Group 15 / VA; Nitrogen Group

Basics

- Nitrogen (N) and phosphorous (P) are part of all biology and thus also of organic chemistry.
  - Phosphorous and arsenic (As) are very important for doping silicon, and nitrogen is found in many ceramics. There are also many applications of arsenic or its oxide (As_2O_3) in mystery books.
  - Bismuth is used in some high-tech products (like thermoelectric generators or Peltier elements): it's and antimony's (Sb) hey-days are yet to come.

Table of Basic Data

Name *(German)*	**Nitrogen** *Stickstoff*	**Phosphorus** *Phosphorus*	**Arsenic** *Arsen*	**Antimony** *Antimon*	**Bismuth** *Bismut*
Atomic number	7	15	33	51	83
Atomic mass [u]	14,01	30,97	74,92	121,75	208,98
Melting point [K]	63,29	317,3	sublimiert	903,89	544,5
Melting point [^oC]	-209,71	44,3	-	630,89	271,5
Melting point [^oF]					
Boiling point [K]	77,4	553	886	2023	1833
Density [g/cm^3]	1,17	1,82	5,72	6,69	9,80
Ionization energy [eV]	14,53	10,49	9,81	8,64	7,29
Electronegativitiy	3,1	2,1	2,2	1,8	1,7
Atomic radius [pm]	71	93	125	145	155
Ionic radius [pm]	171	44	69	89	96
Oxidation numbers	5, 4, 3, 2, -3	5, 3, -3	5, 3, -3	5, 3, -3	5, 3
Lattice typ Transformation temp. [^oC]	hcp	op	r	r	r
Lattice constant [Å] (a or c)	?	?	4,14	4,50	4,74
Young's - Modul us [GPa]	?	?	?	54,9	31,9
Therm. expansion coefficient α [$10^{-6}K^{-1}$]	?	?	?	?	?

- In case of doubt all numbers are for room temperatures
- fcc = face centered cubic; lattice const. = a
  bcc = body centered cubic
  sc = simple cubic
  hp = simple hexagonal
  hcp = hexagonal close packed; lattice constants a and c.
  op = simple orthorhombic, monoclinic, triclinic
  tp = simple tetragonal
  dia = diamond structure
  r = trigonal or rhomboedral trigonal