

ELEMENTALS WORD GAME

(Instructions as of October 21, 2018)

Elementals is both a learning aid for chemistry students and a set of word games using a laser-cut periodic table of elements.

As a learning aid, students simply place atomic tiles onto their corresponding locations within the periodic table. This helps with visually remembering the elements.

As one of several games, Elementals lets students form words using one- and two-letter chemical symbols. For example, "heat" is spelled with two tiles: [He] and [At]. Students quickly and beneficially learn the symbols when attempting to make words.

ALPHABETIC CHEMICAL SYMBOLS CROSS-REFERENCE																	
89 Ac	47 Ag	13 Al	95 Am	18 Ar	33 As	85 At	79 Au	5 B									
56 Ba	4 Be	107 Bh	83 Bi	97 Bk	35 Br	6 C	20 Ca	48 Cd									
58 Ce	98 Cf	17 Cl	96 Cm	112 Cn	27 Co	24 Cr	55 Cs										
29 Cu	105 Ds	110 Ds	66 Dy	68 Er	99 Es	63 Eu	9 F	26 Fe									
114 Fl	100 Fm	87 Fr	31 Ga	64 Gd	32 Ge	1 H	2 He	72 Hf									
80 Hg	67 Ho	108 Hs	53 I	49 In	77 Ir	19 K	36 Kr	57 La	3 Li								
103 Lr	71 Lu	116 Lv	115 Mc	101 Md	12 Mg	25 Mn											
42 Mo	109 Mt	7 N	11 Na	41 Nb	60 Nd	10 Ne	113 Nh										
28 Ni	102 No	93 Np	8 O	118 Og	76 Os	15 P	91 Pa										
82 Pb	46 Pd	61 Pm	84 Po	59 Pr	78 Pt	94 Pu	88 Ra	37 Rb									
75 Re	104 Rf	111 Rg	45 Rh	86 Rn	44 Ru	16 S	51 Sb										
21 Sc	34 Se	106 Sg	14 Si	62 Sm	50 Sn	38 Sr	73 Ta	65 Tb									
43 Tc	52 Te	90 Th	22 Ti	81 Tl	69 Tm	117 Ts	92 U	23 V									
74 W	54 Xe	39 Y	70 Yb	30 Zn	40 Zr												

PERIODIC TABLE OF THE ELEMENTS																					
1 H Hydrogen 1.008																	2 He Helium 4.003				
3 Li Lithium 6.94	4 Be Beryllium 9.012															5 B Boron 10.81	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180
11 Na Sodium 22.990	12 Mg Magnesium 24.305															13 Al Aluminum 26.982	14 Si Silicon 28.085	15 P Phosphorus 30.974	16 S Sulphur 32.06	17 Cl Chlorine 35.453	18 Ar Argon 39.948
19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.867	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.63	33 As Arsenic 74.922	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.798				
37 Rb Rubidium 85.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.96	43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.91	46 Pd Palladium 106.42	47 Ag Silver 107.87	48 Cd Cadmium 112.41	49 In Indium 114.82	50 Sn Tin 118.71	51 Sb Antimony 121.76	52 Te Tellurium 127.60	53 I Iodine 126.90	54 Xe Xenon 131.29				
55 Cs Caesium 132.91	56 Ba Barium 137.33	57-71 Lanthanides	72 Hf Hafnium 178.49	73 Ta Tantalum 180.95	74 W Tungsten 183.84	75 Re Rhenium 186.21	76 Os Osmium 190.23	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.97	80 Hg Mercury 200.59	81 Tl Thallium 204.38	82 Pb Lead 207.2	83 Bi Bismuth 208.98	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)				
87 Fr Francium (223)	88 Ra Radium (226)	89-103 Actinides	104 Rf Rutherfordium (267)	105 Db Dubnium (268)	106 Sg Seaborgium (269)	107 Bh Bohrium (270)	108 Hs Hassium (277)	109 Mt Meitnerium (278)	110 Ds Darmstadtium (281)	111 Rg Roentgenium (282)	112 Cn Copernicium (285)	113 Nh Nihonium (286)	114 Fl Flerovium (289)	115 Mc Moscovium (290)	116 Lv Livermorium (293)	117 Ts Tennessine (294)	118 Og Oganesson (294)				
			57 La Lanthanum 138.91	58 Ce Cerium 140.12	59 Pr Praseodymium 140.91	60 Nd Neodymium 144.24	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.96	64 Gd Gadolinium 157.25	65 Tb Terbium 158.93	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93	68 Er Erbium 167.26	69 Tm Thulium 168.93	70 Yb Ytterbium 173.05	71 Lu Lutetium 174.97				
			89 Ac Actinium (227)	90 Th Thorium 232.04	91 Pa Protactinium 231.04	92 U Uranium 238.03	93 Np Neptunium (237)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)	103 Lr Lawrencium (262)				

ATOMIC NUMBER		ATOMIC WEIGHT		CHEMICAL SYMBOL	
4	9.012	Not used in the game		Use both letters or just the first!	
has your points!		Beryllium		Beryllium	
ELEMENT NAME		Learn it just for fun!		ELEMENTAL WORD GAME	

COMPONENTS

- Laser-cut wooden tray, ~ 12x18 inches x ¼ inch in size
- 118 laser-cut chemical symbol tiles
- Four tile holders.

PLAY AS A SIMPLE WORD GAME

The periodic table board is not used. Flip all tiles face up. Players take turns finding two tiles that can make 3- or 4-letter words. See Making Words and Scoring below for details.

PLAY AS A MEMORY GAME

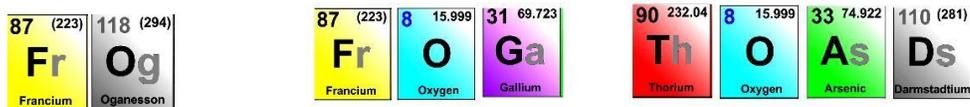
The periodic table board is not used. Flip all tiles face down. Players take turns flipping over four tiles at a time in an attempt to find symbols that will make words. If one or more words are made, simply keep the tiles and score the word(s). Flip back the tiles if a word cannot be made. Use your memory to remember locations of chemical symbols. Alternatively, do not flip back the tiles.

PLAY AS A CROSSWORD GAME

This is the most involved way of making words on the board and the focus of the remaining instructions.

MAKING WORDS

To make a word, use the letters on two or more tiles. You can use both letters on any tile as well as just the first bold letter. Using the second (grey) letter is optional. For instance, here are several ways to make FROG and TOADS:



at times ignoring the last, grey letters.

Within the confined space of the periodic table, you can place words three ways:

- Left to right
- Top to bottom
- Diagonally from top left to bottom right

Always declare your word before scoring it.

PLACING YOUR TILES

If you are not using an existing tile to make a word, one of your tiles must be placed on its matching position within the tray.

For instance, when making a word like PLANTS, you could place the “P” on the [P] (phosphorus) or N on Nitrogen, etc.

6	12.011	7	14.007	8	15.999	9	18.998	10	20.180
C	Carbon	N	Nitrogen	O	Oxygen	F	Flourine	Ne	Neon
14	28.085	15	30.974	57	138.9	7	14.007	117	(294)
Si	Silicon	P	Phosphorus	La	Lanthanum	N	Nitrogen	Ts	Tennessee
32	72.63	33	74.922	34	78.96	35	79.904	36	83.798

Otherwise, you can make a crossed word by using an existing tile as the first, middle or ending letter(s), for example, NAG is crossed from the N in PLANTS.

7	14.007	8	15.999	9	18.998	10	20.180
N	Nitrogen	O	Oxygen	F	Flourine	Ne	Neon
15	30.974	57	138.9	7	14.007	117	(294)
P	Phosphorus	La	Lanthanum	N	Nitrogen	Ts	Tennessee
33	74.922	34	78.96	47	107.87	36	83.798
As	Arsenic	Se	Selenium	Ag	Silver	Kr	Krypton
51	121.76	52	127.60	53	126.90	54	131.29
Sh	Shabazz	Te	Tellurium	I	Iodine	Xe	Xenon

Or you could cross PLANTS with [Ru] and [Ne] to make and score three new words, Rune, Run, Nets.

7	14.007	8	15.999	44	101.07	10	20.180
N	Nitrogen	O	Oxygen	Ru	Ruthenium	Ne	Neon
15	30.974	57	138.9	7	14.007	117	(294)
P	Phosphorus	La	Lanthanum	N	Nitrogen	Ts	Tennessee

WORD PLACEMENT ON THE BOARD

Because space on the board is limited, you can add one or more tiles adjacent to other tiles that will not be part of the new word.

However, you can use existing tiles as part of the new word.

For example, with HAM already placed diagonally on the board, you can make HAUL from the existing [H]. The adjacent [Au] [Am] do not make a word and are ignored.

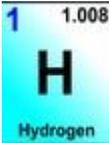
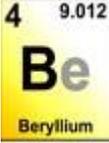
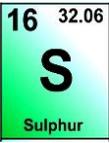
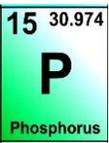
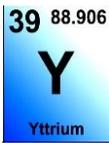
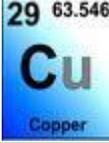
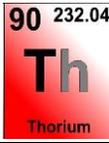
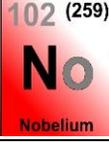
1	1.008		
H	Hydrogen		
3	6.94	95	(243)
Li	Lithium	Am	Americium
11	22.990	12	24.305
Na	Sodium	Mg	Magnesium

1	1.008		
H	Hydrogen		
79	196.97	95	(243)
Au	Gold	Am	Americium
71	174.97	12	24.305
Lu	Lutetium	Mg	Magnesium

SCORING WORDS

You can score your words in one of two ways: either using entire atomic numbers or their individual digits. If you like to add up big numbers with much higher scores, score using entire atomic numbers. Otherwise, choose this simpler addition method:

To score using digits, use the individual digit(s) in the atomic number, with a couple of exceptions. When using only the first letter, use the first digit. When using both letters, using both digits. Some exceptions apply. See the examples below for scoring:

Atomic Number	Examples	Score Using only the First Letter	Using Both Letters
1-9		1	N/A
1-9		4	8 (4+4)
15,16,19,23, 39, 53,74	  	15,16,19,23,39,53,74 For these, use the <u>entire</u> atomic number	N/A
11-99		2	11 (2+9)
10,20,30,40, 50,60,70,80, 90 (Tens)		9	9 (9+0) <i>Alternatively: 9+9=18</i>
100-109		10	10 (10+0) <i>Alternatively: 10+10=20</i>
110-118		10	12 (10+2)



Score PLANTS using **196** (15+57+7+117)
entire atomic numbers:

Score PLANTS using single digits: **52** (15+5+7+7+11+7)

90 232.04 Th Thorium	8 15.999 O Oxygen	33 74.922 As Arsenic	110 (281) Ds Darmstadtium
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Score TOADS using digits: **31** (9+8+3+11)

Score TOADS atomically: **241** (90+8+33+110)

When you make two or more new words, add up all the atomic numbers/digits from all associated letters. So, if you made RUN, NETS and RUNE you would have scored either:

- 44+10+7+117 = 178 points or
- 4+4+1+0+7+11+7=34.

PREPARE TO PLAY

- Remove all tiles and place upside down on the table or in a container
- Give each player six or seven tiles
- Nominate a scorekeeper
- Decide who goes first.

GAME PLAY

On each turn, a player must try to make a word and score its points. Place one or more tiles adjacently, even swapping tiles.

You can make **RUIN** for **37** points (4+4+4+9+16), then someone else can add **SHOWER** for **117** (16+6+7+74+6+8).

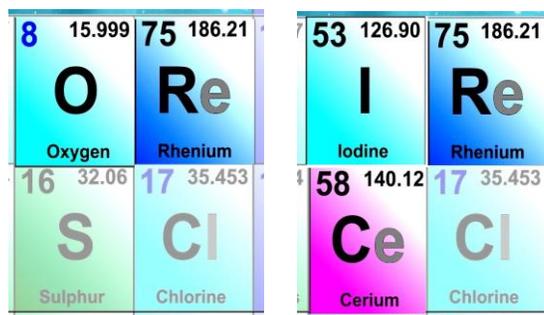
Note that **RUINS** is also scored for **53** points.

Alternatively, a player can swap one of their tiles with one in play as long as the original word is kept intact and a new word is made. Score just the new word. For example, you could swap [Er] for [Es] in **FRENCH** to make and score **LIES**.

However, if you morph the original word into a new word, both words are scored.

Here's an example:

Play ORE (20) then play ICE (64) and IRE (65):



Always replenish your used tiles such that you always have six or seven tiles until the end of the game. Always declare your word so all players agree.

ATOMIC CROSS REFERENCE GUIDE

Use the following cross-reference to find letter fragments to help make a word. Preceding each chemical symbol is its atomic number, which actually is its point value.

ALPHABETIC CHEMICAL SYMBOLS CROSS-REFERENCE

89 **Ac** 47 **Ag** 13 **Al** 95 **Am** 18 **Ar** 33 **As** 85 **At** 79 **Au** 5 **B**
 56 **Ba** 4 **Be** 107 **Bh** 83 **Bi** 97 **Bk** 35 **Br** 6 **C** 20 **Ca** 48 **Cd**
 58 **Ce** 98 **Cf** 17 **Cl** 96 **Cm** 112 **Cn** 27 **Co** 24 **Cr** 55 **Cs**
 29 **Cu** 105 **Db** 110 **Ds** 66 **Dy** 68 **Er** 99 **Es** 63 **Eu** 9 **F** 26 **Fe**
 114 **Fl** 100 **Fm** 87 **Fr** 31 **Ga** 64 **Gd** 32 **Ge** 1 **H** 2 **He** 72 **Hf**
 80 **Hg** 67 **Ho** 108 **Hs** 53 **I** 49 **In** 77 **Ir** 19 **K** 36 **Kr** 57 **La** 3 **Li**
 103 **Lr** 71 **Lu** 116 **Lv** 115 **Mc** 101 **Md** 12 **Mg** 25 **Mn**
 42 **Mo** 109 **Mt** 7 **N** 11 **Na** 41 **Nb** 60 **Nd** 10 **Ne** 113 **Nh**
 28 **Ni** 102 **No** 93 **Np** 8 **O** 118 **Og** 76 **Os** 15 **P** 91 **Pa**
 82 **Pb** 46 **Pd** 61 **Pm** 84 **Po** 59 **Pr** 78 **Pt** 94 **Pu** 88 **Ra** 37 **Rb**
 75 **Re** 104 **Rf** 111 **Rg** 45 **Rh** 86 **Rn** 44 **Ru** 16 **S** 51 **Sb**
 21 **Sc** 34 **Se** 106 **Sg** 14 **Si** 62 **Sm** 50 **Sn** 38 **Sr** 73 **Ta** 65 **Tb**
 43 **Tc** 52 **Te** 90 **Th** 22 **Ti** 81 **Tl** 69 **Tm** 117 **Ts** 92 **U** 23 **V** 74
W 54 **Xe** 39 **Y** 70 **Yb** 30 **Zn** 40 **Zr**