



### An Earth Scientist's Periodic Table of the Elements and Their Ions

Version 4.7c © 2003 L. Bruce Railsback, Department of Geology, University of Georgia, Athens, Georgia, 30602-2501 U.S.A. (rlsbk@gly.uga.edu)  
For updates and more information, see <http://www.gly.uga.edu/railsback/PT.html>.

#### "Hard" or "Type A" Cations

(All electrons removed from outer shell)  
(Thus a noble-gas-like configuration of the outer shell)

#### Intermediate Cations

(Some electrons remain in outer shell)  
Coordination with S or O likely

#### "Soft" ("Type B") Cations

(Many electrons remain in outer shell)  
Coordinate  $|>Br>S>Cl=N>O>F$   
Commonly coordinate with C of organic ligands, as in methylmercury

#### Anions

See also Inset 7.  
Anions that commonly coordinate with  $H^+$  (e.g., as  $CH_4, NH_3, H_2S, H_2O$ , etc.)

Table of elements categorized as "Hard" or "Type A" cations. Elements include He, Ne, Ar, Kr, Xe, Rn, and various alkali and alkaline earth metals (Li, Na, K, Rb, Cs, Fr, Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Hf, Ta, Nb, Sb, Bi, Po, At, Rn, Fr, Ra, Ac, Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No, Lr). Each element cell contains its symbol, atomic number, name, atomic mass, and ionic charge (z<sub>f</sub>).

Table of elements categorized as Intermediate cations. Elements include transition metals (Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, Ge, As, Se, Br, Kr, Rb, Sr, Y, Zr, Nb, Mo, Tc, Ru, Rh, Pd, Ag, Cd, In, Sn, Sb, Te, Bi, Po, At, Rn, Fr, Ra, Ac, Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No, Lr) and lanthanides/actinides.

Table of elements categorized as "Soft" or "Type B" cations. Elements include transition metals (Pt, Au, Hg, Tl, Pb, Bi, Po, At, Rn, Fr, Ra, Ac, Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No, Lr) and heavy metals.

Table of elements categorized as Anions and Noble Gases. Elements include He, Ne, Ar, Kr, Xe, Rn, and various non-metals (C, N, O, F, Cl, Br, I, At, S, Se, Te, Po, Bi, Pb, Tl, Hg, Au, Pt, Ir, Rh, Ru, Pd, Ag, Cd, In, Sn, Sb, Te, Bi, Po, At, Rn, Fr, Ra, Ac, Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No, Lr).

