

CHEMICAL ELEMENTS INSIDE OF OTHER ELEMENTS

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The names of the chemical elements have received a certain amount of attention in *Word Ways* over the years. Borgmann (1968) presented a quiz on 20 transposed element names in the first issue of *Word Ways*. Other articles have documented more extensive transpositions of element names (Borgmann, 1974, 1978; Francis, 1977) and where an element did not have a transposition, Francis (1977) offered the shortest possible transadditions of the element names.

Others papers have offered more transadditions (Francis, 2006a), old names for some of the elements, elements in US placenames, and words composed exclusively of the element symbols, such as CoAgULaTe.

All the symbols of chemical elements as an ordered collection of letters have been examined too (Francis 2002, 2006b). Viewing the symbols as a sequence of more of two hundred letters, Francis presented words that occurred "naturally" in that sequence (CLARK and CONIC were five-letter examples), words that could be made by transposition of the letters in adjacent symbols (e.g. SPORTIER can be formed from the symbols Re Os Ir Pt with atomic numbers 75-78), and words that can be made by transposition of symbols and partsymbols.

An analysis of the chemical symbols that compose the names of the elements with atomic numbers 1 to 111 is presented in this paper in puzzle format as a new contribution to this word play about chemical elements. We have detected that solely 15 names of the 111 chemical elements are composed by the chemical symbols of others elements of the periodic table. Chemical symbols of the isotopes of hydrogen (deuterium (D) and tritium (T)) have been included in this analysis too. The shady and empty squares in Figure 1 correspond with the position of those 15 elements at the periodic table. If you are chemist, you will know easily these elements with transposition.

Figure 1: Chemical elements inside of other elements

H																	He	
Li	Be											B	1	N	O	F	2	
Na	Mg											Al	3	4	S	Cl	Ar	
K	Ca	Sc	Ti	V	Cr	Mn	5	6	Ni	7	Zn	Ga	Ge	8	Se	Br	9	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	10	Sb	Te	11	12	
Cs	Ba	*	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	13	Po	14	15	
Fr	Ra	**	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg								
			*	La	Ce	Pr	Nd	Pm	Sr	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
			**	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

In order to know those 15 special elements, names of elements that compose them are showed as clues. To solve the puzzle, you must find the symbols that correspond to the elemental names and rearrange them into the chemical elements' names. For example, if the clues at [1] are *nitrogen, carbon, argon, oxygen* and *boron*, symbols are N, C, Ar, O and B. If you rearrange these symbols, it will appear CARBON, correct?. Find the rest of elements.

[2] neon, nitrogen, oxygen

[3] cobalt, nitrogen, lithium, silicon

[4] ruthenium, sulfur, oxygen, hydrogen, phosphorus

[5] oxygen, nitrogen, iridium

[6] cobalt, aluminium, tritium, boron

[7] erbium, phosphorus, carbon, oxygen

[8] carbon, nickel, arsenic, selenium

[9] yttrium, tritium, oxygen, nitrogen, phosphorus, krypton

[10] iodine, tritium, nitrogen

[11] iodine, neon, deuterium, oxygen

[12] nitrogen, oxygen, xenon

[13] samarium, uranium, bismuth, thorium

[14] tantalum, arsenic, titanium, neon

[15] deuterium, oxygen, radon, nitrogen

In conclusion, [1] CARBON, [2] NeON, [3] SiLiCoN, [4] PHOSPHORuS, [5] IrON, [6] CoBAIT, [7] COPPEr, [8] ArSeNiC, [9] KRyPTON, [10] TIN, [11] IODINE, [12] XeNON, [13] BiSmUTh, [14] AsTaTiNe and [15] RaDON are formed by other chemical symbols.

- [12] uranium, iodine, boron, oxygen, nickel
 [13] tellurium, titanium, uranium, neon, carbon, hydrogen
 [14] tritium, uranium, ruthenium, helium, nickel
 [15] rhodium, oxygen, uranium, iodine, deuterium
 [16] aluminium, iodine, phosphorus, deuterium, lanthanum, uranium
 [17] deuterium, iodine, calcium, uranium
 [18] deuterium, indium, uranium, iodine
 [19] sulfur, iodine, uranium, cerium
 [20] boron, uranium, iodine, argon
 [21] nitrogen, tantalum, lutetium
 [22] iodine, uranium, osmium
 [23] deuterium, iodine, uranium, indium
 [24] titanium, uranium, nitrogen, phosphorus, lanthanum
 [25] thorium, lithium, aluminium, uranium
 [26] carbon, uranium, nitrogen, fluorine, iodine, radium
 [27] uranium, radium, deuterium, iodine
 [28] uranium, nickel, boron, deuterium
 [29] silicon, uranium, arsenic, hydrogen
 [30] argon, deuterium, tantalum, sulfur, titanium, uranium
 [31] erbium, carbon, uranium, iodine
 [32] dysprosium, oxygen, phosphorus, uranium, radium, iodine, selenium
 [33] neon, oxygen, uranium, iodine, dysprosium
 [34] sulfur, argon, iodine, uranium, americium
 [35] uranium, nickel, lithium, oxygen, deuterium, gallium
 [36] tellurium, iodine, uranium, rubidium
 [37] dysprosium, sulfur, uranium, iodine, osmium, praseodymium
 [38] bismuth, uranium, erbium
 [39] uranium, thorium, lithium
 [40] tritium, rubidium, iodine, uranium, yttrium, tellurium
 [41] tellurium, titanium, uranium, lutetium
 [42] titanium, nickel, actinium, uranium
 [43] praseodymium, titanium, uranium, actinium, oxygen, tritium, nickel
 [44] uranium, nickel, radium
 [45] platinum, neon, uranium, nickel
 [46] phosphorus, oxygen, uranium, lutetium, tritium, nickel
 [47] iodine, erbium, americium, carbon, uranium
 [48] uranium, calcium, oxygen, iodine, fluorine, lithium, radon
 [49] erbium, fluorine, uranium, iodine
 [50] beryllium, lithium, nobelium, uranium
 [51] nitrogen, tungsten, lanthanum, uranium, carbon, iodine, rhenium

In conclusion, [1] HeLiUM, [2] LiThiUM, [3] SODIUM, [4] MAgNeSiUM, [5] AlUMINiUM, [6] POTAsSiUM, [7] CAICIUM, [8] SCaNDIUM, [9] TiTaNIUM, [10] BrOMINe, [11] RuBiDIUM, [12] NIOBIUM, [13] TeCHNeTiUM, [14] RuTHENiUM, [15] RhODIUM, [16] PAiLaDIUM, [17] CaDMiUM, [18] InDIUM, [19] CeSIUM, [20] BArdUM, [21] TaNTaLuM, [22] OsMIUM, [23] IrIDIUM, [24] PLaTiNUM, [25] ThAlLiUM, [26] FRaNCIUM, [27] RaDIUM, [28] DUBNIUM, [29] HAsSiUM, [30] DARmSTaDTiUM, [31] CERiUM, [32] PRaSeODyMIUM, [33] NeODyMIUM, [34] SAmArUM, [35] GaDOLiNIUM, [36]

TeRbIUM, [37] DySPROsIUM, [38] ErBiUM, [39] ThULIUM, [40] YTTeRbIUM, [41] LuTeTiUM, [42] AcTiNiUM, [43] PrOTAcTiNiUM, [44] URaNiUM, [45] NePtUNiUM, [46] PLuTONiUM, [47] AmErCIUM, [48] CaLiFORnIUM, [49] FErMIUM, [50] NoBeLiUM, and [51] LaWRenCIUM, are formed by other chemical symbols plus M letter.

Next clues and different additional letters to M that you need to form the others 10 elements are:

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|--|--|
| [A] R, germanium, nitrogen, deuterium, yttrium, oxygen, hydrogen | [E] R, iodine, neon, oxygen, fluorine, lutetium |
| [B] R, oxygen, boron, nitrogen | [F] G, argon, nitrogen, oxygen |
| [C] R, nickel, germanium, nitrogen, oxygen, tritium | [G] Z, iodine, carbon, nitrogen |
| [D] X, yttrium, oxygen, germanium, nitrogen | [H] L, erbium, vanadium, silicon |
| | [I] A, nitrogen, yttrium, molybdenum, titanium |
| | [J] G, nitrogen, uranium, tellurium, sulfur, tritium |
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Therefore, [A] HYDRoGeN, [B] BORON, [C] NiTROGeN, [D] OXYGeN, [E] FLuORINe, [F] ArGON, [G] ZINC, [H] SiLVER, [I] ANTiMoNY, and [J] TUNGSTeN are these last elements.

Finally, if we want form the names of the rest of chemical elements as a series of chemical symbols we need from two to six additional letters.

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