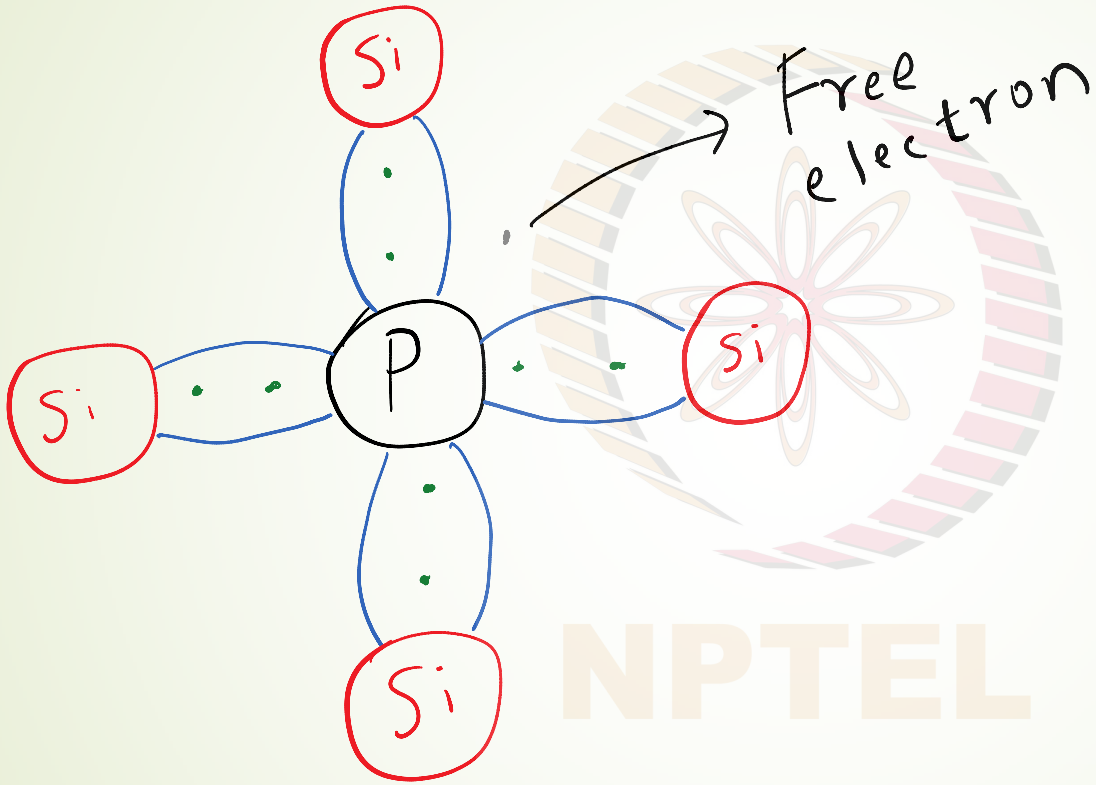
Silicon

Instructor – Dr. Madhav Rao

NPTEL

Doping: N-type doping



Silicon density : 5 X $10^{22}/cm^3$

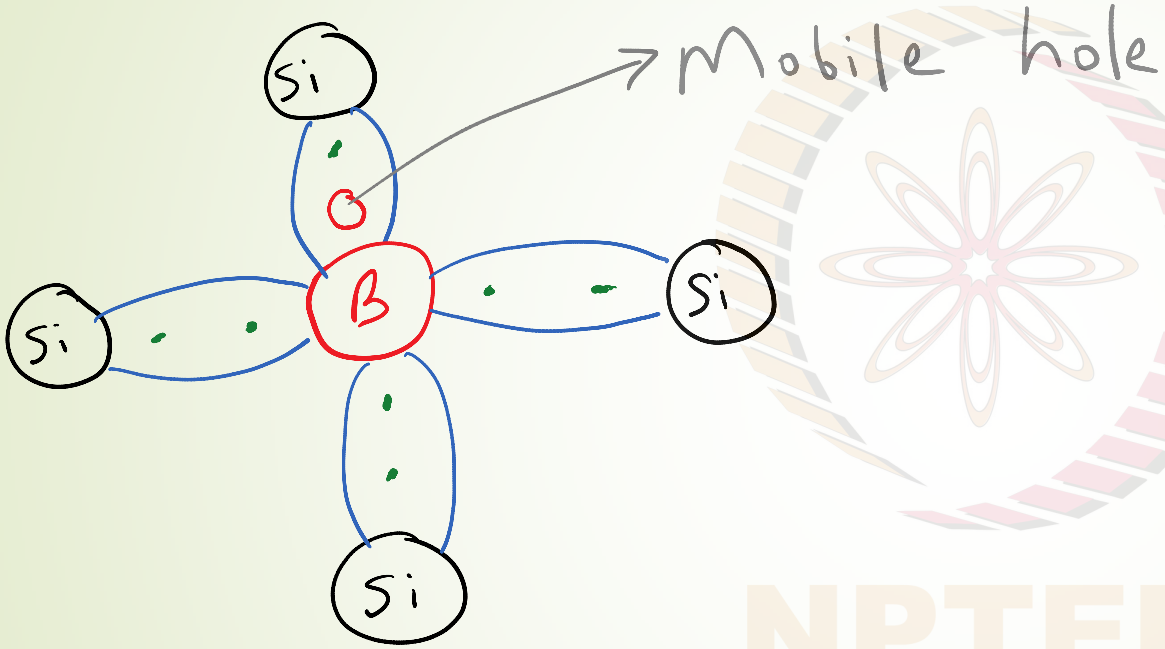
Intrinsic concentration for silicon at Room Temperature: 1.4 X $10^{10}/cm^3$

Doping helps to improve conductivity of Silicon.

Dopants of Arsenic, Phosphorous (5 valence electrons) will give 1-free electron.

Silicon as a material is abundantly and easily available, and hence has been highly utilized for semiconductor circuits and systems.

P-Type Doping



Dopants of Boron, Gallium (3 valence electrons) will give 1-hole.

Silicon as a material is abundantly and easily available, and hence has been highly utilized for semiconductor circuits and systems.

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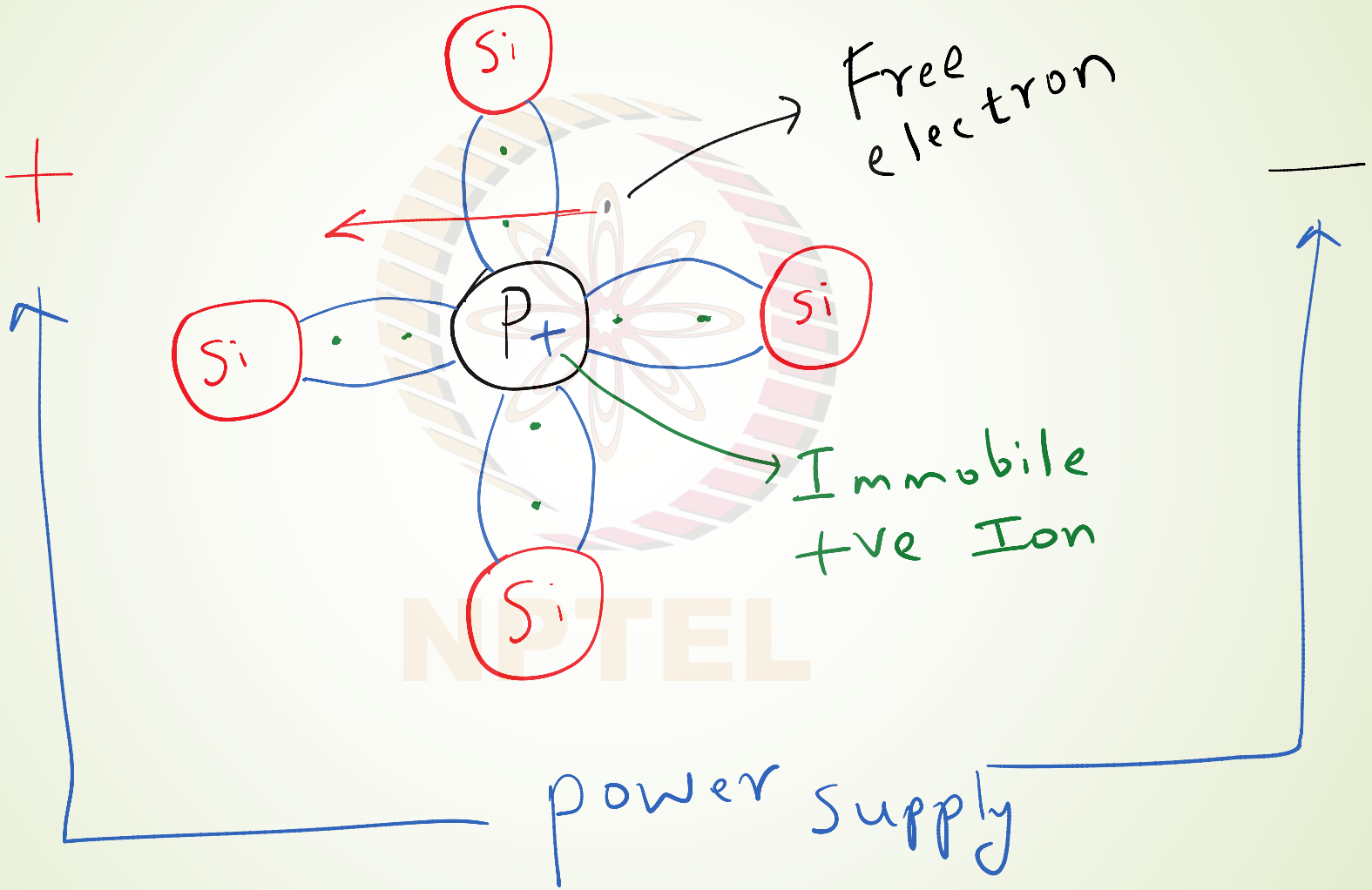
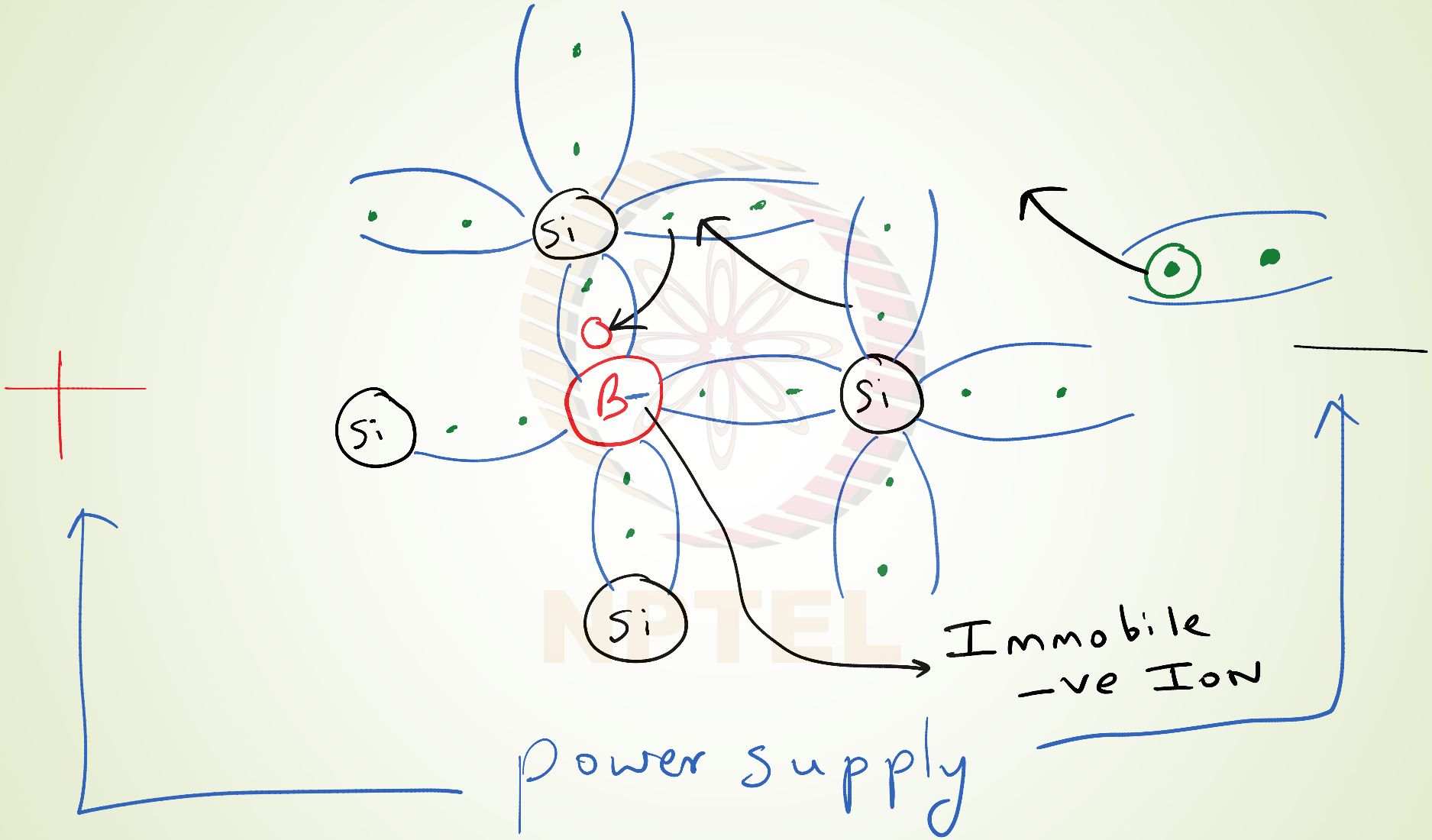
N-Type : Movement of free electrons when biased



P-Type: Movement of mobile holes when biased



Doping Representation

Representation	N_D or N_A
N^{--} or P^{--}	$< 10^{14}/cm^3$
N^{-} or P^{-}	$< 10^{16}/cm^3$
N or P	$< 10^{18}/cm^3$
N^{+} or P^{+}	$< 10^{20}/cm^3$
N^{++} or P^{++}	$> 10^{20}/cm^3$

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