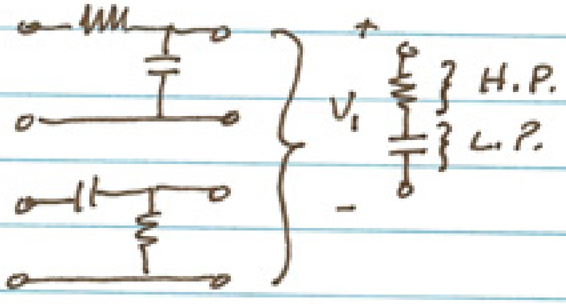
S.T.C.

Frequency Response

1ea S.T.C.

Cascade S.T.C.'s



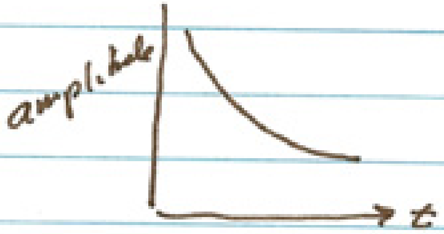
Complex Frequency $s = \underset{\substack{\uparrow \\ \text{decay}}}{\sigma} + j\underset{\substack{\uparrow \\ \text{"wiggle" rate}}}{\omega}$

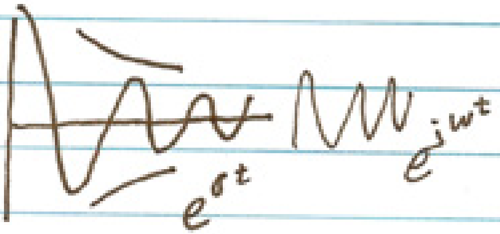
$$\sigma + j\omega$$

$$e^{st} = e^{(\sigma+j\omega)t} = e^{\sigma t}e^{j\omega t}$$

$$\underrightarrow{4e^{-2t}}$$

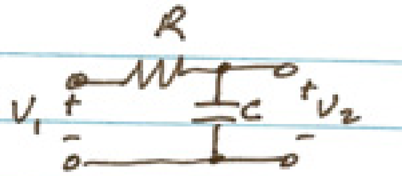
$$\boxed{\sigma=0,\ s=j\omega}$$





S.T.C. L.P. Table 1.2

$$\frac{K}{1+s/\omega_0} = \frac{\omega_0 K}{s+\omega_0}$$



$$\left(\frac{\frac{1}{Cs}}{R+\frac{1}{Cs}}\right)V_1 = V_2$$

$\frac{V_2}{V_1}$ = voltage transfer function (gain)

$$\frac{V_2}{V_1} = \frac{1}{RCs+1} = \frac{\frac{1}{RC}}{s+\frac{1}{RC}}$$

Let $s \to j\omega$, $\omega_0 = \frac{1}{RC}$

$$\frac{\omega_0}{\underset{j\omega}{\cancel{s}}+\omega_0} = M\angle\theta$$

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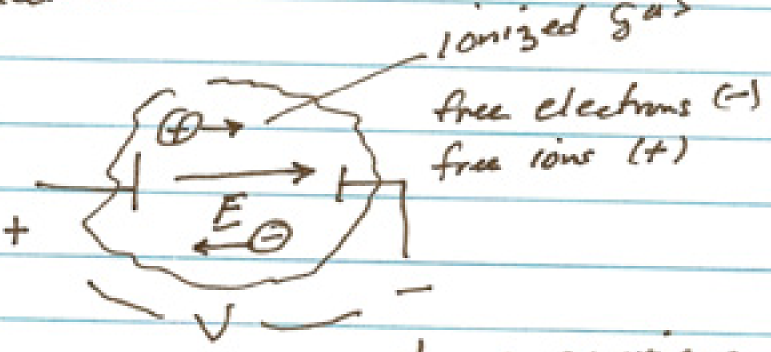
free charge ≡ conduction

|||

electrons



charge carriers

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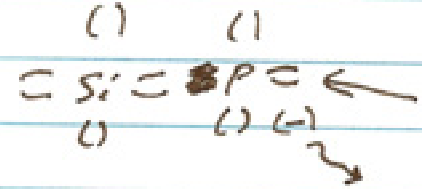
Solids: ions are bond
electrons are free

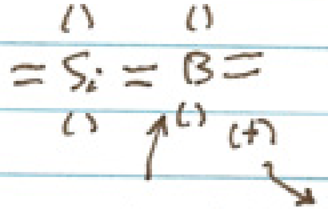
Semiconductor: crystal lattice

n-type semiconductor
P & Si



P -5
excess electron
bound +1 ion
total charge neutral
electron majority carrier
bound opposite ion

p-type semiconductor
B & Si



bound (-) ion

B +3
deficient 1 electron
hole = missing electron

hole majority carrier
bound ion is (-)
net charge = 0

majority = opposite of minority carrier

minority carrier is always same as
bound charge type

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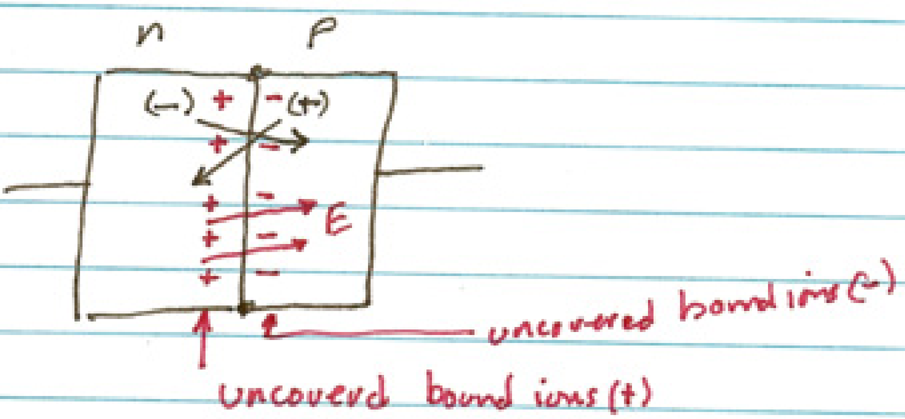
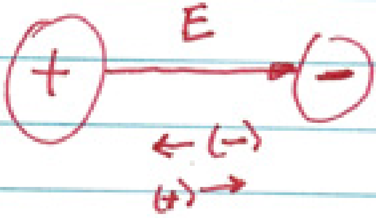
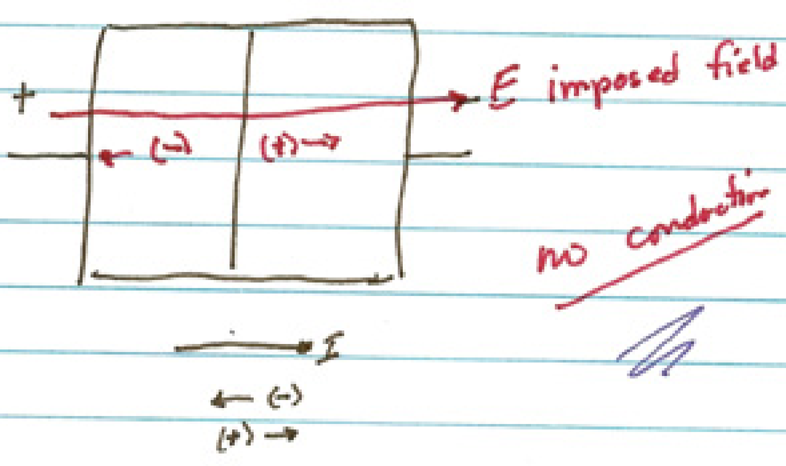
	n-Type	p-Type
impurity	P	B
valence	penta-	tri-
majority	(−)	(+)
minority	(+)	(−)
bound ion	(+)	(−)
net charge	0	0

junction diode







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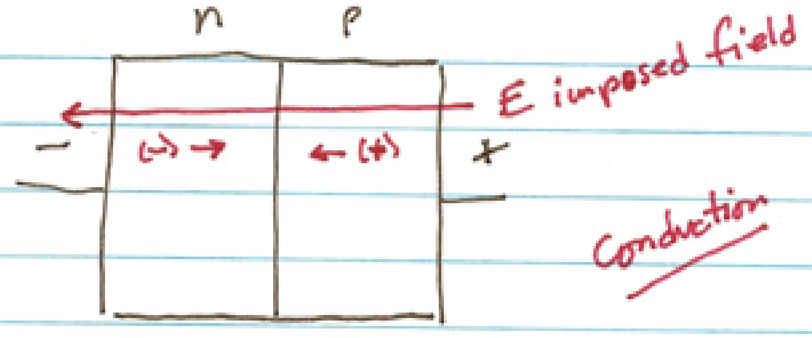
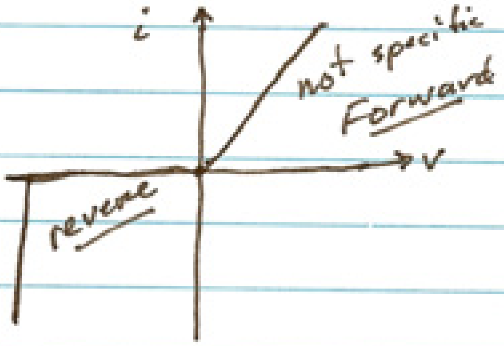


Conduction

diode is unilateral
resistor is bilateral



Breakdown
no conduction → conduction

Conduction - forward bias
no conduction - reverse bias