

# N-type and P-type semiconductors

- Semiconductors: typically elements that form covalent bonds with each other, like Silicon (Si) or Germanium (Ge) - 4 electrons in outer valence shell
- N-type semiconductor: doped with an element that "donates" electrons (has "extra" electrons), so it is "negative" (hence, n-type)
  - Element characteristic: has 5 electrons in outer valence shell, e.g. Phosphorus (P) or Antimony (Sb)
- P-type semiconductor: doped with an element that "accepts" electrons ("wants" electrons), so it is "positive" (hence, p-type)
  - Element characteristic: has 3 electrons in outer valence shell, e.g. Aluminum (Al) or Indium (In)

# Review: Periodic table of elements

Group ►		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18										
Period ▼																			Noble gases										
Nonmetals	1	1 H																	2 He										
	2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne										
Metals	3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar										
	4	19 K	20 Ca											21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
	5	37 Rb	38 Sr											39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
	6	55 Cs	56 Ba	La to Yb	71 Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn									
	7	87 Fr	88 Ra	Ac to No	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og									
		s-block (plus He)		f-block	d-block										p-block (excluding He)														
				Lanthanides	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb											
				Actinides	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No											