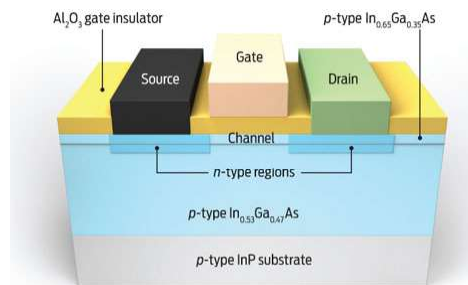
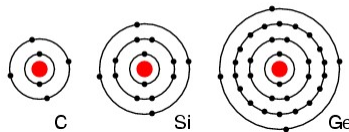


Class 17 Semiconductors



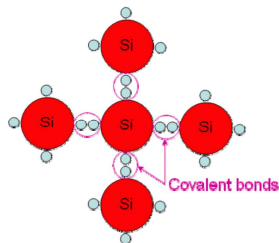
- Semiconductor
 - A material with conductivity between conductors and insulators
 - Has 3, 4 or 5 valence electrons
 - Trivalent – boron, aluminum, gallium, indium
 - Tetravalent – silicon, germanium
 - Pentavalent – phosphorous, arsenic, antimony
 - Devices
 - Diodes, transistors, silicon controlled rectifier (SCR), TRIAC, thyristor



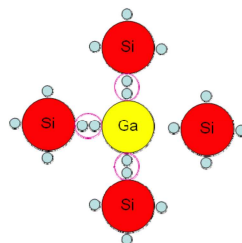
● Semiconductor

● Covalent bonds

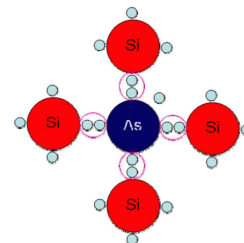
- Tetravalent + tetravalent = stability
- Tetravalent + trivalent = extra hole
- Tetravalent + pentavalent = extra electron



Electrically Stable



Extra Hole
(positively charged)



Extra Electron
(negatively charged)

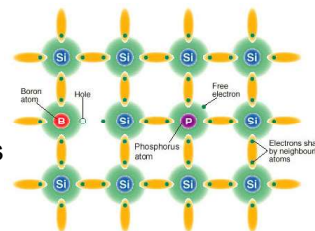
● Semiconductor

● P-Type Semiconductor

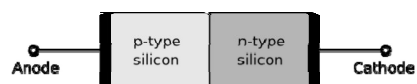
- Tetravalent + trivalent = extra holes
- Conductor with free holes!
- Positively charged

● N-Type Semiconductor

- Tetravalent + pentavalent = extra electrons
- Conductor with free electrons!
 - Influenced by light, heat, force, charge
- Negatively charged



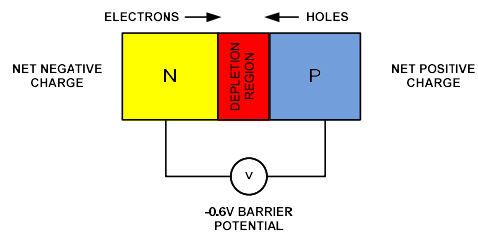
Free electron & free hole
in close proximity.



● Semiconductor

● PN Junction

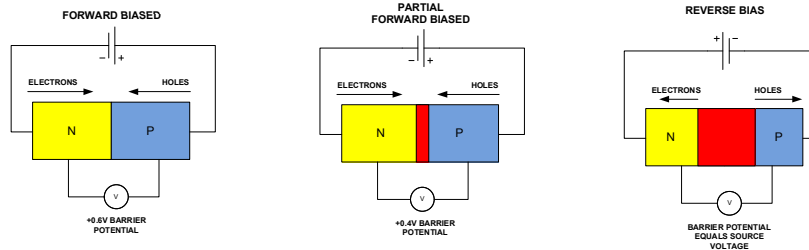
- Depletion region
 - N-type electrons join with P-type holes
 - Electrically stable
- Barrier potential
 - Silicon – 0.6 V
 - Germanium – 0.3 V



● Semiconductor

● PN Junction Bias

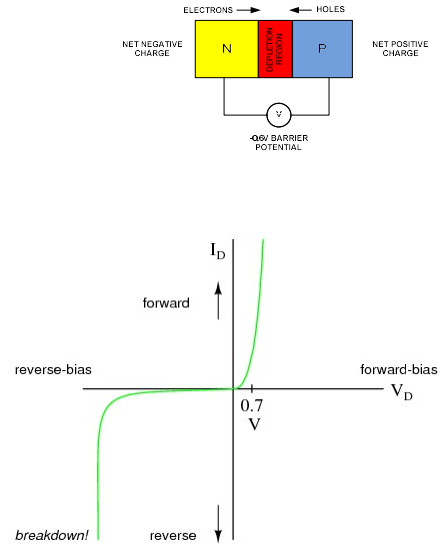
- **Forward Bias** – depletion region eliminated, allows full conductivity
- **Partial Forward Bias** – small depletion region allows partial conductivity
- **Reverse Bias** – large depletion region blocks conduction



● Semiconductor

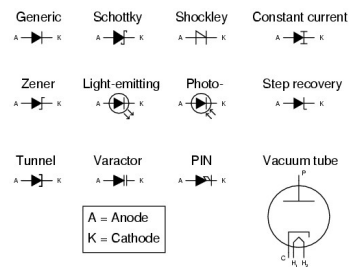
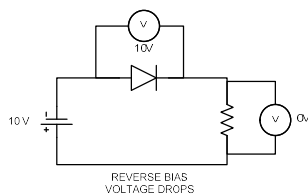
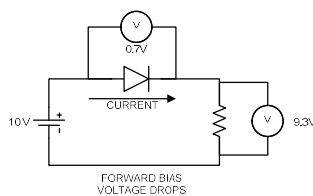
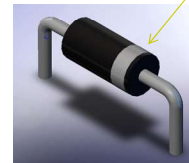
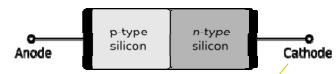
● PN Junction Bias

- Forward bias
 - Current increases after bias reaches barrier potential
- Reverse bias
 - Current increases after bias reaches breakdown voltage



● Diodes

- A two-terminal semiconductor that allows current flow in one direction



● Lab 17 – Diode Performance Test

Learning Objectives

- Use a datasheet to research diode performance specifications
- Understand current characteristics of a forward biased diode
- Understand current characteristics of a reverse biased diode

		Points Possible
Documentation	Quality of documentation (neatness, clarity, spelling, grammar), Expected and measured values recorded on schematic diagram	10
Diode Data Sheet	Diode performance specifications listed & accurate	5
Diode Data	Performance data taken accurately; displayed on scatter plot; within expected zener diode performance specifications	15
	Total	30