Group 18 / VII; Noble Gases

Basics

- Noble gases do not react with other elements. Almost but not quite true - there are a few noble gas compounds like fluorides, see below.
  - Noble gases remain gases down to very low temperatures. Helium (He) turns liquid at 4.2 K (- 269 ^{o}C; -452 ^{o}F) and does not turn solid at normal pressure. It is absolutely indispensable for low temperature physics and applications.
  - The other noble gases are of some importance, too. Neon (Ne) gave the name to "neon tubes", i.e. florescent lights. Important uses are simply as absolutely inert protection gases, e.g. in argon (Ar) welding or inside furnaces and low-pressure equipment like plasma etchers. Compounds like Argon or Krypton (Kr) fluorides (ArF_3, KrF_3) are of prime importance for Lasers needed to make modern microelectronic chips.
    Radon is radioactive and constantly produced in small quantities by the decay of naturally occurring uranium (U).
- *Table of Basic Data*

Name *(German)*	**Helium** *Helium*	**Neon** *Neon*	**Argon** *Argon*	**Krypton** *Krypton*	**Xenon** *Xenon*	**Radon** *Radon*
Atomic number	2	10	18	36	54	86
Atomic mass [u]	4,00	20,18	39,95	83,8	131,29	222,02
Melting point [K]	-	24,48	83,78	61.6120,85	166,1	211,4
Melting point [^{o}C]	-	-248,52	-189,22	-152,15	-106,9	-71
Melting point [^{o}F]	-	-415	-308	-242	-161	-96
Boiling point [K]	4,216	27,1	87,29	120,85	166,1	211,4
Density [g/cm^3]	0,17	0,84	1,66	3,48	4,49	9,23
Ionization energy [eV]	24,587	21,56	15,76	14,0	12,13	10,75
Electronegativitiy	K.A.	--	--	--	--	--
Atomic radius [pm]	128	K.A.	174	K.A.	218	K.A.
Ionic radius [pm]	--	--	--	169	190	K.A.
Oxidation numbers	--	--	--	2	2, 4, 6, 8	2
Lattice typ Transformation temp. [^{o}C]	hcp	fcc	fcc	fcc	fcc	fcc
Lattice constant [Å] (a or c)	?	?	?	?	?	?
Young's - Modul us [GPa]	?	?	?	?	?	?
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