

Periodic Table of Elements

Periodic Table of the Elements

1	IA																2	0																		
1	H	IIA																2	He																	
2	3	Li	4	Be																	5	B	6	C	7	N	8	O	9	F	10	Ne				
3	11	Na	12	Mg	13	Al	14	Si	15	P	16	S	17	Cl	18	Ar																				
4	19	K	20	Ca	21	Sc	22	Ti	23	V	24	Cr	25	Mn	26	Fe	27	Co	28	Ni	29	Cu	30	Zn	31	Ga	32	Ge	33	As	34	Se	35	Br	36	Kr
5	37	Rb	38	Sr	39	Y	40	Zr	41	Nb	42	Mo	43	Tc	44	Ru	45	Rh	46	Pd	47	Ag	48	Cd	49	In	50	Sn	51	Sb	52	Te	53	I	54	Xe
6	55	Cs	56	Ba	57	*La	72	Hf	73	Ta	74	W	75	Re	76	Os	77	Ir	78	Pt	79	Au	80	Hg	81	Tl	82	Pb	83	Bi	84	Po	85	At	86	Rn
7	87	Fr	88	Ra	89	+Ac	104	Rf	105	Ha	106	106	107	107	108	108	109	109	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110

* Lanthanide Series

58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu

+ Actinide Series

90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

Periodic Table of the Elements

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
<i>IA</i>												<i>IIIA</i>	<i>IVA</i>	<i>VA</i>	<i>VIA</i>	<i>VIIA</i>	<i>VIIIA</i>
1 H 1.008																	2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.41	31 Ga 69.72	32 Ge 72.64	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (97.9)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57 La* 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.8	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac~ (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Ds (271)	111 Uuu (272)	112 Uub (277)	113 Uut	114 Uuq	115 Uup	116 Uuh		

*Lanthanides	58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
	~Actinides	90 Th 232.0	91 Pa (231)	92 U (238)	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)

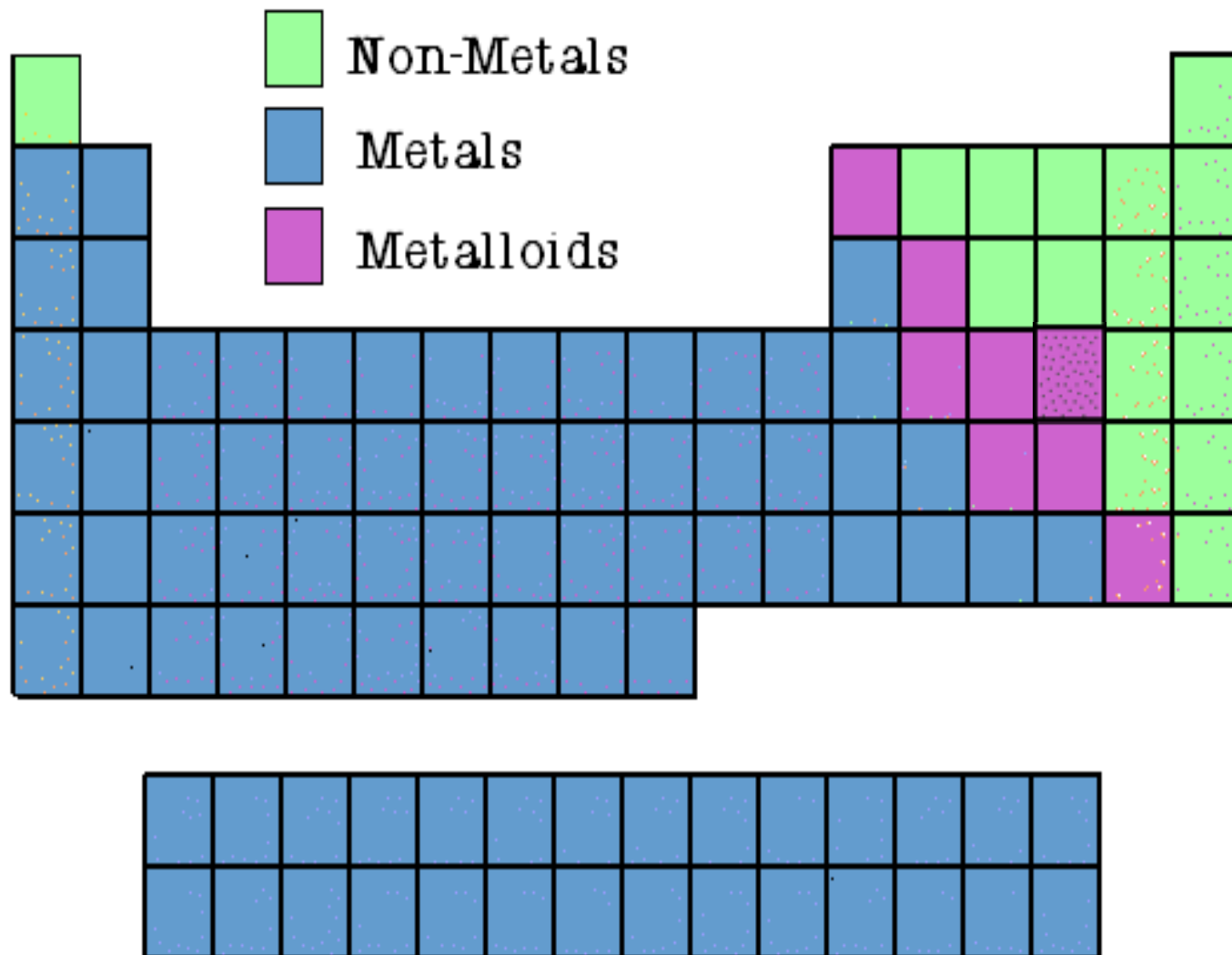
[Elements]

- Scientists have identified 90 naturally occurring elements, and created about 28 others.
- The elements, alone or in combinations, make up our bodies, our world, our sun, and in fact, the entire universe.

[Periodic Table]

- The periodic table organizes the elements in a particular way. A great deal of information about an element can be gathered from its position in the periodic table.
- For example, you can predict with reasonably good accuracy the physical and chemical properties of the element. You can also predict what other elements a particular element will react with chemically.

The elements of the periodic table can be divided into three main categories: Metals, Non-Metals, and Metalloids.



[Properties of Metals]

- Metals are good conductors of heat and electricity.
- Metals are shiny.
- Metals are ductile (can be stretched into thin wires).
- Metals are malleable (can be pounded into thin sheets).
- A chemical property of metal is its reaction with water which results in corrosion.



[Properties of Non-Metals]



Sulfur

- Non-metals are poor conductors of heat and electricity.
- Solid non-metals are brittle and break easily.
- They are dull.
- Many non-metals are gases.

[Properties of Metalloids]



Silicon

- Metalloids (metal-like) have properties of both metals and non-metals.
- They are solids that can be shiny or dull.
- They conduct heat and electricity better than non-metals but not as well as metals.
- They are ductile and malleable.

Families

- Columns of elements are called groups or families.
- Elements in each family have similar but not identical properties.
- For example, lithium (Li), sodium (Na), potassium (K), and other members of Group 1 are all soft, white, shiny metals.
- All elements in a family have the same number of valence electrons.

Periods

- Each horizontal row of elements is called a period.
- The elements in a period are not alike in properties.
- In fact, the properties change greatly across any given row.
- The first element in a period is always an extremely active solid. The last element in a period, is always an inactive gas.

[

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Families

Periodic Table of the Elements

A stylized periodic table grid with 7 rows and 18 columns. The grid is divided into several regions: a blue region in the first column (rows 2-6), a purple region in the second column (rows 2-6), a grey region in the first column (rows 1, 3-7), a grey region in the second column (rows 1, 3-7), a grey region in the last column (rows 1, 3-7), and a grey region in the last two columns (rows 2-7). The main body of the table (rows 3-7, columns 3-16) is grey. Scattered dots are present in various cells: orange dots in the first column (rows 2-7), purple dots in the second column (rows 2-7), blue dots in the first column (rows 3-7), orange dots in the last column (rows 2-7), purple dots in the last column (rows 2-7), and blue dots in the last two columns (rows 2-7).

A 2x14 grid of grey cells. The top row contains 14 cells, each with scattered blue dots. The bottom row contains 14 cells, each with scattered blue dots.

Periodic Table of the Elements

A stylized periodic table grid with a red vertical column. The grid consists of 7 rows and 18 columns. The first two columns are on the left, and the last two are on the right. A vertical column of 7 red cells is located between the 12th and 13th columns. The cells contain various colored dots: orange and yellow dots in the first two columns, purple dots in the 3rd-12th columns, blue dots in the 14th-16th columns, and orange and purple dots in the 17th-18th columns.

A horizontal grid of 14 cells, arranged in two rows of seven. Each cell contains blue dots.

Periodic Table of the Elements

A schematic periodic table grid with a yellow highlighted column. The grid consists of 7 rows and 18 columns. The first two columns are on the left, and the last two are on the right, with a gap in between. The central 14 columns are connected. The 11th column from the left (the 3rd column from the right) is highlighted in yellow. Various colored dots (orange, purple, blue) are scattered in the cells, representing different element groups.

A separate 2x14 grid of cells, each containing a pattern of blue dots. This grid is positioned below the main periodic table structure.

Periodic Table of the Elements

A schematic periodic table with a grid of 18 columns and 7 rows. The grid is shaped like a standard periodic table, with the first two columns on the left and the last two columns on the right. The central block consists of 10 columns. The third column from the right is highlighted in bright green. The other cells are light gray and contain small clusters of colored dots (orange, purple, blue) representing different elements.

A separate grid consisting of 2 rows and 14 columns of light gray cells. Each cell contains a small cluster of blue dots, representing a set of elements.

Periodic Table of the Elements

A schematic periodic table with a grid of 16 columns and 7 rows. The grid is shaped like a standard periodic table, with the first two rows having 2 columns each, the next three rows having 18 columns each, and the final row having 10 columns. A vertical column of 7 cells, located in the 15th column from the left, is highlighted in yellow. The other cells are light gray. The highlighted column contains small orange and yellow dots in the top row, and small purple and blue dots in the other six rows.

A separate grid consisting of 2 rows and 14 columns of light gray cells. Each cell contains small blue and purple dots.

Periodic Table of the Elements

A schematic periodic table grid with 7 rows and 18 columns. The grid is divided into several regions: a vertical column of 7 cells on the far left; a vertical column of 6 cells on the far right, colored orange; a block of 6 rows and 10 cells in the middle; and a block of 6 rows and 5 cells on the right side of the middle block. The cells are filled with a light gray background and contain scattered dots in yellow, orange, purple, and blue. The orange column on the right is a distinct feature.

A rectangular grid consisting of 14 columns and 2 rows. Each cell contains a light gray background with scattered blue dots. This grid is positioned below the main periodic table structure.

[Noble Gases]

Periodic Table of the Elements

The image shows a simplified periodic table of elements. The noble gas column, consisting of Helium, Neon, Argon, Krypton, Xenon, and Radon, is highlighted in orange. The rest of the table is shown in grey. Below the main table is a separate row of 18 grey boxes, likely representing the noble gas configuration for the elements in the row above.



[Alkali Metals]

- The alkali family is found in the first column of the periodic table.
- Atoms of the alkali metals have one electron in their outermost level, in other words, one valence electron.
- They are shiny, have the consistency of clay, and are easily cut with a knife.

[Alkali Metals]

- They are the most reactive metals.
- They react violently with water.
- Alkali metals are never found as free elements in nature. They are always bonded with another element.

[Alkaline Earth Metals]

- They are the reactive metals in group 2
- They react with weak acids.
- Atoms of the alkaline earth metals have two electrons in their outermost level, in other words, two valence electrons.

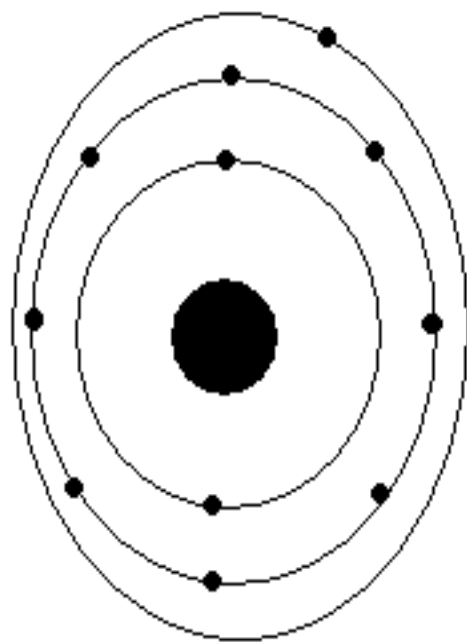
[Halogen Family]

- Halogens have 7 valence electrons, which explains why they are the most reactive non-metals.
- They are never found free (uncombined) in nature.
 - Halogen atoms only need to gain 1 electron to fill their outermost energy level.
 - They react with alkali metals to form salts.

Noble Gases

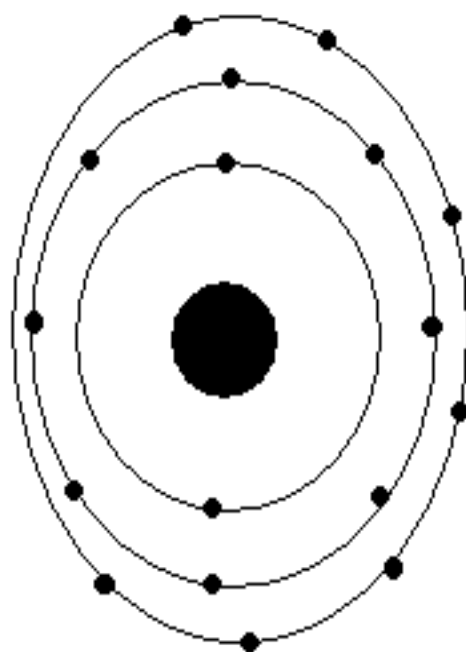
- Noble Gases are colorless gases that are extremely un-reactive.
- One important property of the noble gases is their inactivity. They are inactive because their outermost energy level is full.
- Because they do not readily combine with other elements to form compounds, the noble gases are called inert.
- All the noble gases are found in small amounts in the earth's atmosphere.

Sodium



1 valence
electron

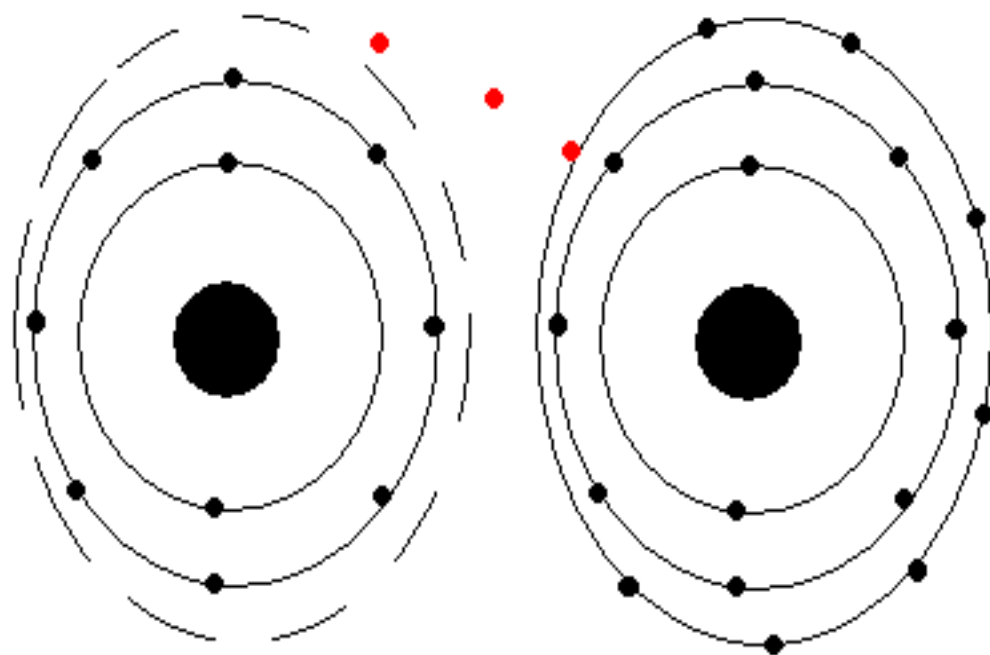
Chlorine



7 valence
electrons

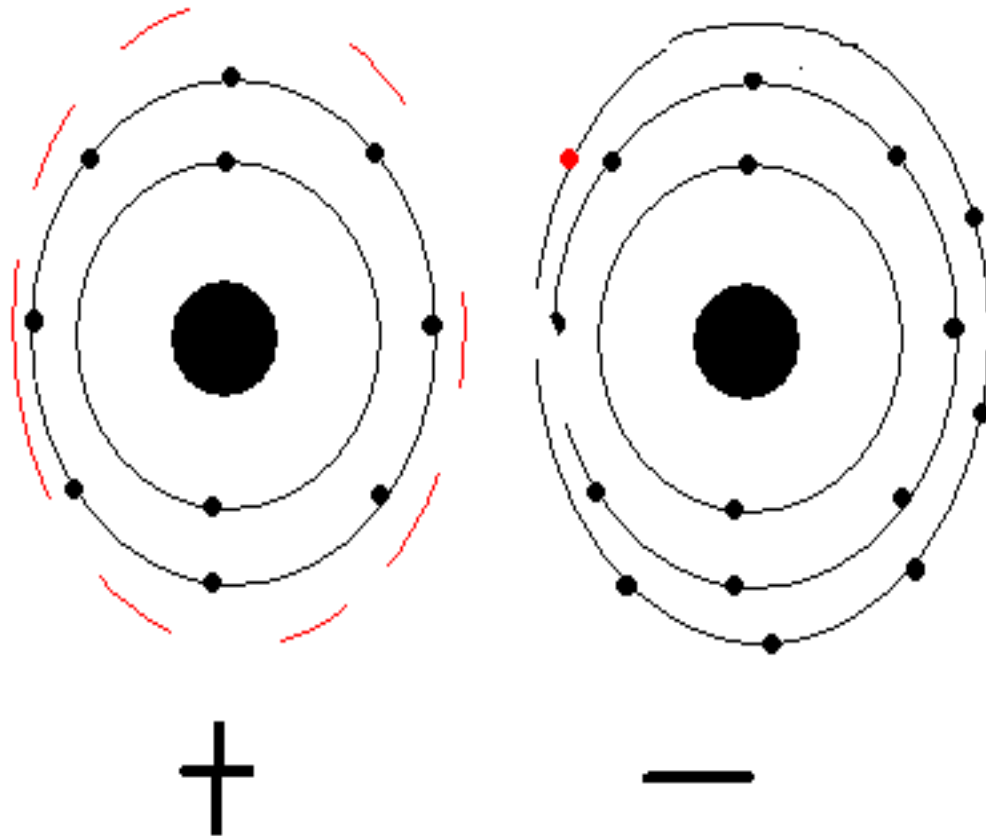
Sodium

Chlorine



Sodium loses one electron.
Chlorine gains one electron.

Sodium Chloride



[Alkaline Earth Metals]

- They are never found uncombined in nature.
- They have two valence electrons.
- Alkaline earth metals include magnesium and calcium, among others.

Periodic Table of the Elements

The diagram shows a simplified periodic table with a grid of cells. The cells are shaded in light gray. The first column on the left is highlighted in blue, representing the alkaline earth metals. The table is arranged in four rows. The first row has 2 cells. The second row has 2 cells in the first column and 10 cells in the second column. The third row has 2 cells in the first column and 18 cells in the second column. The fourth row has 2 cells in the first column and 16 cells in the second column. Below the main grid is a separate row of 18 cells, representing the lanthanide and actinide series.

[Transition Metals]

- Transition Elements include those elements in the Groups 3-12.
- These are the metals you are probably most familiar with: copper, tin, zinc, iron, nickel, gold, and silver.
- They are good conductors of heat and electricity.

Periodic Table of the Elements

The diagram shows a periodic table with the following structure:

- Row 1: 2 grey cells.
- Row 2: 2 grey cells.
- Row 3: 2 grey cells.
- Row 4: 2 grey cells, followed by 10 blue cells, followed by 2 grey cells.
- Row 5: 2 grey cells, followed by 10 blue cells, followed by 2 grey cells.
- Row 6: 2 grey cells, followed by 10 blue cells, followed by 2 grey cells.
- Row 7: 2 grey cells, followed by 10 blue cells, followed by 2 grey cells.
- Row 8: 18 grey cells.
- Row 9: 18 grey cells.

[Transition Elements]

- Transition elements have properties similar to one another and to other metals, but their properties do not fit in with those of any other family.
- Many transition metals combine chemically with oxygen to form compounds called oxides.

Rare Earth Elements

Periodic Table of the Elements

The image shows a schematic periodic table with a separate block for the lanthanide and actinide series. The main table is shaded gray, and the separate block below is shaded blue. The separate block consists of two rows of 14 cells each, representing the lanthanide and actinide series.

- The thirty rare earth elements are composed of the lanthanide and actinide series.
- One element of the lanthanide series and most of the elements in the actinide series are called trans-uranium, which means synthetic or man-made.