

Physics 264 - Lecture 5

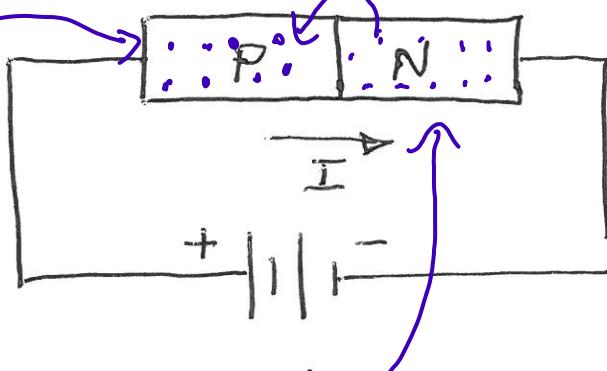
Conductor
Conduct Very Well

Conduction Band
Valence Band

- Availability of free electrons
- energy gap of 0

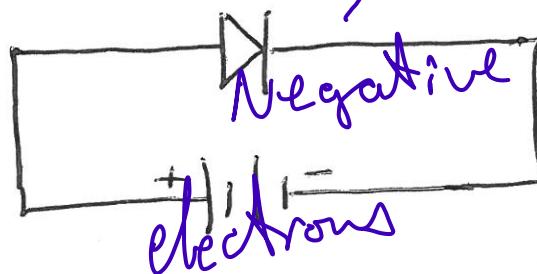
PN junction Diode

Forward Bias



Positive holes

- missing an electron



- have an extra electron

Closed switch

Insulator

Conduction Band

Energy Gap $> 3\text{ eV}$

Valence Band

Conduction Band

Energy Gap $< 3\text{ eV}$

Valence Band

- takes effort to go through

but not as much as

an insulator

Diode

- all or nothing device

- can act as an open or

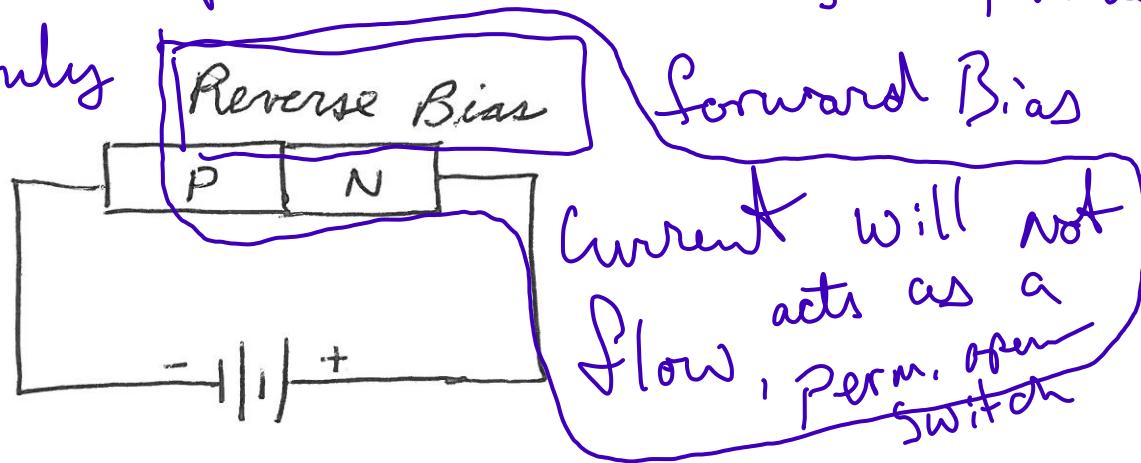
closed switch

Composed of 2 materials - anode or cathode

- If we apply battery w/ + toward P-side, then

- this diode only

wants the current to go 1 way



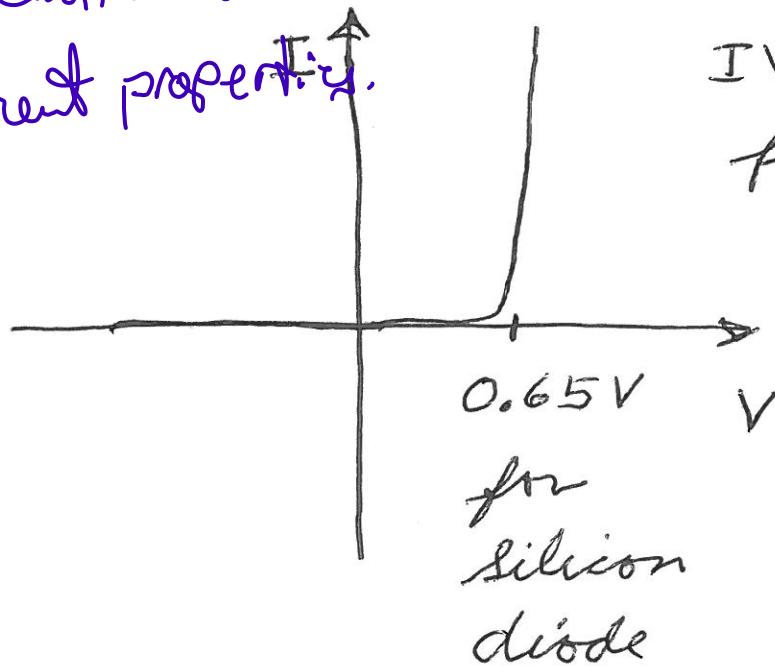
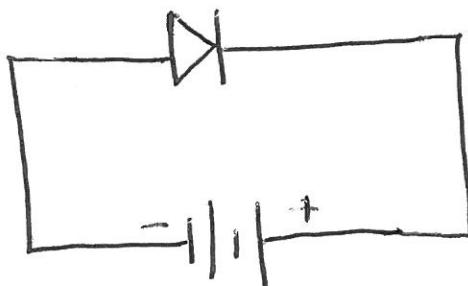
"Perfect diode"

would start @

0 V, reality is

different semiconductors

have different properties.



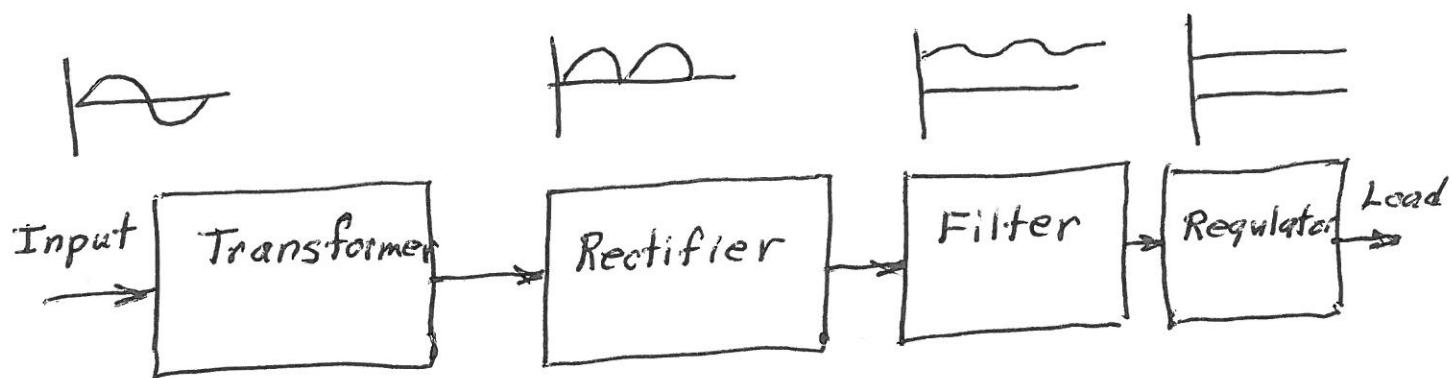
IV characteristic
for a diode

- Alka all or
Nothing
devices

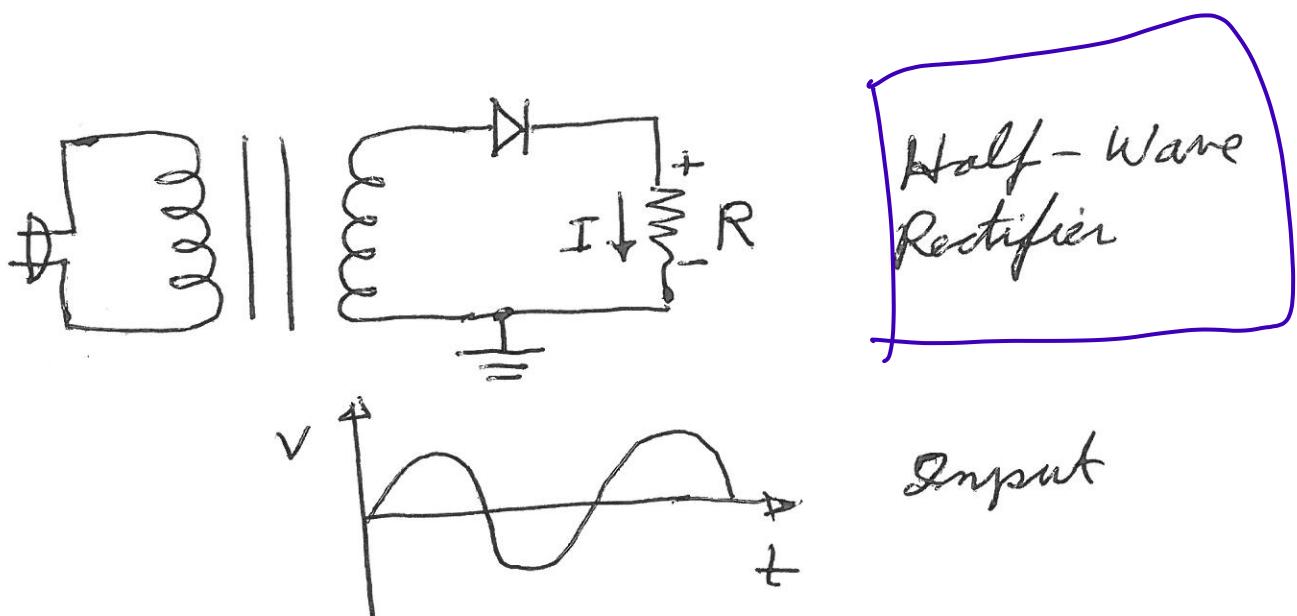
- Changes AC current to DC current

5-3

Block Diagram Power Supply



Types of Rectifiers

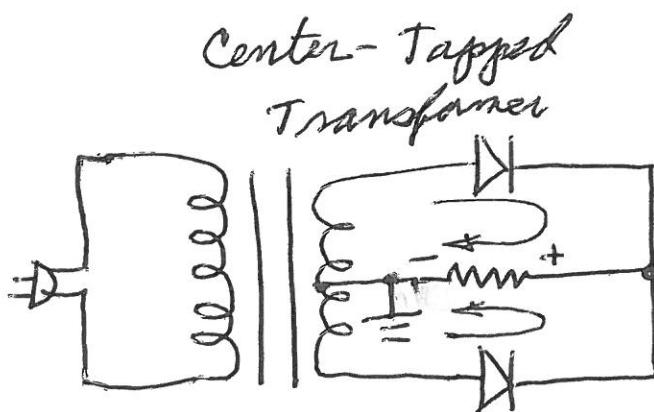


Diode doesn't allow neg. current to go through

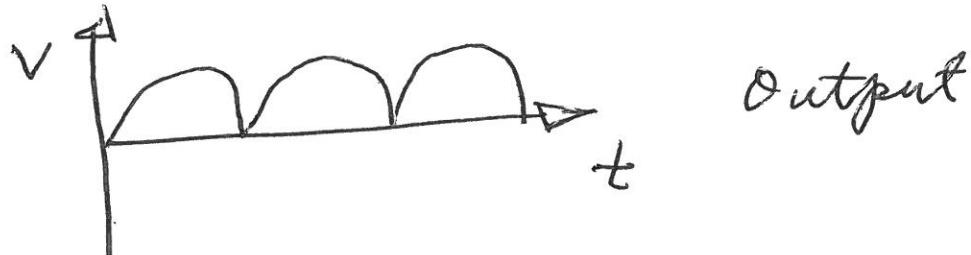
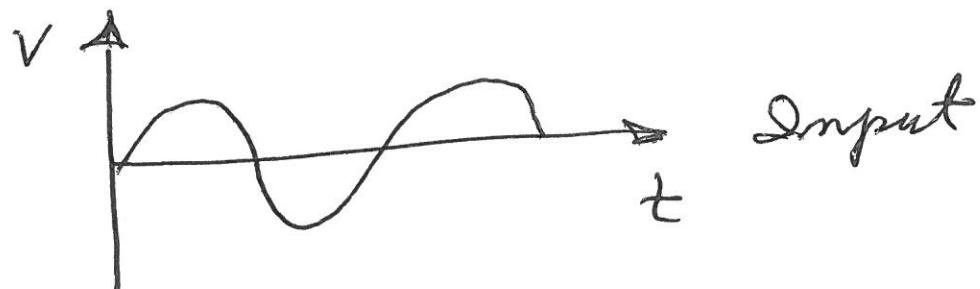
The graph shows the input AC voltage v on the vertical axis and time t on the horizontal axis. The output voltage is zero during the negative half-cycle of the input. During the positive half-cycle, the output voltage is a constant value, labeled as "One diode voltage drop".

Output

One diode voltage drop



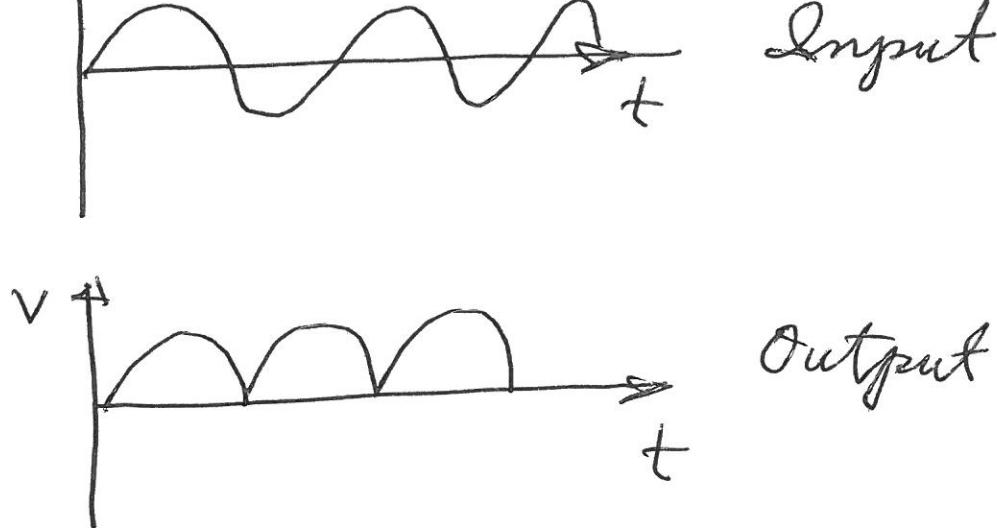
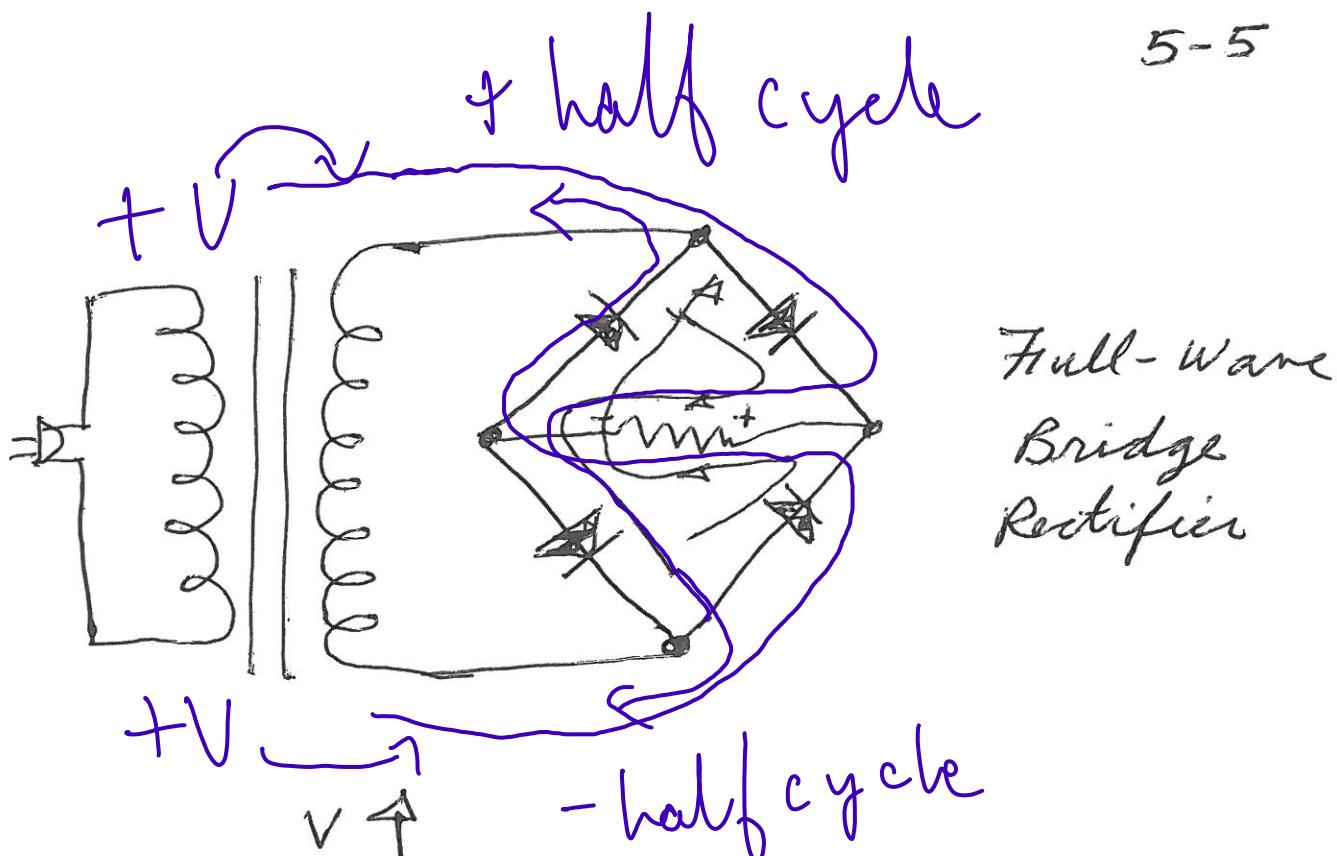
Full-Wave Rectifier



One diode voltage drop

- Both diodes work together to create only positive voltage

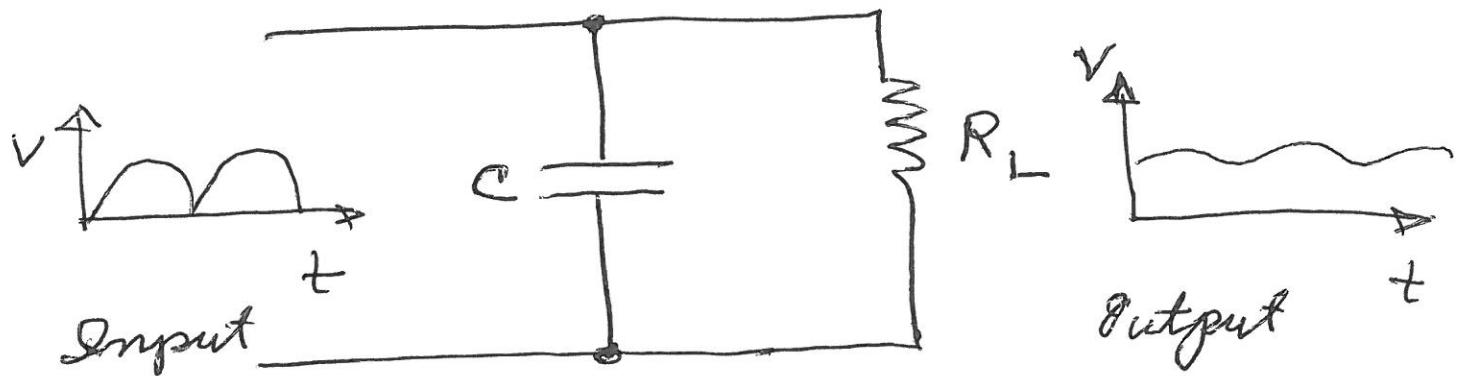
5-5



Two diode voltage drop

- Current is still oscillating

Simple RC Filter



- Capacitor holds a charge, which it can release energy to smooth out the hills from the AC current
- Diodes allow for current to only go 1 way