Graphing Data:
ELECTRONEGATIVITY, ATOMIC RADII AND IONIC RADII DATA

The following data table includes information about three atomic properties for elements in the first two and last six columns (s- and p-blocks) of the periodic table, as well as for the first row of the transition metals.

Electronegativity (EN): There is more than one way to calculate the electronegativity; the values originally calculated by Linus Pauling are used here. All values are in kJ/mol.

Atomic Radius: The atomic radius of isolated atoms is difficult to measure in a consistent manner. Hence the table shows the value calculated from sophisticated quantum mechanical mathematics. All values are in picometers (10^{-12} m).

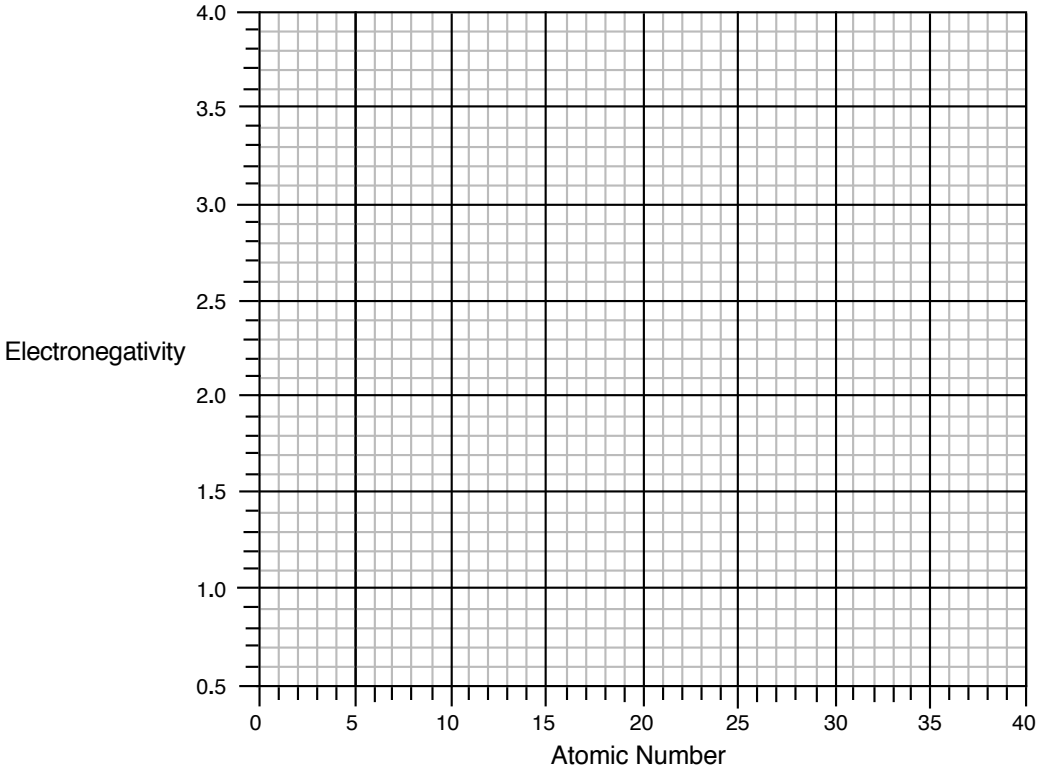
Ionic Radius: The ionic radius differs depending on the crystal in which the ion exists. The values here are considered to be typical. The charge of the ion formed is indicated in parentheses. Where an atom forms more than one type of ion, the most stable ion is used. All values are in picometers (10^{-12} m).

Element	Atomic No.	EN	Atomic Radius	Ionic Radius	Element	Atomic No.	EN	Atomic Radius	Ionic Radius
H	1	2.20	53	8.4×10^{-7} (+1)	Ni	28	1.91	149	0.078 (+2)
He	2	–	31	–	Cu	29	1.90	145	0.072 (+2)
Li	3	0.98	167	0.078 (+1)	Zn	30	1.65	142	0.083 (+2)
Be	4	1.57	112	0.034 (+2)	Ga	31	1.81	136	0.062 (+3)
B	5	2.04	87	0.023 (+3)	Ge	32	2.01	125	0.272 (-4)
C	6	2.55	67	0.260 (-4)	As	33	2.18	114	0.069 (+3)
N	7	3.04	56	– (-3)	Se	34	2.55	103	0.191 (-2)
O	8	3.44	48	0.132 (-2)	Br	35	2.96	94	0.196 (-1)
F	9	3.98	42	0.133 (-1)	Kr	36	3.00	88	–
Ne	10	–	38	–	Rb	37	0.82	265	0.149 (+1)
Na	11	0.93	190	0.098 (+1)	Sr	38	0.95	219	0.127 (+2)
Mg	12	1.31	145	0.078 (+2)	In	49	1.78	156	0.092 (+3)
Al	13	1.61	118	0.057 (+3)	Sn	50	1.96	145	0.093 (+2)
Si	14	1.90	111	0.026 (+4)	Sb	51	2.05	133	0.089 (+3)
P	15	2.19	98	0.212 (-3)	Te	52	2.1	123	0.211 (-2)
S	16	2.58	88	0.184 (-2)	I	53	2.66	115	0.220 (-1)
Cl	17	3.16	79	0.181 (-1)	Xe	54	2.6	108	–
Ar	18	–	71	–	Cs	55	0.79	298	0.165 (+1)
K	19	0.82	243	0.133 (+1)	Ba	56	0.89	253	0.143 (+2)
Ca	20	1.00	194	0.106 (+2)	Tl	81	1.62	156	0.105 (+3)
Sc	21	1.36	184	0.083 (+3)	Pb	82	2.33	154	0.132 (+2)
Ti	22	1.54	176	– (+4)	Bi	83	2.02	143	0.096 (+3)
V	23	1.63	171	0.061 (+4)	Po	84	2.0	135	0.230 (-2)
Cr	24	1.66	166	0.064 (+3)	At	85	2.2	127	–
Mn	25	1.55	161	0.091 (+2)	Rn	86	2.4	120	–
Fe	26	1.83	156	0.082 (+3)	Fr	87	0.7	–	0.189 (+1)
Co	27	1.88	152	0.082 (+2)	Ra	88	0.9	–	0.152 (+2)

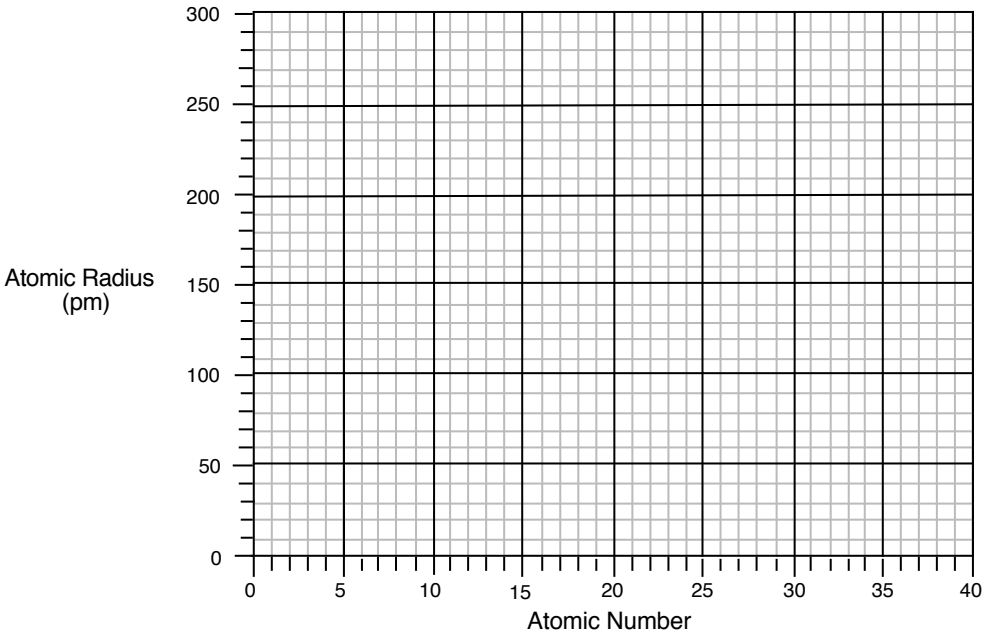
EXERCISES:

1. Recall that neutral atoms consist of two or more elementary particles. Suggest a reason why the ionic radius of H^+ is so much smaller than the ionic radius of the other atoms in the table.

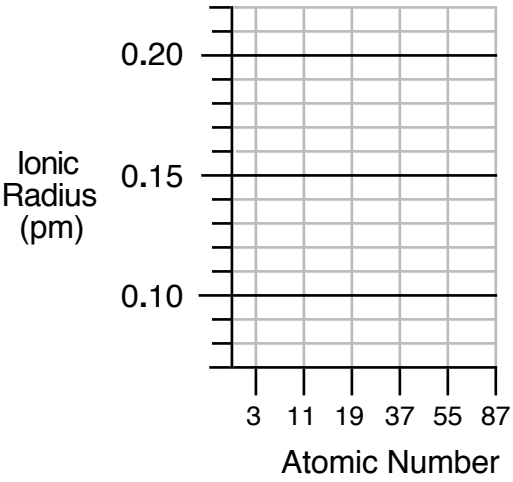
2. Plot the electronegativity versus atomic number for the first 38 elements on the following graph and connect each point to the next with a straight line. Where no data exists, leave a blank space and do **not** connect the point before the blank to the point after the blank.

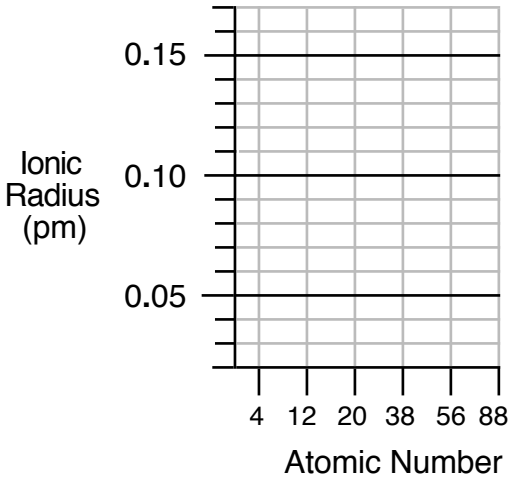


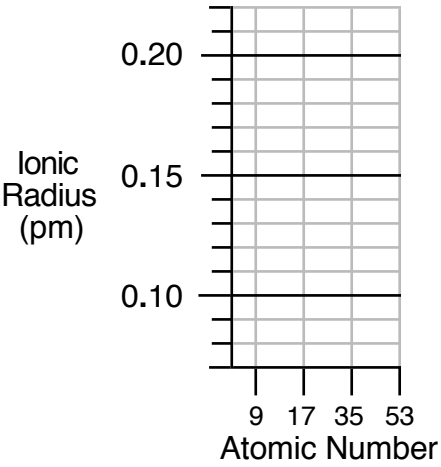
3. Plot the atomic radius versus atomic number for the first 38 elements on the following graph and connect each point to the next with a straight line.



4. Plot ionic radius versus atomic number for:
   (a) the alkali metals,
   (b) the alkaline earth metals, and
   (c) the halogens,
   using the following graphs and connect each point to the next with a straight line.







5. Write a statement that summarizes the trend in electronegativity:
   (a) going from left to right across the 2nd period (Li, B, etc.) of the periodic table, and
   (b) going down the 1st column of the periodic table,

6. Write a statement that summarizes the trend in atomic radius:
   (a) going from left to right across the 3rd period of the periodic table, and
   (b) going down the column containing the halogens.

7. Write a statement that summarizes the trend in ionic radius going down the column containing the alkaline earth metals.

8. Examine the trend in ionic radius for each of:
   (a) Li, Be and B,
   (b) Na, Mg and Al, and
   (c) K, Ca and Ga.
   Write a statement that summarizes the trend in ionic radius as the ionic charge increases.