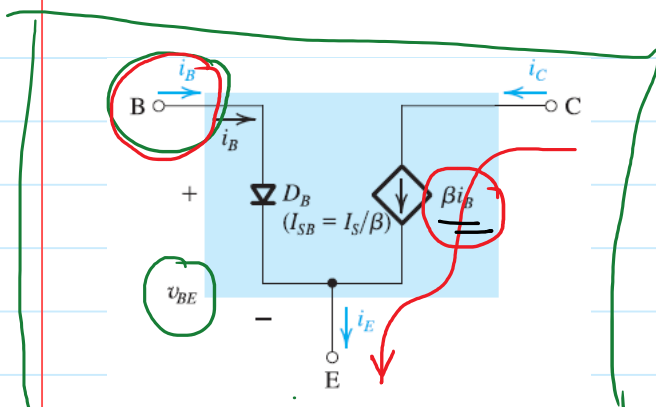
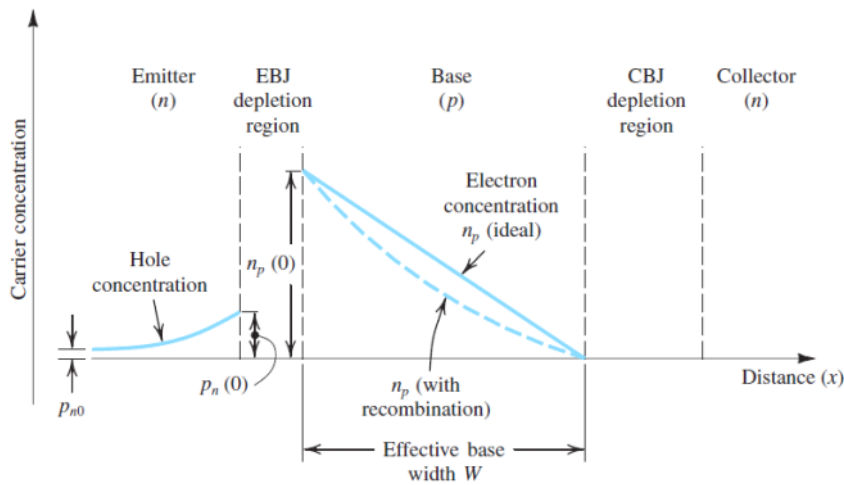
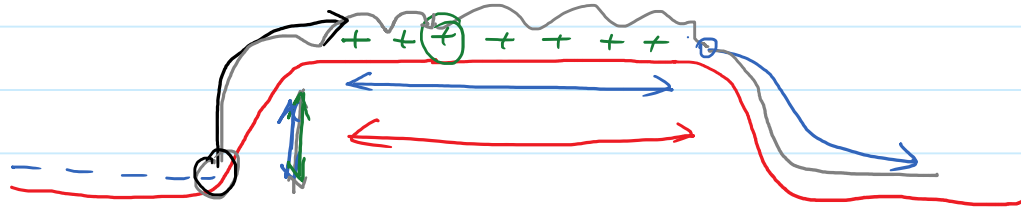
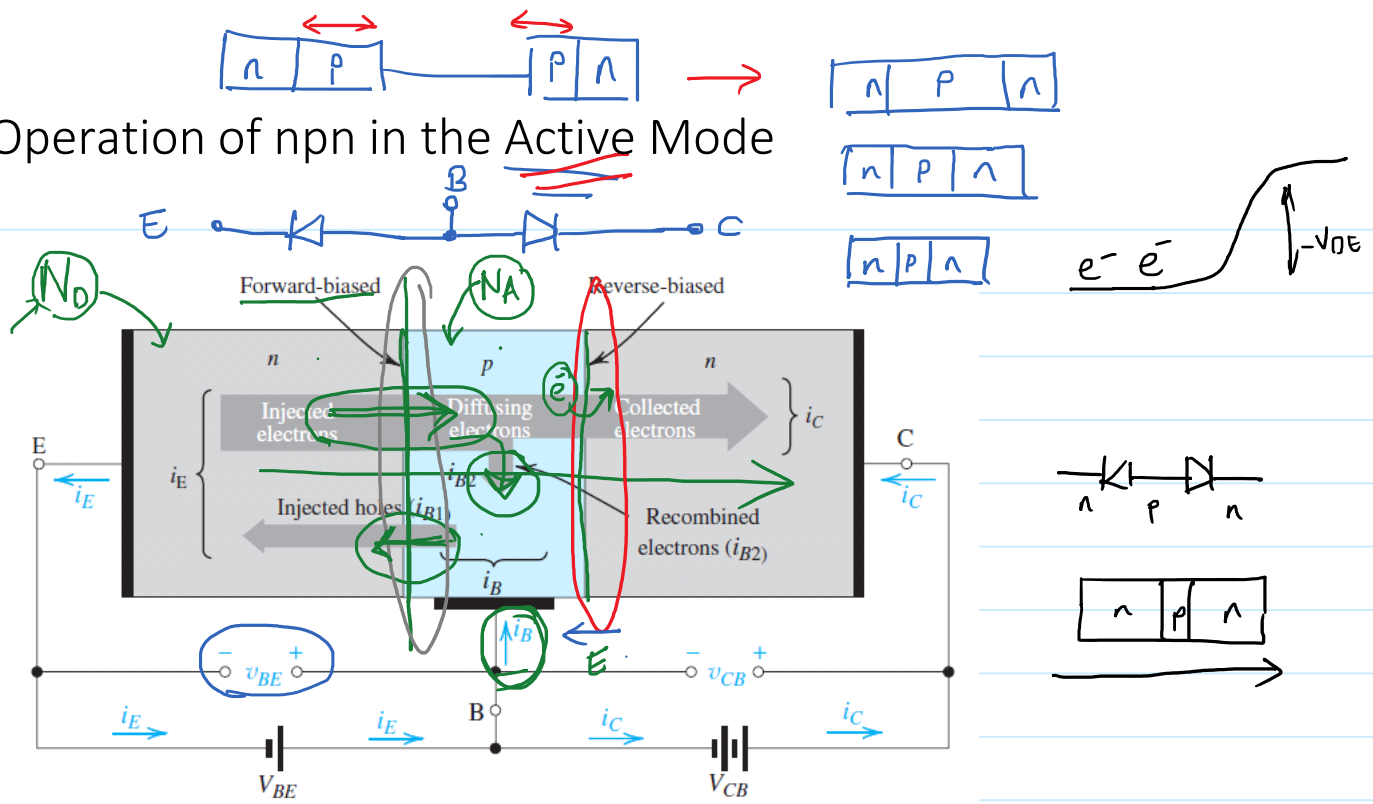
BJT and Operation Modes

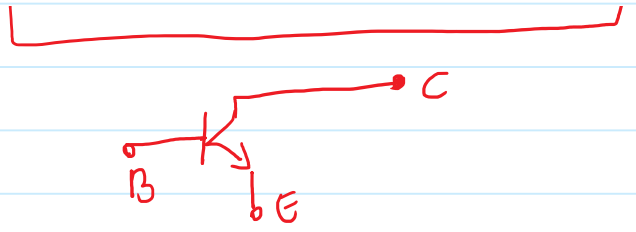
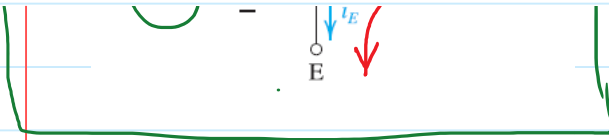


Mode	<u>EBJ</u>	<u>CBJ</u>
Cutoff	Reverse	Reverse
Active	Forward	Reverse
Saturation	Forward	Forward

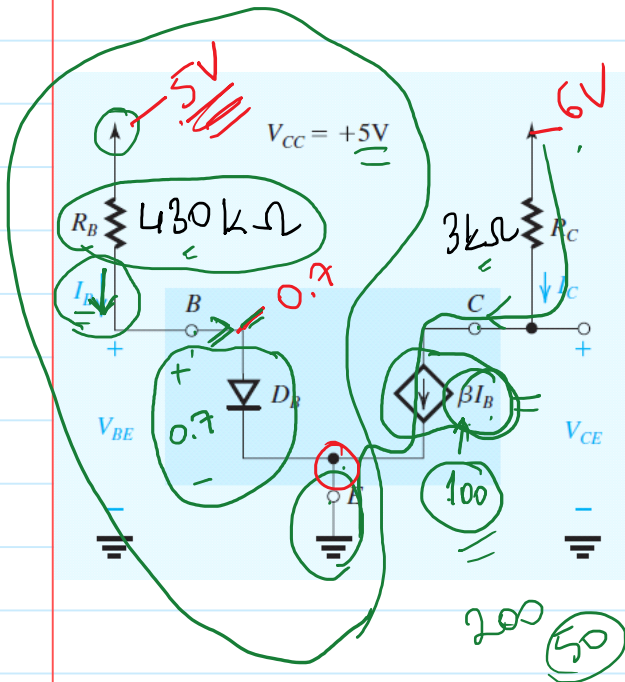


Operation of npn in the Active Mode





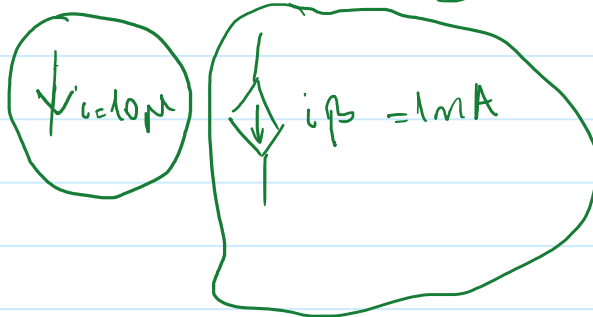
Example



$\downarrow = ?$ $V_{CE} = ?$

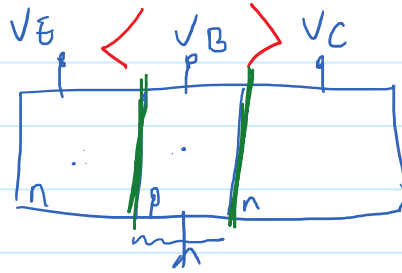
$$I_B = \frac{5 - 0.7}{430\text{k}} = \frac{4.3}{430\text{k}} = 10\mu\text{A}$$

$$10\mu\text{A} = 10 \times 10^{-6} \text{ A}$$

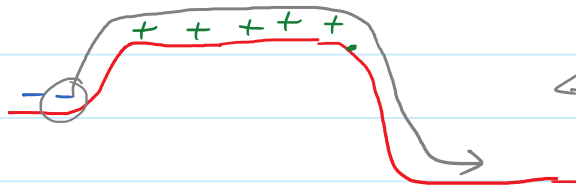


$$I_C = 100 \cdot 10\mu\text{A} = 1\text{mA}$$

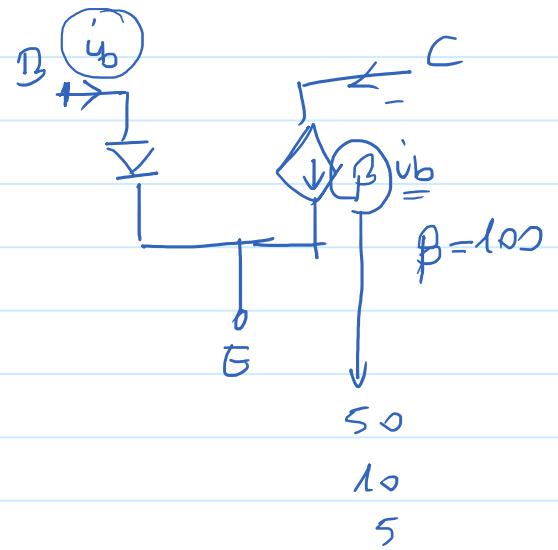
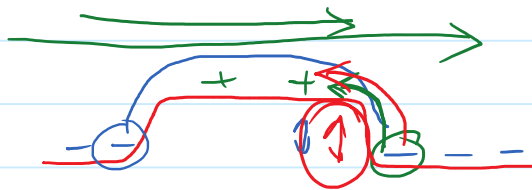
Operation of npn in the Saturation Mode



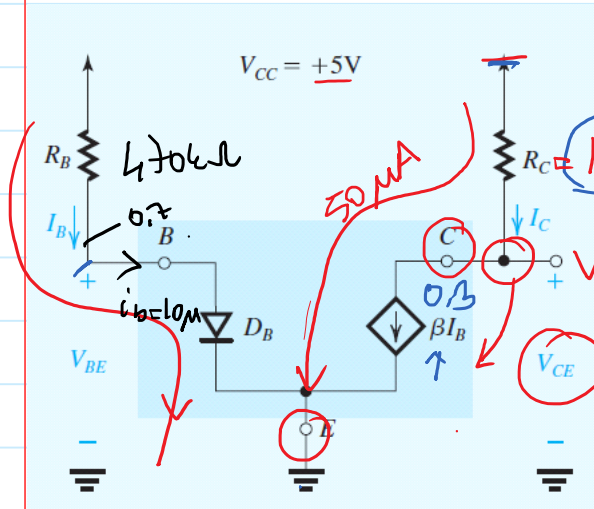
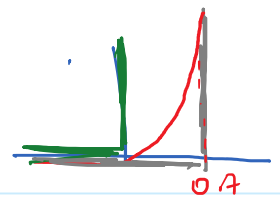
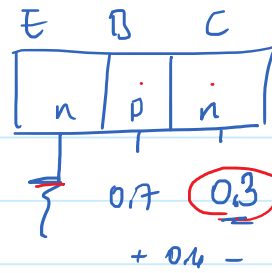
$$V_P > V_N$$



← active mode



Template



$$R_C = \frac{5 - 0.3}{0.1 \text{ mA}} = 47 \text{ k}\Omega$$

$$I_C = \frac{5 - 0.3}{100 \text{ k}\Omega} = \frac{4.7}{100 \text{ k}\Omega} = 50 \mu\text{A}$$

$$\beta = 5$$

$$\beta_F = 100$$

$$\beta_S = 90$$

