

Manual for pgf-PeriodicTable 2.1.0

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1																	18			
1	H hydrogen 1.008																	He helium 4.0026		
2	Li lithium 6.94	Be beryllium 9.0122											B boron 10.81	C carbon 12.011	N nitrogen 14.007	O oxygen 15.999	F fluorine 18.998	Ne neon 20.18		
3	Na sodium 22.99	Mg magnesium 24.305											Al aluminum 26.982	Si silicon 28.085	P phosphorus 30.974	S sulfur 32.06	Cl chlorine 35.45	Ar argon 39.95		
4	K potassium 39.098	Ca calcium 40.078	Sc scandium 44.956	Ti titanium 47.867	V vanadium 50.942	Cr chromium 51.996	Mn manganese 54.938	Fe iron 55.845	Co cobalt 58.933	Ni nickel 58.693	Cu copper 63.546	Zn zinc 65.38	Ga gallium 69.723	Ge germanium 72.63	As arsenic 74.922	Se selenium 78.971	Br bromine 79.904	Kr krypton 83.798		
5	Rb rubidium 85.468	Sr strontium 87.62	Y yttrium 88.906	Zr zirconium 91.224	Nb niobium 92.906	Mo molybdenum 95.95	Tc technetium [98]	Ru ruthenium 101.07	Rh rhodium 102.91	Pd palladium 106.42	Ag silver 107.87	Cd cadmium 112.41	In indium 114.82	Sn tin 118.71	Sb antimony 121.76	Te tellurium 127.6	I iodine 126.9	Xe xenon 131.29		
6	Ce caesium 132.91	Ba barium 137.33	lanthanoids		Hf hafnium 178.49	Ta tantalum 180.95	W tungsten 183.84	Re rhenium 186.21	Os osmium 190.23	Ir iridium 192.22	Pt platinum 195.08	Au gold 196.97	Hg mercury 200.59	Tl thallium 204.38	Pb lead 207.2	Bi bismuth 208.98	Po polonium [209]	At astatine [210]	Rn radon [222]	
7	Fr francium [223]	Ra radium [226]	actinoids			Rf rutherfordium [261]	Db dubnium [268]	Sg seaborgium [269]	Bh bohrium [270]	Hs hassium [270]	Mt meitnerium [278]	Ds darmstadtium [281]	Rg roentgenium [282]	Cn copernicium [285]	Nh nihonium [286]	Fl flerovium [289]	Mc moscovium [290]	Lv livermorium [293]	Ts tennessine [294]	Og oganesson [294]
6	La lanthanum 138.91	Ce cerium 140.12	Pr praseodymium 140.91	Nd neodymium 144.24	Pm promethium [145]	Sm samarium 150.36	Eu europium 151.96	Gd gadolinium 157.25	Tb terbium 158.93	Dy dysprosium 162.5	Ho holmium 164.93	Er erbium 167.26	Tm thulium 168.93	Yb ytterbium 173.05	Lu lutetium 174.97					
7	Ac actinium [227]	Th thorium 232.04	Pa protactinium 231.04	U uranium 238.03	Np neptunium [237]	Pu plutonium [244]	Am americium [243]	Cm curium [247]	Bk berkelium [247]	Cf californium [251]	Es einsteinium [252]	Fm fermium [257]	Md mendelevium [258]	No nobelium [259]	Lr lawrencium [260]					

`\pgfPT[show title=false,show legend=false]`

Abstract

The purpose of this package is to provide the Periodic Table of Elements in a simple way. It relies on `pgf/TikZ` to offer a full or partial periodic table with a variety of options and displaying the desired data. The data available, from all the actual 118 elements, is: atomic number, element name, chemical symbol, relative atomic mass, standard relative atomic mass, radioactivity, atomic radius (empirical), covalent radius, ionic radius, first ionization energy, electronegativity (Pauling), electroaffinity, oxidation states, melting point (in Kelvin and Celsius degrees), boiling point (in Kelvin and Celsius degrees), electron distribution, electronic configuration (increasing n and increasing $n + \ell$), density, specific heat capacity, thermal conductivity, lattice structure, lattice constants (a , b , c and c/a ratio), discovery year, discovery country and visible range spectral lines. It is possible to get the Periodic Table in different languages: English, French, German, Portuguese (from Portugal and from Brazil), Spanish, Italian and translations provided by user contributions – currently in Dutch only.

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Getting started

Installation

`pgf-PeriodicTable` is placed under the terms of the L^AT_EX Project Public License, version 1.3 or later (<http://www.latex-project.org/lppl.txt>). `pgf-PeriodicTable` loads and requires the `TikZ` and `fontenc` or `fontspec` (at least v2.7h – 2020/02/03) packages.

You need to put the package files (`pgf-PeriodicTable.sty` & *friends*) in a location where PDF^LA_TE_X, Lua^LA_TE_X or Xe^LA_TE_X can find them. According to the TDS conventions this may be a subdirectory named `tex/latex/pgf-PeriodicTable/` or `tex/latex/misc/` in your (site specific) installation tree (insert your appropriate directory delimiter instead of `/`, if needed).

Package loading and options

If you are using PDF^LA_TE_X, Lua^LA_TE_X or Xe^LA_TE_X you can just simply include the style file without any option via the `\usepackage` command, `\usepackage{pgf-PeriodicTable}`

It can also be loaded with a comma separated list of *options* to select the desired default language or to use Devanagari or Mandarin numerals in the Atomic Number, Periods and/or Groups.

Language Option

There are six *built-in* languages – English, French, German, Portuguese (from Portugal and Brazil), Spanish and Italian. The default language used in the package may be selected at package loading:

```
\usepackage[language flag]{pgf-PeriodicTable}
```

The *language flags* available are:

-
- | | |
|----------------------------------------|--------------------------------------|
| ✓ en for English (default), | ✓ br for Portuguese (Brazil), |
| ✓ fr for French, | ✓ es for Spanish and |
| ✓ de for German, | ✓ it for Italian. |
| ✓ pt for Portuguese (Portugal), | |
-

A *user language* can also be chosen as default language loading the package with the following option syntax:

```
\usepackage[userlang=<ISO 639-1 CODE>]{pgf-PeriodicTable}
```

In the present version only a Dutch translation is available. It can be loaded by:

```
\usepackage[userlang=nl]{pgf-PeriodicTable}
```

Anyone who wishes to contribute with translations for use in this package can go to the [🔗 pgf-periodictable](#) project page.

Note that the *built-in* languages are always available for the `languages` option of the `\pgfPT` command, but the *user language* is only available if loaded with the package.

Devanagari numerals

It is possible to get some numbers in the Periodic Table with Devanagari numerals: the atomic number and the numeration of periods and groups. To get this feature enabled the package must be loaded with the option *numerals* set to **dvn**:

```
\usepackage[numerals=dvn]{pgf-PeriodicTable}
```

This option requires the Xe_LA_TE_X engine to typeset the document.

```
% \usepackage[numerals=dvn]{pgf-PeriodicTable}
\pgfPT
```

Periodic Table of Elements

It is also possible to load a font for the Devanagari numerals using the following command:

```
\pgfPTdvnfont[font options]{font name}
```

The default font is *Eczar*.

Mandarin numerals

To get some numbers of the Periodic Table with Mandarin numerals (the atomic number and the numeration of periods and groups) the package must be loaded with the above option *numerals* set to **zh**:

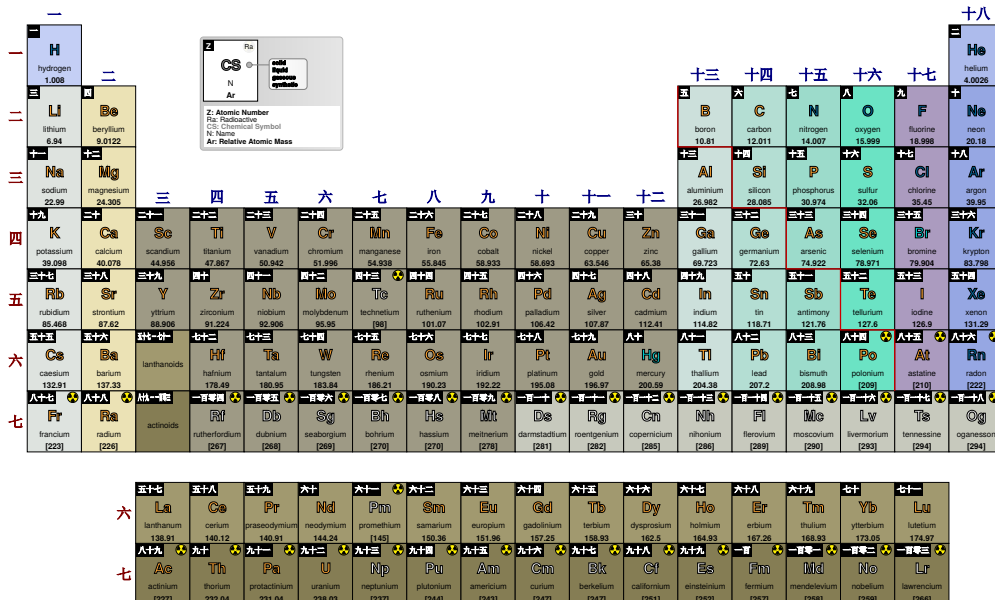
```
\usepackage[numerals=zh]{pgf-PeriodicTable}
```

This option works with the Xe_LA_TE_X and Lua_LA_TE_X engines to typeset the document and requires the *zhnumber* package, which is automatically loaded.


```
% \usepackage[numerals=zh]{pgf-PeriodicTable}
```

\pgfPT

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As with the Devanagari numerals, the following command loads the specified font for the Mandarin numerals:

```
\pgfPTzhfont[font options]{font name}
```

The default font is *SimSun* loaded with the *AutoFakeBold=4* option.

It is also possible to enable or disable the numbers shown in Mandarin with the command:

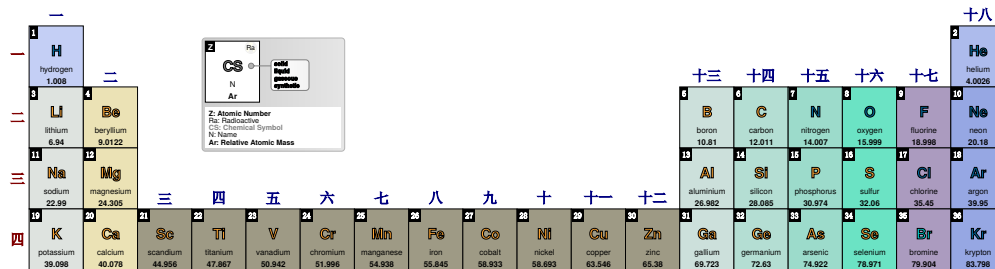
```
\pgfPTzhnumber[<true|false>]{comma separated list}
```

The list can have **Z** for the atomic number, **per** for the period numbers and **gr** for the group numbers. At package loading, with this option, they are set to **true**.

```
% \usepackage[numerals=zh]{pgf-PeriodicTable}
```

```
\pgfPTzhnumber[false]{Z}
\pgfPT[Z list={1,...,36}]
```

Periodic Table of Elements



Interaction with other packages

fontspec

To correctly set the font in each cell contents the command `\fontspec` must be used. For example if you want to use *Arial* for the **name font**, it must be set using `font name=\fontspec{Arial}\selectfont`.

All other font selection commands, e.g., `\large`, `\itshape`, are used as usual. For example if you want to use *Arial* in *large* size and *bold* weight for the **name font**, then you type `font name=\large\bfseries\fontspec{Arial}\selectfont` or `font name=\fontspec{Arial}\large\bfseries\selectfont`.

ragged2e

Using `\usepackage[document]{ragged2e}` and `\usepackage{pgf-PeriodicTable}` together, the Periodic Table will be completely fractured and out of the page.

Solution:

Use a local group: `{\justifying\pgfPT}`

The data

The data available in [pgf-PeriodicTable](#) was mainly compiled with selected and filtered data from Wikipedia, taken from November 2021 to July 2022.

acronym	description	unit	remarks (compiled from @date)
Ar	Relative Atomic Mass		(Wikidata @09/jan/2022)
Arstar	Standard Relative Atomic Mass		STANDARD ATOMIC WEIGHTS 2021, Commission on Isotopic Abundances and Atomic Weights, © CIAAW, 2007–2022 (https://ciaaw.org/impressum.htm)
radio	Radioactivity		(gperiodic-3.0.3, Dec 26 2018)
R	Atomic Radius	pm	Calculated (Wikidata @04/jul/2022)
Rcov	Covalente Radius	pm	Single bond, Wikidata @04/jul/2022)
Rion	Ionic Radius	pm	(Wikidata @04/jul/2022)
Ei	First Ionization Energy	$\text{kJ} \cdot \text{mol}^{-1}$	(Wikidata @04/jul/2022)
eneg	Electronegativity (Pauling)		(Wikidata @04/jul/2022)
eaff	Electroaffinity	$\text{kJ} \cdot \text{mol}^{-1}$	(Wikidata @04/jul/2022)
O	Oxidation States		(Wikidata @09/jan/2022)
Tmelt	Melting Point	K	at standard pressure (Wikidata @21/dez/2021)
TmeltC	Melting Point	°C	at standard pressure (Wikidata @21/dez/2021)
Tboil	Boiling Point	K	at standard pressure (Wikidata @21/dez/2021)
TboilC	Boiling Point	°C	at standard pressure (Wikidata @21/dez/2021)
eDist	Electron Distribution		(Wikidata @01/nov/2021)
eConfign	Electronic Configuration (increasing n)		(Wikidata @01/nov/2021)
eConfignl	Electronic Configuration (increasing n + ℓ)		(Wikidata @01/nov/2021)
d	Density	$\text{g} \cdot \text{dm}^{-3}$ for gases $\text{g} \cdot \text{cm}^{-3}$ all other physical states	physical state at 25°C, 1 atm (Wikidata @01/nov/2021)
Cp	Specific heat capacity	$\text{J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$	at 25°C and 100 kPa (Wikidata @20/nov/2021)
kT	Thermal Conductivity	$\text{W} \cdot \text{m}^{-1} \cdot \text{K}^{-1}$	at 25°C (Wikidata @21/nov/2021)
Is	Lattice Structure		(Wikidata @20/dez/2021 and University of Bielefeld)
Isa	Lattice constant: a	pm	(University of Bielefeld @21/dez/2021)
Isb	Lattice constant: b	pm	(University of Bielefeld @21/dez/2021)
Is c	Lattice constant: c	pm	(University of Bielefeld @21/dez/2021)
Isca	Lattice c/a ratio		Calculated from available data and rounded to two digits
DiscY	Discover Year		(Wikidata @22/dez/2021)
DiscC	Discover Country		(Wikidata @22/dez/2021)
spectra	Visible range spectral lines		Elements spectrum made with <code>\pgfspectra</code> . See the pgf-spectra manual for more details

The utilization of the *acronyms* will be explained in [Designing cells with \pgfPTbuildcell](#).

The commands

The commands to achieve the Periodic Table of Elements are:

- `\pgfPT` or `\pgfPT[options list]` – draws a full or partial graphical Periodic Table controlled by the optional keys.
- `\pgfPTstyle[options list]` – sets the global style for the Periodic Table.
- `\pgfPTresetstyle` – resets the style for the Periodic Table with the default values.
- `\pgfPTbuildcell(nrows,ncolumns)[entries]` – builds the contents of each cell in the Periodic Table.
- `\pgfPTresetcell` – resets the cell to its default layout.
- `\pgfPTbuildcellstyle{name}(nrows,ncolumns)[entries]` – builds the contents of each cell in the Periodic Table and stores it in a named style.
- `\pgfPTpreviewcell` or `\pgfPTpreviewcell[scale factor]` – preview the last unnamed built cell with an optional scale factor. If no cells have yet been built, the default cell is shown.
- `\pgfPTpreviewcellstyle{name}` or `\pgfPTpreviewcellstyle[scale factor]{name}` – preview the named builded cell with an optional scale factor.
- `\pgfPTnewcolorscheme[trailing color]{name}{color list}` – makes a color scheme to fill the cells along the Periodic Table.
- `\pgfPTnewZlist{name}` – create a user defined atomic numbers (Z) named list.
- `\pgfPTsetLanguage{language flag}` – globally change the default language.

► Utilization of `\pgfPT`

Use this command to draw the Periodic Table of Elements in the language selected at package inclusion (`\usepackage[language flag]{pgf-PeriodicTable}`):

`\pgfPT`

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1	2																	18	
1	H hydrogen 1.008																	2	He helium 4.0026
2	3	4											13	14	15	16	17	18	
	Li lithium 6.94	Be beryllium 9.0122											B boron 10.81	C carbon 12.011	N nitrogen 14.007	O oxygen 15.999	F fluorine 18.998	Ne neon 20.18	
3	11	12											13	14	15	16	17	18	
	Na sodium 22.99	Mg magnesium 24.305											Al aluminum 26.982	Si silicon 28.085	P phosphorus 30.974	S sulfur 32.06	Cl chlorine 35.45	Ar argon 39.95	
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
	K potassium 39.098	Ca calcium 40.078	Sc scandium 44.956	Ti titanium 47.867	V vanadium 50.942	Cr chromium 51.996	Mn manganese 54.938	Fe iron 55.845	Co cobalt 58.933	Ni nickel 58.693	Cu copper 63.546	Zn zinc 65.38	Ga gallium 69.723	Ge germanium 72.63	As arsenic 74.922	Se selenium 78.971	Br bromine 79.904	Kr krypton 83.798	
5	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	
	Rb rubidium 85.468	Sr strontium 87.62	Y yttrium 88.906	Zr zirconium 91.224	Nb niobium 92.906	Mo molybdenum 95.95	Tc technetium [98]	Ru ruthenium 101.07	Rh rhodium 102.91	Pd palladium 106.42	Ag silver 107.87	Cd cadmium 112.41	In indium 114.82	Sn tin 118.71	Sb antimony 121.76	Te tellurium 127.6	I iodine 126.9	Xe xenon 131.29	
6	55	56	57-71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	
	Cs caesium 132.91	Ba barium 137.33	lanthanoids	Hf hafnium 178.49	Ta tantalum 180.95	W tungsten 183.84	Re rhenium 186.21	Os osmium 190.23	Ir iridium 192.22	Pt platinum 195.08	Au gold 196.97	Hg mercury 200.59	Tl thallium 204.38	Pb lead 207.2	Bi bismuth 208.98	Po polonium [209]	At astatine [210]	Rn radon [222]	
7	87	88	89-103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	
	Fr francium [223]	Ra radium [226]	actinoids	Rf rutherfordium [267]	Db dubnium [268]	Sg seaborgium [269]	Bh bohrium [270]	Hs hassium [271]	Mt meitnerium [272]	Ds darmstadtium [281]	Rg roentgenium [282]	Cn copernicium [285]	Nh nihonium [286]	Fl flerovium [289]	Mc moscovium [290]	Lv livermorium [293]	Ts tennessine [294]	Og oganeson [294]	
6	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71				
	La lanthanum 138.91	Ce cerium 140.12	Pr praseodymium 140.91	Nd neodymium 144.24	Pm promethium [145]	Sm samarium 150.36	Eu europium 151.96	Gd gadolinium 157.25	Tb terbium 158.93	Dy dysprosium 162.5	Ho holmium 164.93	Er erbium 167.26	Tm thulium 168.93	Yb ytterbium 173.05	Lu lutetium 174.97				
7	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103				
	Ac actinium [227]	Th thorium 232.04	Pa protactinium 231.04	U uranium 238.03	Np neptunium [237]	Pu plutonium [244]	Am americium [243]	Cm curium [247]	Bk berkelium [247]	Cf californium [251]	Es einsteinium [252]	Fm fermium [257]	Md mendelevium [258]	No nobelium [259]	Lr lawrencium [260]				

This command can also be used with options – as described in section [Options for \pgfPT: creating a «Periodic Table»](#) – to modify, for instance, the font of the Periodic Table or the colors of the cells:

```
\pgfPT[font=pnc,back color scheme=MNM]
```

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► Utilization of \pgfPTstyle[options list]

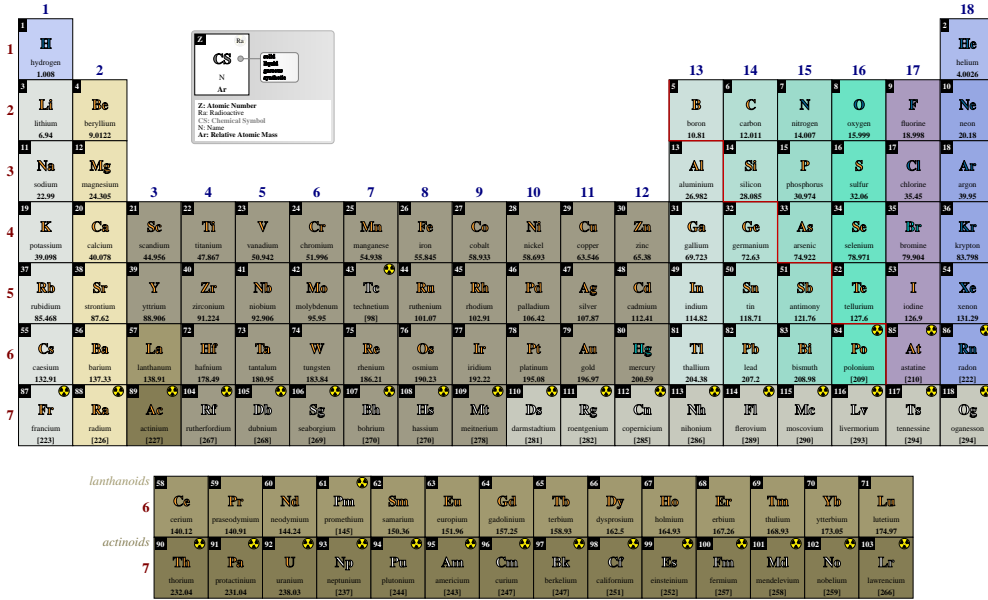
This command globally sets a style for the Periodic Table:

```
\pgfPTstyle[font=ptm,IUPAC=false,show title=false]
\pgfPT
```

It is possible to locally override the *global style* defined:

```
\pgfPT[show title]
```

Periodic Table of Elements



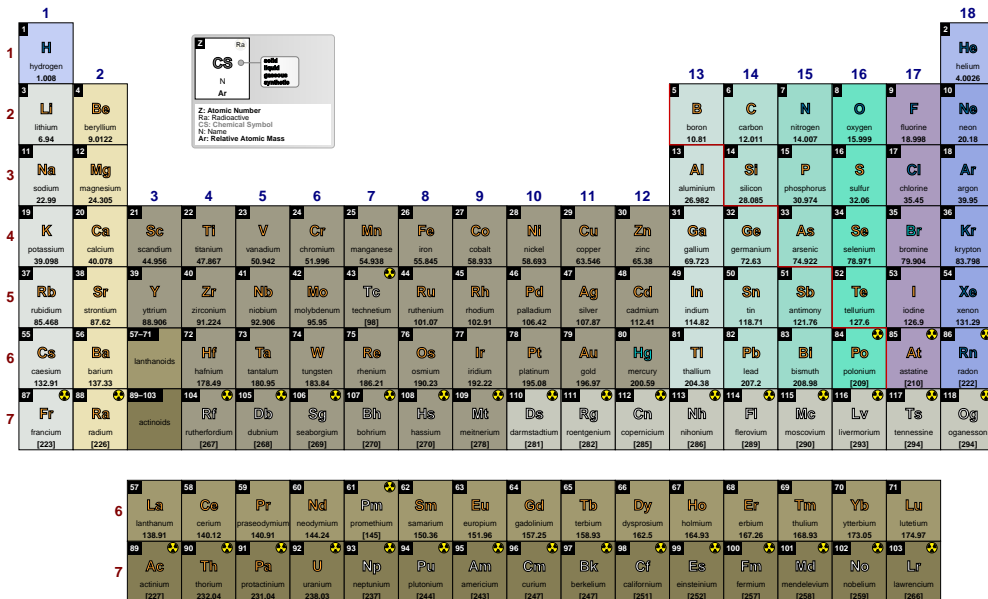
► Utilization of \pgfPTresetstyle

This command resets the style used in the Periodic Table to default values:

```
\pgfPTresetstyle
```

```
\pgfPT
```

Periodic Table of Elements



► Utilization of `\pgfPTbuildcell(nrows,ncolumns)[entries]`

With `\pgfPTbuildcell` it is possible to customize the *elementar* cell of the Periodic Table. Each cell is built on the given *number of rows* and *number of columns*. After that, each *entry* is constructed according to the structure `row;column;what` or `initial row-final row;initial column-final column;what`.

- ✓ The first *syntax* – `row;column;what` – puts «*what*» in the «*row*» row and in the «*column*» column with the height of one row and the width of one column:
 - for example, `1;1;Z` puts the atomic number *Z* in row **1** and column **1**, which actually corresponds to a box anchored to the top left corner of the cell and that goes below and to the right of that corner.
- ✓ The second *syntax* – `initial row-final row;initial column-final column;what` – puts «*what*» from «*initial row*» to «*final row*» with the height of `final row – initial row + 1` and from «*initial column*» to «*final column*» with the width of `final column – initial column + 1`. It is important to keep in mind that when using this syntax the *row* and *column* could have any value between **1** and **number of rows** and **number of columns**, respectively.
 - for example, `1;1-2.1;Z` puts the atomic number *Z* in row **1** with the height of one row and from column **1** to *column 2.1*, with the width of `2.1 × column`. Note that in this example the two *syntaxes* are mixed up.

The **default cell** of the Periodic Table is constructed with the command:

```
\pgfPTbuildcell(5,3)% 5 rows by 3 columns
[(1;1-2;Z),(1;3;radio),(2-3;1.5-2.5;CS),(4;1-3;name),(5;1-3;Ar)]
```

► Utilization of `\pgfPTresetcell`

The `\pgfPTresetcell` resets the cell to its default layout.

► Utilization of `\pgfPTbuildcellstyle{name}(nrows,ncol...)[entr...]`

The `\pgfPTbuildcellstyle` command works like `\pgfPTbuildcell`, but stores the cell style under the *name* provided. It is only used when called via the *cell style* passed as an option to `\pgfPT`. Otherwise it remains unavailable, unlike the `\pgfPTbuildcell` command which immediately affects the cells of the Periodic Table.

► Utilization of `\pgfPTpreviewcell`

The main purpose of this command is to show the built cell for *debugging*. With `\pgfPTpreviewcell` you can preview the last unnamed built cell with an optional *scale factor*. If no cells have yet been built, the default cell is shown.

```
\pgfPTpreviewcell
```

Using the last cell built

The build command:

```
\pgfPTbuildcell(5,3)%
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4;1-3;name),(5;1-3;Ar)]
```

	1	2	3
1	Z		radio
2			
3		CS	
4			name
5			Ar

scale 1:1

```
\pgfPTbuildcell(8,3)% 8 rows by 3 columns
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4-5;1-3;name),
(6;1-3;spectra),(7;1-3;DiscC),(8;1-3;DiscY)]
\pgfPTpreviewcell[1.8]
```

Using the last cell built

The build command:

```
\pgfPTbuildcell(8,3)%
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4-5;1-3;name),(6;1-3;spectra),(7;1-3;DiscC),(8;1-3;DiscY)]
```

	1	2	3
1	Z		radio
2		CS	
3			
4	name		
5			
6	spectra		
7	DiscC		
8	DiscY		

scale 1.8:1

► Utilization of `\pgfPTpreviewcellstyle{name}`

This previews a *named* cell, again with the optional *scale factor*.

```
\pgfPTpreviewcellstyle{myname}
```

User style **myname** doesn't exist!

```
\pgfPTbuildcellstyle{myname}(5,3)% 5 rows by 3 columns
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4;1-3;name),(5;1-3;Ar*)]
\pgfPTpreviewcellstyle[2]{myname}
```

User style **myname**

The build command:

```
\pgfPTbuildcell(5,3)%
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4;1-3;name),(5;1-3;Ar*)]
```

	1	2	3
1	Z		radio
2		CS	
3			
4	name		
5	Arstar		

scale 2:1

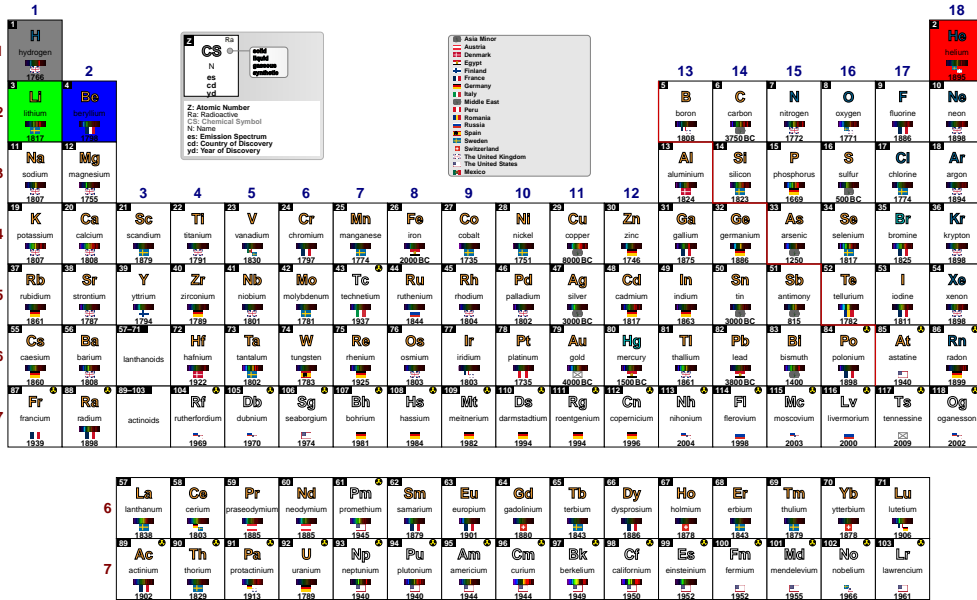
► Utilization of `\pgfPTnewColorScheme{name}{color list}`

Use this command to create a *color scheme* for cells in the Periodic Table. It has two mandatory arguments – *name* and *color list* – and an optional argument – *trailing color*.

The *name* is used to identify the *color scheme*. The *color list* is a comma-separated list of red, green and blue values written as r/g/b, defined in ascending order of Z and starting at Z=1. The optional argument *trailing color* is appended to the end of the list and is used for all cells starting from this point on. It also has the form r/g/b and its default value is 1/1/1 (white).

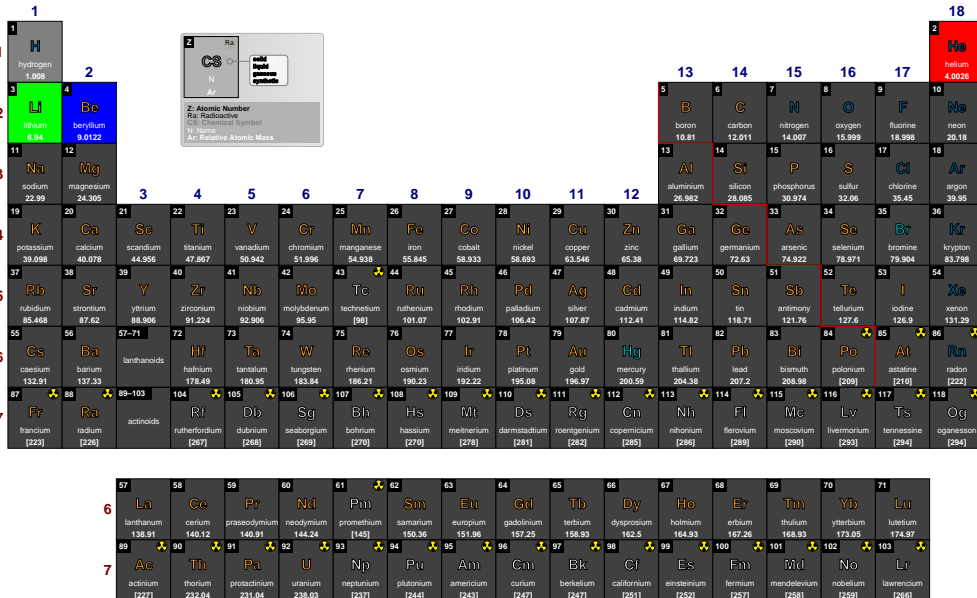

```
\pgfPTnewColorScheme{myname}{.5/.5/.5,1/0/0,0/1/0,0/0/1}
\pgfPT[back color scheme=myname]
```

Periodic Table of Elements



```
\pgfPTnewColorScheme[.25/.25/.25]{myname}{.5/.5/.5,1/0/0,0/1/0,0/0/1}
\pgfPTresetcell
\pgfPT[back color scheme=myname,name color=white, Ar color=white,legend back color=black!30]
```

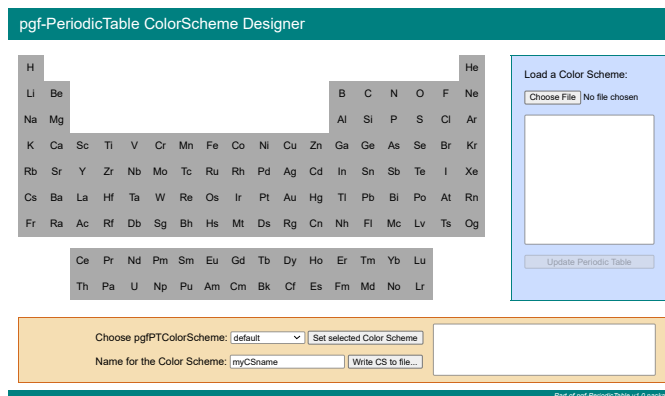
Periodic Table of Elements



There are a few *color schemes* predefined:

- ✓ **default**, the default built-in color scheme, which is loaded if no value is passed to the **back color scheme** key.
- ✓ **Soft**, a soft color pattern for cells, differentiating metals, non metals, semimetals, lanthanides and actinides.
- ✓ **Jmol**, a color scheme based upon **Jmol: an open-source Java viewer for chemical structures in 3D**.
- ✓ **CPK**, a color scheme that is based upon the colors of the popular plastic spacefilling models which were developed by Corey, Pauling and later improved by Kultun.
- ✓ **Rasmol** and **RasmolNew**, two color schemes based upon the computer program **RasMol**.
- ✓ **Wikipedia**, a color scheme built on the Periodic Table of Elements available at **Wikipedia**.
- ✓ **MNM**, a color pattern which distinguishes between **Metals**, semimetals and **Non Metals**.
- ✓ **PS**, a color scheme depicting the **Physical State** at room temperature.
- ✓ **Radio**, a two color color scheme showing the radioactivity of the elements.
- ✓ **Blocks**, a four colored color scheme showing the *s*, *p*, *d* and *f* blocks of the Periodic Table.

Writing a color scheme can be painstaking work, so a *script* is provided for that:



pgfPTcolorSchemes.html

► Utilization of `\pgfPTnewZlist{name}`

This command makes a user defined atomic numbers' list with the provided **name**. The list can be anything that the `\foreach` loop, defined in the `TikZ` package, can understand. For more information on how to use `\foreach` loop refer to the section *Repeating Things: The Foreach Statement* in the `pgfmanual`.

```
\pgfPTnewZlist{myZlist}{1,...,57,72,80,81,...,85}
\pgfPT[Z list=myZlist,IUPAC=false]
```

Periodic Table of Elements

1																	2			
1	H hydrogen 1.008																	He helium 4.0026		
2	Li lithium 6.94	Be beryllium 9.0122											B boron 10.81	C carbon 12.011	N nitrogen 14.007	O oxygen 15.999	F fluorine 18.998	Ne neon 20.18		
3	Na sodium 22.99	Mg magnesium 24.305											Al aluminium 26.982	Si silicon 28.085	P phosphorus 30.974	S sulfur 32.06	Cl chlorine 35.45	Ar argon 39.95		
4	K potassium 39.098	Ca calcium 40.078	Sc scandium 44.956	Ti titanium 47.867	V vanadium 50.942	Cr chromium 51.996	Mn manganese 54.938	Fe iron 55.845	Co cobalt 58.933	Ni nickel 58.693	Cu copper 63.546	Zn zinc 65.38	Ga gallium 69.723	Ge germanium 72.63	As arsenic 74.922	Se selenium 78.971	Br bromine 79.904	Kr krypton 83.798		
5	Rb rubidium 85.468	Sr strontium 87.62	Y yttrium 88.906	Zr zirconium 91.224	Nb niobium 92.906	Mo molybdenum 95.95	Tc technetium [98]	Ru ruthenium 101.07	Rh rhodium 102.91	Pd palladium 106.42	Ag silver 107.87	Cd cadmium 112.41	In indium 114.82	Sn tin 118.71	Sb antimony 121.76	Te tellurium 127.6	I iodine 126.9	Xe xenon 131.29		
6	Cs caesium 132.91	Ba barium 137.33	La lanthanum 138.91	Hf hafnium 178.49											Hg mercury 200.59	Tl thallium 204.38	Pb lead 207.2	Bi bismuth 208.98	Po polonium [209]	At astatine [210]

► Utilization of `\pgfPTsetLanguage{language flag}`

This command globally changes the default language of the Periodic Table. If a user language has been loaded, the corresponding ISO 639-1 code can also be used as a language flag.

```
\pgfPTsetLanguage{pt}
\pgfPT
```

Tabela Periódica dos Elementos

```
\pgfPTsetLanguage{en}
\pgfPT
```

Periodic Table of Elements

```
% \usepackage[userlang=nl]{pgf-PeriodicTable}
\pgfPTsetLanguage{nl}
\pgfPT
```

Periodiek Systeem van de Elementen

1																	18		
1	H																	He	
	waterstof																	helium	
	1.008																	4.0026	
2	Li	Be											B	C	N	O	F	Ne	
	lithium	beryllium											bor	koolstof	stikstof	zuurstof	fluor	neon	
	6.94	9.0122											10.81	12.011	14.007	15.999	18.998	20.18	
3	Na	Mg											Al	Si	P	S	Cl	Ar	
	natrium	magnesium											aluminium	silicium	fosfor	zwavel	chlor	argon	
	22.99	24.305											26.982	28.085	30.974	32.06	35.45	39.95	
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
	kaliüm	calcium	scandium	titanium	vanadium	chrom	mangaan	ijzer	kobalt	nikkel	koper	zink	galium	germanium	arsen	seleen	broom	krypton	
	39.098	40.078	44.956	47.867	50.942	51.996	54.938	55.845	58.933	58.693	63.546	65.38	69.723	72.63	74.922	78.971	79.904	83.798	
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
	rubidium	strontium	yttrium	zirkonium	niobium	molybdeen	technetium	ruthenium	rhodium	palladium	zilver	cadmium	indium	tin	antimon	telluur	jood	xenon	
	85.468	87.62	88.906	91.224	92.906	95.95	98	101.07	102.91	106.42	107.87	112.41	114.82	118.71	121.76	127.6	126.9	131.29	
6	Cs	Ba	Lanthaniden		Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
	cesium	barium			hafnium	tantaal	wolfram	renium	osmium	iridium	platina	goud	kwik	thallium	lood	bismut	polonium	aastaat	radon
	132.91	137.33			178.49	180.95	183.84	186.21	190.23	192.22	195.08	196.97	200.59	204.38	207.2	208.98	209	210	222
7	Fr	Ra	Actiniden		Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
	francium	radium			rutherfordium	dalium	seaborgium	bohrium	hassium	meitnerium	darmstadtium	roëntgenium	copernicium	nihonium	tennessium	moscovium	livermorium	tennessine	oganesoon
	[223]	[226]			[261]	[262]	[263]	[264]	[265]	[266]	[267]	[268]	[269]	[270]	[271]	[272]	[273]	[274]	[275]
6	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu				
	lanthaan	cerium	praseodymium	neodymium	promethium	samarium	europium	gadolinium	terbium	dysprosium	holmium	erbio	thulium	ytterbium	lutetium				
	138.91	140.12	140.91	144.24	[145]	150.36	151.96	157.25	158.93	162.5	164.93	167.26	168.93	173.05	174.97				
7	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr				
	actinium	thorium	protactinium	uranium	neptunium	plutonium	americium	curium	berkelium	californium	einsteinium	fermium	mendelevium	nobelium	lawrencium				
	[227]	232.04	231.04	238.03	[237]	[244]	[243]	[247]	[247]	[251]	[252]	[257]	[258]	[259]	[260]				

Options for \pgfPT: creating a «Periodic Table»

For the commands `\pgfPT` and `\pgfPTstyle` there are a set of options available to draw the Periodic Table or any portion of the Periodic Table, as described below.

The list of options is a comma separated list of any of the following elements:

- ↪ a 'key' or a 'key=value' pair,
- a 'style' or a 'style=value' pair,
- a *pseudo style* with a proper syntax: 'style={key 1=value 1, key 2=value 2, ... , key n=value n}', where none of the 'keys' are mandatory.

The options *can be divided* in two subsets, one that affects the *appearance* of the *entire* Periodic Table, the other that concerns the *contents* of each cell of the Periodic Table.

✂ Periodic Table options: keys, styles and pseudo styles

The following options and styles are used to *control* the Periodic Table *as a whole* in various aspects, such as the **cell width** or **cell height**, which elements are displayed (**Z list**), whether the title or legend are shown – **show title** or **show legend** – among others.

➡ General layout

Z list

default: *all*

Set's the list of the elements to display in the Periodic Table. It could be a **name** or a **comma separated** list of atomic numbers, which in turn supports the *dots notation* as explained in the section *Repeating Things: The Foreach Statement* in the `pgfmanual`.

```
\pgfPT[Z list={1,...,36}]
```

Periodic Table of Elements

1																	18					
1	H hydrogen 1.008																	He helium 4.0026				
2	Li lithium 6.94	Be beryllium 9.0122															B boron 10.81	C carbon 12.011	N nitrogen 14.007	O oxygen 15.999	F fluorine 18.998	Ne neon 20.18
3	Na sodium 22.99	Mg magnesium 24.305															Al aluminium 26.982	Si silicon 28.085	P phosphorus 30.974	S sulfur 32.06	Cl chlorine 35.45	Ar argon 39.95
4	K potassium 39.098	Ca calcium 40.078	Sc scandium 44.956	Ti titanium 47.867	V vanadium 50.942	Cr chromium 51.996	Mn manganese 54.938	Fe iron 55.845	Co cobalt 58.933	Ni nickel 58.693	Cu copper 63.546	Zn zinc 65.38	Ga gallium 69.723	Ge germanium 72.63	As arsenic 74.922	Se selenium 78.971	Br bromine 79.904	Kr krypton 83.798				

The possible **name** is one of the following:

✓ built-in:

- ▷ 'all' is equivalent to `Z list={1,...,118}`, *i.e.*, all known elements.
- ▷ 's', 'p', 'd' or 'f', for the elements in the corresponding blocks.
- ▷ 'sp', 'spd', for the elements resulting from merging the corresponding blocks.
- ▷ 'lanthanoids' or simply 'La', for lanthanoids †.
- ▷ 'actinoids' or 'Ac', for actinoids †.
- ▷ 'G1*', 'G1', ..., 'G18', which are used, respectively, for the elements of *group 1 without hydrogen*, *group 1*, ..., *group 18*.
- ▷ 'P1', ..., 'P7', 'P6*', 'P7*', which are used, respectively, for the elements of the *1st period*, ..., *7th period*, *6th period and lanthanoids †*, *7th period and actinoids †*.

† Depending on the value of the *IUPAC key*, the Lanthanum or Actinium are or are not included.

✓ any **user defined** name via `\pgfPTnewZlist{name}{list}`

cell width

default: 34pt

Sets the width of each base cell of the Periodic Table.

```
\pgfPT[Z list={1,...,36},cell width=40pt]
```

Periodic Table of Elements

cell height

default: 38.25pt

Sets the height of each base cell of the Periodic Table.

```
\pgfPT[Z list={1,...,36},cell height=50pt]
```

Periodic Table of Elements

cell size

default: 38.25pt

Style to set both the width and the height of each base cell of the Periodic Table.

```
\pgfPT[Z list={1,...,36},cell size=40pt]
```

Periodic Table of Elements

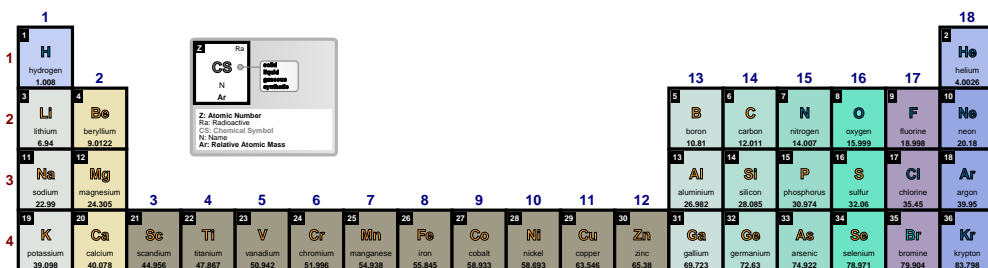
cell line width

default: 0.4pt

Sets the width of the line surrounding the base cell of the Periodic Table.

```
\pgfPT[Z list={1,...,36},cell line width=2pt]
```

Periodic Table of Elements



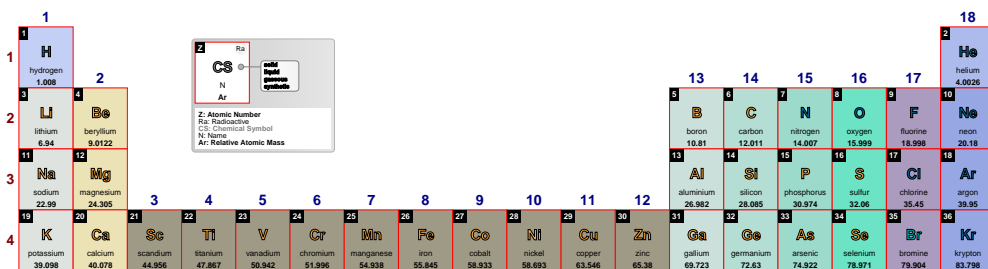
cell line color

default: black

Sets the color of the line surrounding the base cell of the Periodic Table.

```
\pgfPT[Z list={1,...,36},cell line color=red]
```

Periodic Table of Elements



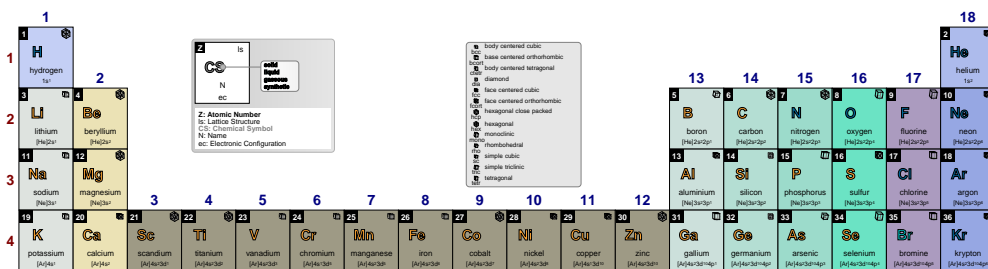
cell style

default: {}

Loads a named cell style, built via \pgfPTbuildcellstyle, to use as a layout for each cell of the Periodic Table.

```
\pgfPTbuildcellstyle{myname}(5,3)% 5 rows by 3 columns
[(1;1-2;Z),(1;3;ls),(2-3;1.5-2.5;CS),(4;1-3;name),(5;1-3;eConfignl)]
\pgfPT[Z list={1,...,36},cell style=myname]
```

Periodic Table of Elements



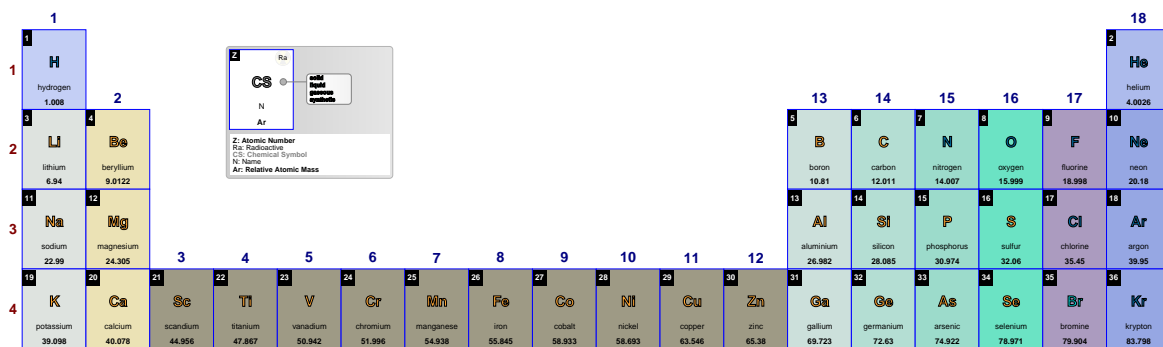
cell default: $\{w=34pt,h=38.25pt,lw=.4pt,lc=black\}$

Pseudo style to set the cell **w**idth, the cell **h**eight, the cell **s**ize, the cell **l**ine **w**idth, the cell **l**ine **c**olor and/or the cell **s**tyle. None of the **keys** – **w**, **h**, **s**, **lw**, **lc** and **style** – are mandatory.

USAGE: `cell={w=<length>,h=<length>,s=<length>,lw=<length>,lc=<color>,style=<name>}`

`\pgfPT[Z list={1,...,36},cell={w=40pt,h=50pt,lw=.6pt,lc=blue}]`

Periodic Table of Elements



font default: *phv* (pdf \LaTeX); *TeX Gyre Heros* (Xe \LaTeX or Lua \LaTeX)

Sets the font family, via the proper \LaTeX font name, to use in the Periodic Table.

When pdf \LaTeX is used to typeset the Periodic Table the *default* font is *phv*, i.e., the Helvetica font. In this case the value of the **font** key can be any \LaTeX font name known to the local \LaTeX installation.

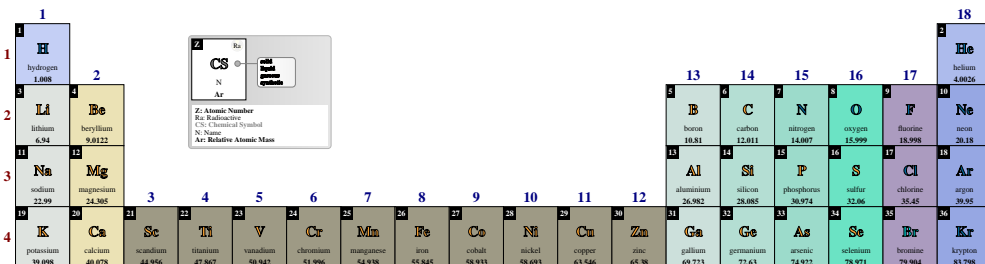
When Xe \LaTeX or Lua \LaTeX are used to typeset the Periodic Table the *default* font is *TeX Gyre Heros*, a closest alternative to Helvetica font. In this case the value of the **font** key can be any font name known to your Operating System and with Lua \LaTeX it can also be any font name available in your TEXMF tree.

See \LaTeX font names below or the [fontspec documentation](#) for further details. *(changed in v2.1.0)*

Examples with pdf \LaTeX :

`\pgfPT[Z list={1,...,36},font=ptm]`

Periodic Table of Elements




```
\pgfPT[Z list={1,...,36},font=RobotoSlab-TLF]
```

Periodic Table of Elements

L^AT_EX font names:

✓ The L^AT_EX font names commonly available in L^AT_EX distributions are:

– **Serif fonts**

- ▷ cmr – Computer Modern Roman
- ▷ lmr – Latin Modern Roman
- ▷ pbk – Bookman
- ▷ bch – Charter
- ▷ pnc – New Century Schoolbook
- ▷ ppl – Palatino
- ▷ ptm – Times

– **Sans Serif fonts**

- ▷ cmss – Computer Modern Sans Serif
- ▷ lmss – Latin Modern Sans Serif
- ▷ pag – Avant Garde
- ▷ phv – Helvetica

✓ There are other fonts available to L^AT_EX that require installation of the corresponding packages:

- ▷ the **roboto** package provides the following fonts:
 - Roboto-TLF – Roboto tabular lining
 - Roboto-LF – Roboto proportional lining
 - Roboto-OsF – Roboto proportional oldstyle
 - Roboto-TOsF – Roboto tabular oldstyle
 - RobotoSlab-TLF – RobotoSlab proportional lining
 - RobotoSlab-OsF – RobotoSlab proportional oldstyle
 - RobotoSlab-TOsF – RobotoSlab tabular oldstyle
 - RobotoMono-TLF – RobotoMono proportional lining
- ▷ the **frursive** package provides the *frc* – French Cursive font.
- ▷ the **miama** package provides the *fmr* – Miama Nueva font.
- ▷ ...

For more information about fonts visit the [TUG Font Catalogue](#)

Examples with XeL^AT_EX or LuaL^AT_EX:

```
\pgfPT[Z list={1,...,36},font=Verdana,CS font=\fontspec{Mistral}\selectfont]
```

Periodic Table of Elements

```
\pgfPT[Z list={1,...,36},font=Arial,CS font=\fontspec{LCALLIG.TTF}\selectfont]
```

Periodic Table of Elements

back color scheme

default: *default*

Sets a **named** back color scheme for the Periodic Table.

```
\pgfPT[back color scheme=Soft]
```

Periodic Table of Elements

The possible name is one of the following:

✓ **built-in:**

- ▷ 'Soft', a soft color scheme that distinguishes metal, non metals, silicon and germanium, lanthanoids and actinoids.
- ▷ 'Jmol', is the color scheme used in the computer software [Jmol](#): an open-source Java viewer for chemical structures in 3D.
- ▷ 'CPK', is the color scheme of the popular color convention for distinguishing atoms of different chemical elements in molecular models. The scheme is named after the CPK molecular models designed by chemists Robert Corey and Linus Pauling, and improved by Walter Koltun.
- ▷ 'Rasmol', is the color scheme used in the computer software [RasMol](#), a program for molecular graphics visualization originally developed by Roger Sayle.
- ▷ 'RasmolNew', is a color scheme used in RasMol with revision of CPK colors made by C. Chigbo (RasMol 2.7.3).
- ▷ 'Wikipedia', is the color scheme based on the [Wikipedia Periodic Table of Elements](#).
- ▷ 'MNM', is designed to show **M**etals and **N**on **M**etals in two different colors, showing also the semi-metals in a third color.
- ▷ 'PS', is designed to show the **P**hysical **S**tate of the elements at normal temperature and pressure (NTP) in different colors.
- ▷ 'Radio', is designed to show the **R**adioactive elements in one color and the non radioactive elements in another color.
- ▷ 'Blocks', for showing the elements in each block of the Periodic Table with the same color.
- ▷ 'solid', to show the background of each cell of the Periodic Table with the same color specified by the key 'back color'.

✓ any **user defined** name via `\pgfPTnewColorScheme{name}{color list}`

back color

default: *white*

Sets the background of each cell of the Periodic Table. It only takes effect if the **back color scheme** key is set to **solid**

`\pgfPT[Z list={1,...,36},back color=black!15]`

Periodic Table of Elements

The image shows a standard periodic table where the first 36 elements (Hydrogen to Zinc) have a light gray background, while the remaining elements (Gallium to Krypton) have a white background. A legend box is present, showing 'CS' with a light gray background and 'Ra' with a white background, indicating that 'CS' stands for 'color solid' and 'Ra' for 'radioactive'.

`\pgfPT[Z list={1,...,36},back color scheme=solid,back color=black!15]`

Periodic Table of Elements

The image shows a standard periodic table where the first 36 elements (Hydrogen to Zinc) have a solid black background, while the remaining elements (Gallium to Krypton) have a white background. A legend box is present, showing 'CS' with a black background and 'Ra' with a white background, indicating that 'CS' stands for 'color solid' and 'Ra' for 'radioactive'.

It is possible to set the *back color scheme* key with the built-in names using the following styles:

csSolid

default: *white*

A style equivalent to `back color scheme=solid,back color=#1`

```
\pgfPT[csSolid]
```

Periodic Table of Elements

A standard periodic table of elements with a white background for all cells. The table includes element symbols, names, atomic numbers, and relative atomic masses. It features a legend for element types (solid, liquid, gas, metal, non-metal, noble gas, radioactive) and a key for element properties (atomic number, radioactivity, chemical symbol, name, relative atomic mass).

```
\pgfPT[csSolid=black!15]
```

Periodic Table of Elements

A standard periodic table of elements with a 15% black background for all cells. The table includes element symbols, names, atomic numbers, and relative atomic masses. It features a legend for element types (solid, liquid, gas, metal, non-metal, noble gas, radioactive) and a key for element properties (atomic number, radioactivity, chemical symbol, name, relative atomic mass).

csSoft

no value

A style equivalent to `back color scheme=Soft`

```
\pgfPT[csSoft]
```

Periodic Table of Elements

csJmol

no value

A style equivalent to `back color scheme=Jmol`

```
\pgfPT[csJmol]
```

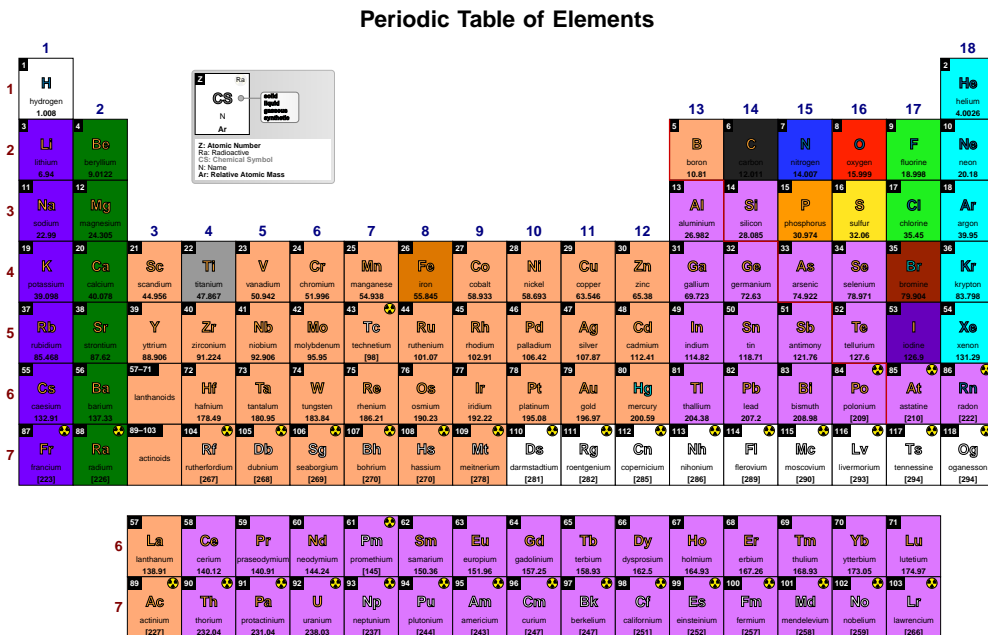
Periodic Table of Elements

csCPK

no value

A style equivalent to `back color scheme=CPK`

```
\pgfPT[csCPK]
```

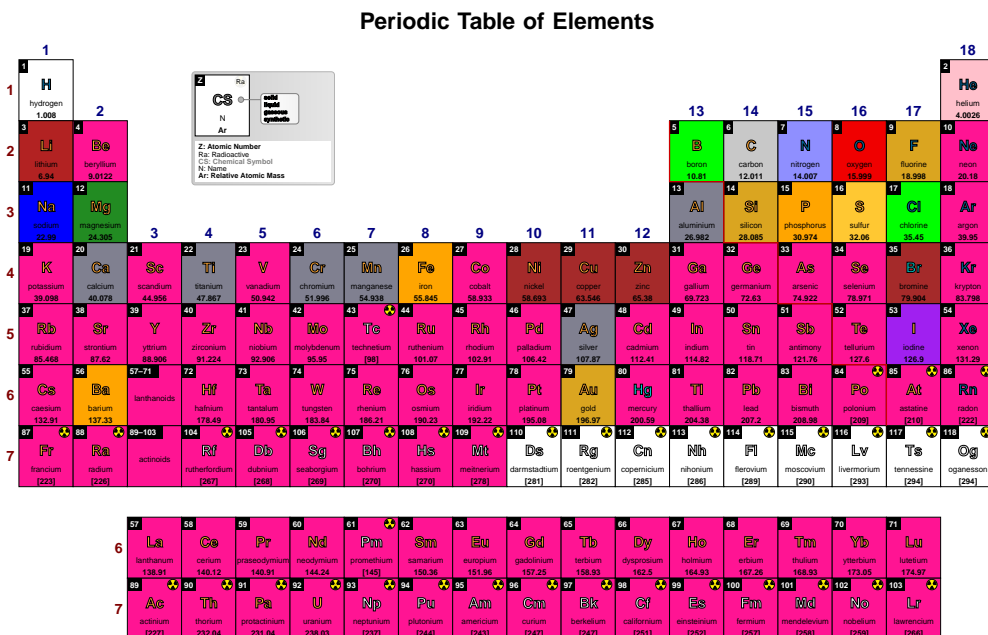


csRasmol

no value

A style equivalent to `back color scheme=Rasmol`

```
\pgfPT[csRasmol]
```



csRasmolNew

no value

A style equivalent to `back color scheme=RasmolNew`

```
\pgfPT[csRasmolNew]
```

Periodic Table of Elements

csWikipedia

no value

A style equivalent to `back color scheme=Wikipedia`

```
\pgfPT[csWikipedia]
```

Periodic Table of Elements

csMNM

no value

A style equivalent to `back color scheme=MNM`

\pgfPT[csMNM]

Periodic Table of Elements

csPS

no value

A style equivalent to `back color scheme=PS`

\pgfPT[csPS]

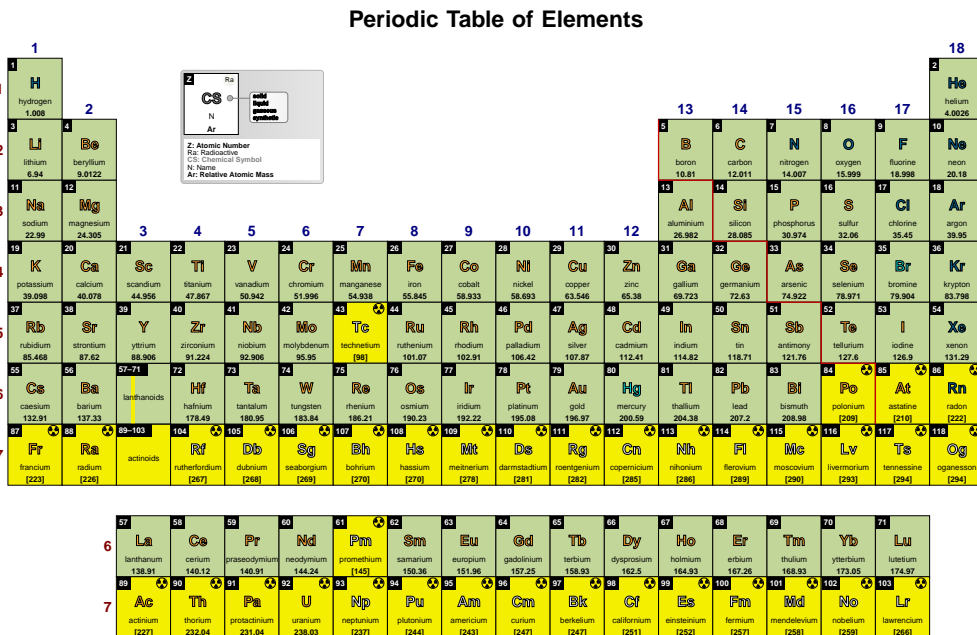
Periodic Table of Elements

csRadio

no value

A style equivalent to `back color scheme=Radio`

```
\pgfPT[csRadio]
```

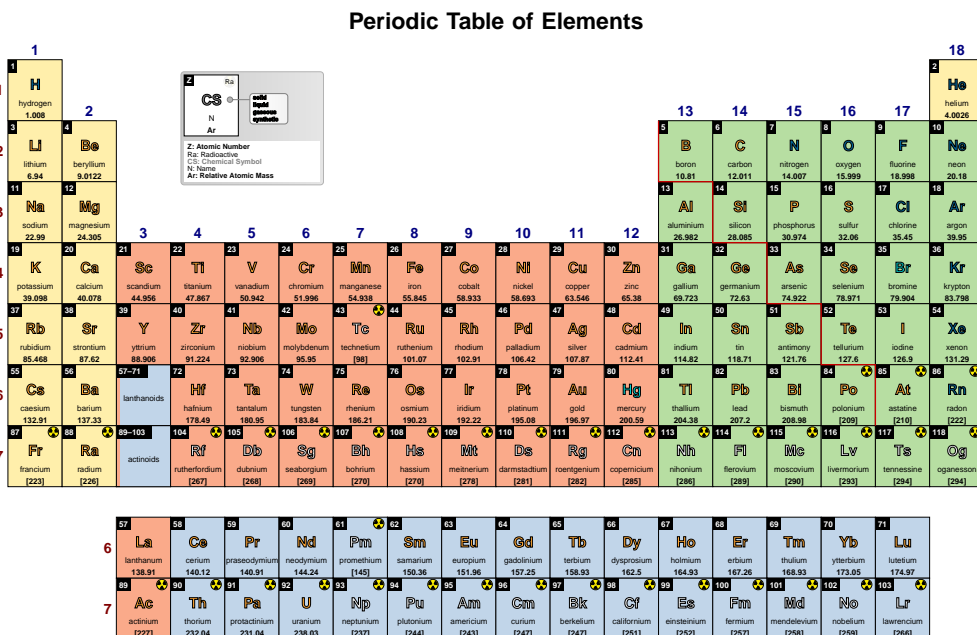


csBlocks

no value

A style equivalent to `back color scheme=Blocks`

```
\pgfPT[csBlocks]
```

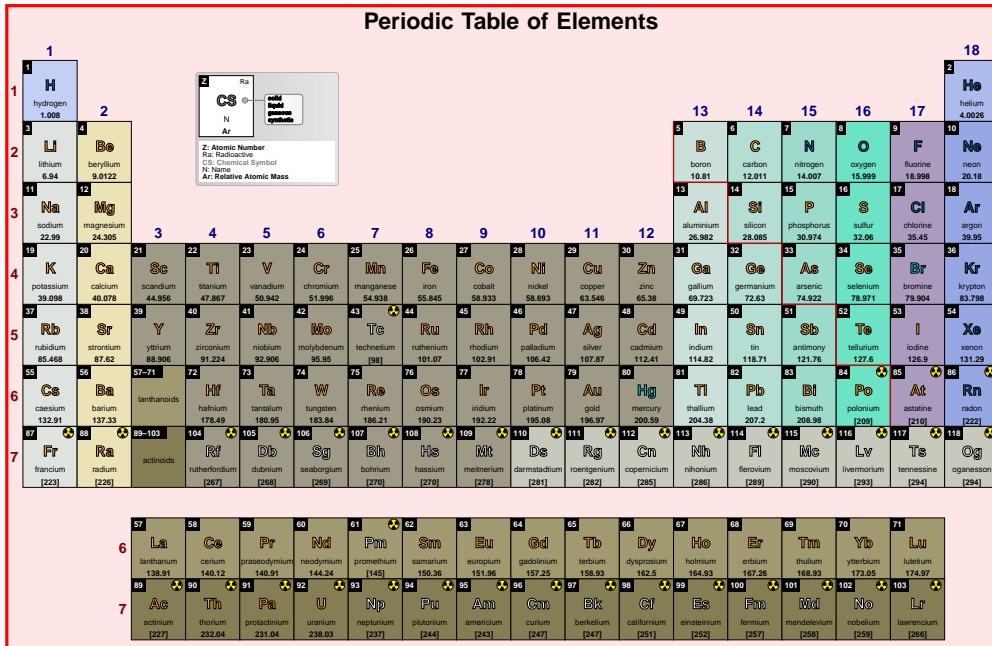


background

default: {}

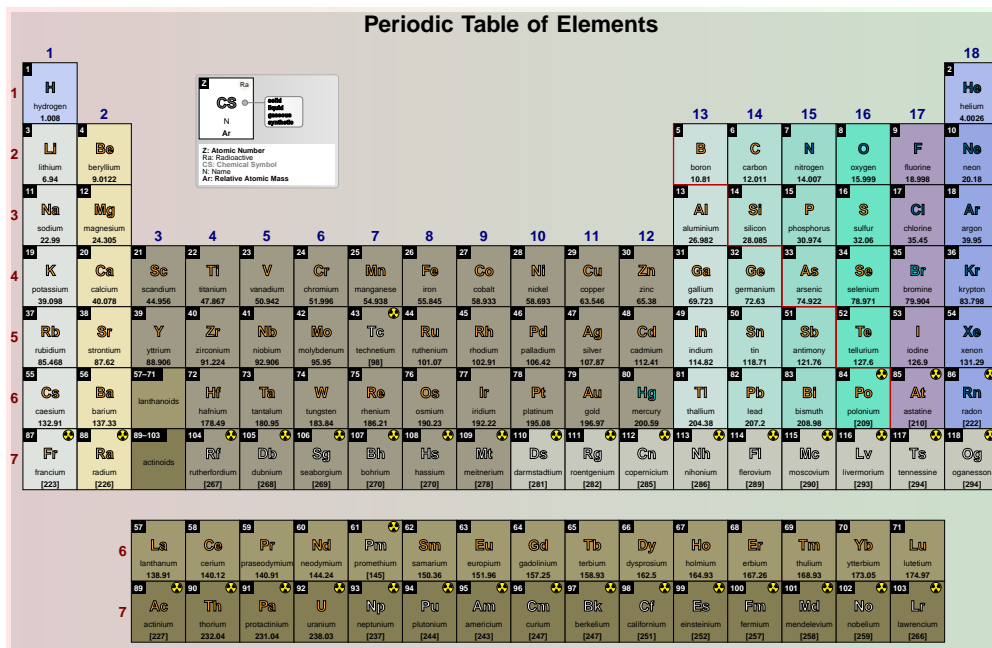
A style to set the background of the Periodic Table, built with any of the TikZ keys that can be applied to a path construction.

```
\pgfPT[background={draw=red,line width=2pt,fill=red!10}]
```



```
\usetikzlibrary{shadows}
```

```
\pgfPT[background={left color=red!10,right color=green!10,postaction={drop shadow={left color=red!10,right color=green!10}}}]
```



IUPAC

default: *true*

When set to true draws the periodic table with *lanthanum* and *actinium* appended to block f and the labels *lanthanoids* and *actinoids* are placed at group 3, substituting *lanthanum* and *actinium*. When **IUPAC** is set to false, *lanthanum* and *actinium* are shown in group 3 and the labels *lanthanoids* and *actinoids* are placed near the *f* block (if the key **show label LaAc** is set to true).

\pgfPT

Periodic Table of Elements

1																	18																																																	
1	H																	He																																																
2	Li	Be											B	C	N	O	F	Ne																																																
3	Na	Mg											Al	Si	P	S	Cl	Ar																																																
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr																																																
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe																																																
6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn																																																
7	Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og																																																
6	<table border="1"> <tr> <td>57</td><td>La</td><td>Ce</td><td>Pr</td><td>Nd</td><td>Pm</td><td>Sm</td><td>Eu</td><td>Gd</td><td>Tb</td><td>Dy</td><td>Ho</td><td>Er</td><td>Tm</td><td>Yb</td><td>Lu</td> </tr> <tr> <td>58</td><td>cerium</td><td>praseodymium</td><td>neodymium</td><td>promethium</td><td>samarium</td><td>europium</td><td>gadolinium</td><td>terbium</td><td>dysprosium</td><td>holmium</td><td>erbium</td><td>thulium</td><td>ytterbium</td><td>lutetium</td><td></td> </tr> <tr> <td>59</td><td>140.12</td><td>140.91</td><td>144.24</td><td>(145)</td><td>150.36</td><td>151.96</td><td>157.25</td><td>158.93</td><td>162.5</td><td>164.93</td><td>167.26</td><td>168.93</td><td>173.05</td><td>174.97</td><td></td> </tr> </table>																		57	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	58	cerium	praseodymium	neodymium	promethium	samarium	europium	gadolinium	terbium	dysprosium	holmium	erbium	thulium	ytterbium	lutetium		59	140.12	140.91	144.24	(145)	150.36	151.96	157.25	158.93	162.5	164.93	167.26	168.93	173.05	174.97	
57	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu																																																			
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7	<table border="1"> <tr> <td>87</td><td>Ac</td><td>Th</td><td>Pa</td><td>U</td><td>Np</td><td>Pu</td><td>Am</td><td>Cm</td><td>Bk</td><td>Cf</td><td>Es</td><td>Fm</td><td>Md</td><td>No</td><td>Lr</td> </tr> <tr> <td>88</td><td>actinium</td><td>thorium</td><td>protactinium</td><td>uranium</td><td>neptunium</td><td>plutonium</td><td>americium</td><td>curium</td><td>berkelium</td><td>californium</td><td>einsteinium</td><td>fermium</td><td>mendelevium</td><td>nobelium</td><td>lawrencium</td> </tr> <tr> <td>89</td><td>[227]</td><td>232.04</td><td>231.04</td><td>238.03</td><td>[237]</td><td>[244]</td><td>[243]</td><td>[247]</td><td>[247]</td><td>[251]</td><td>[252]</td><td>[257]</td><td>[258]</td><td>[259]</td><td>[261]</td> </tr> </table>																		87	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr	88	actinium	thorium	protactinium	uranium	neptunium	plutonium	americium	curium	berkelium	californium	einsteinium	fermium	mendelevium	nobelium	lawrencium	89	[227]	232.04	231.04	238.03	[237]	[244]	[243]	[247]	[247]	[251]	[252]	[257]	[258]	[259]	[261]
87	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr																																																			
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89	[227]	232.04	231.04	238.03	[237]	[244]	[243]	[247]	[247]	[251]	[252]	[257]	[258]	[259]	[261]																																																			

\pgfPT[IUPAC=false]

Periodic Table of Elements

1																	18																																																
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2	Li	Be											B	C	N	O	F	Ne																																															
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show label LaAc

default: {}

Determines when the labels 'lanthanoids' and 'actinoids' are shown (true) or not shown (false) near the f block. When the IUPAC key is set to true, the default behavior is to show the labels and when the IUPAC key is set to false, the default behavior is to hide the labels. This *default behavior can be overridden by this key* setting it to true, to show the labels, or to false to hide them, independently of the value of the IUPAC key.

```
\pgfPTnewZlist{myZlist}{55,...,118}
\pgfPTstyle[show title=false,show legend=false,show group numbers=false]
\pgfPT[Z list=myZlist]
```

Periodic table showing elements 55-118. The lanthanoid and actinoid series are highlighted in brown and labeled 'lanthanoids' and 'actinoids' respectively. Element symbols and atomic numbers are shown in each cell.

Periodic table showing elements 55-118. The lanthanoid and actinoid series are highlighted in brown and labeled with their IUPAC names: 'Lanthanoids' and 'Actinoids'.

```
\pgfPT[Z list=myZlist,show label LaAc=true]
```

Periodic table showing elements 55-118. The lanthanoid and actinoid series are highlighted in brown and labeled 'lanthanoids' and 'actinoids' respectively. Element symbols and atomic numbers are shown in each cell.

Periodic table showing elements 55-118. The lanthanoid and actinoid series are highlighted in brown and labeled with their IUPAC names: 'Lanthanoids' and 'Actinoids'.

```
\pgfPT[Z list=myZlist,IUPAC=false]
```

Periodic table showing elements 55-118. The lanthanoid and actinoid series are highlighted in brown and labeled with their IUPAC names: 'Lanthanoids' and 'Actinoids'.

Periodic table showing elements 55-118. The lanthanoid and actinoid series are highlighted in brown and labeled with their IUPAC names: 'Lanthanoids' and 'Actinoids'.

```
\pgfPT[Z list=myZlist,IUPAC=false,show label LaAc=false]
```

Periodic table showing elements 55-118. The lanthanoid and actinoid series are highlighted in brown and labeled with their IUPAC names: 'Lanthanoids' and 'Actinoids'.

Periodic table showing elements 55-118. The lanthanoid and actinoid series are highlighted in brown and labeled with their IUPAC names: 'Lanthanoids' and 'Actinoids'.

label LaAc font

default: `\footnotesize\itshape`

Sets the font for the labels 'lanthanoids' and 'actinoids'.

```
\pgfPT[label LaAc font=\bfseries,Z list=myZlist,IUPAC=false]
```

\pgfPTresetstyle

languages

default: `{}`

Sets a language list to use in the Periodic Table. It is a comma separated list of language flags: 'pt', 'en', 'fr', 'de', 'it', 'es' or 'br'. If a user language has been loaded, the corresponding ISO 639-1 code can also be used as a language flag. *This key overrides the default language, that is, the language loaded at package inclusion.*

(changed in v2.1.0)

```
\pgfPT[Z list={1,...,36},languages=pt]
```

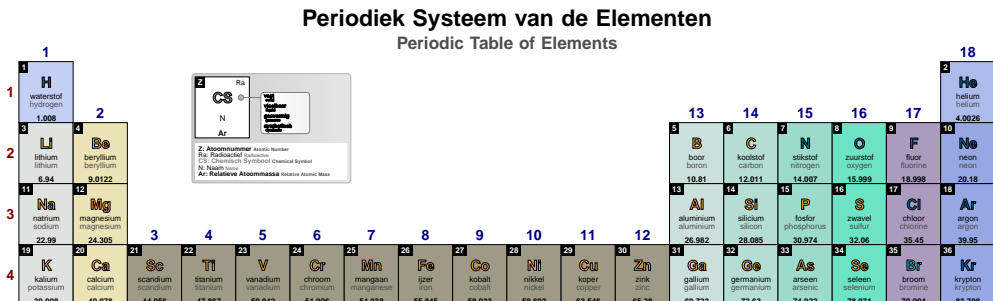
Tabela Periódica dos Elementos

```
\pgfPT[Z list={1,...,36},cell style=pgfPT2lang,languages={en,fr}]
```

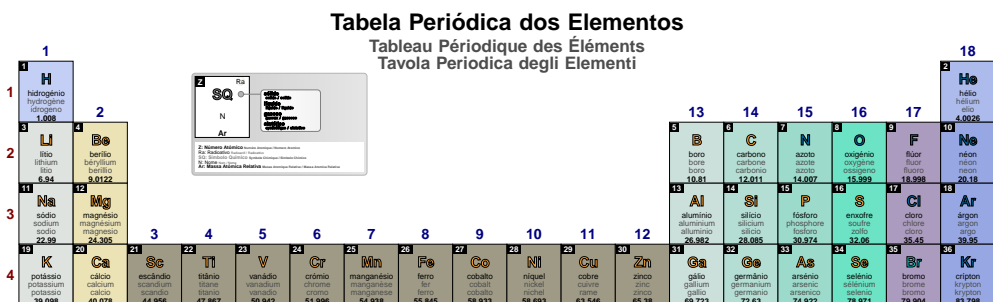
Periodic Table of Elements

Tableau Périodique des Éléments

```
% \usepackage[userlang=nl]{pgf-PeriodicTable}
\pgfPT[Z list={1,...,36},cell style=pgfPT2lang,languages={nl,en}]
```



```
\pgfPT[Z list={1,...,36},cell style=pgfPT3lang,languages={pt,fr,it}]
```

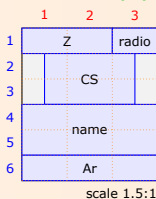


When using a set of languages, space to accommodate the names in each cell must be provided by building a suitable cell - typically one cell row per language. The cell styles used in the two examples above are built-in and serve this purpose.

✓ Built-in style **pgfPT2lang**

The build command:

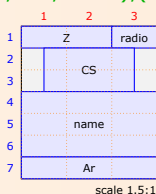
```
\pgfPTbuildcell(6,3)%
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4-5;1-3;name),(6;1-3;Ar)]
```



✓ Built-in style **pgfPT3lang**

The build command:

```
\pgfPTbuildcell(7,3)%
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4-6;1-3;name),(7;1-3;Ar)]
```



Also, the space for the title should be taken into account – if using more than three languages, the legend must be *turned off*, otherwise the title overlaps the legend.

other languages font

default: `\tiny`

Sets the font used in *other languages*, i.e., the languages started at the second entry of the list provide to the `languages` key.

\pgfPT[Z list=spd]

Periodic Table of Elements

\pgfPT[show MNM line=false]

Periodic Table of Elements

\pgfPT[Z list={1,...,36}]

Periodic Table of Elements

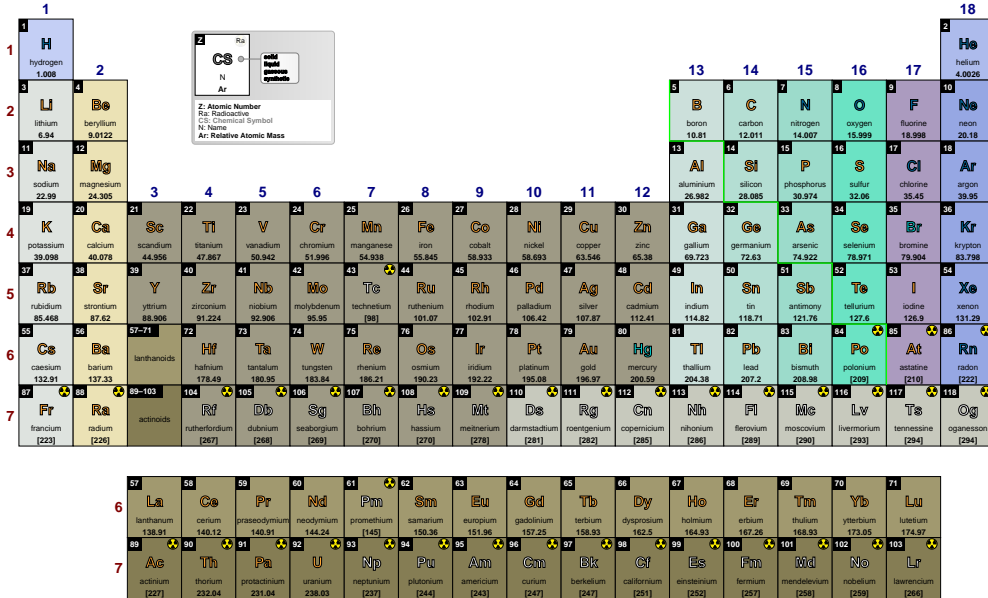
MNM line color

default: *red!80!black*

Sets the color of the *MNM line*.

```
\pgfPT[MNM line color=green]
```

Periodic Table of Elements



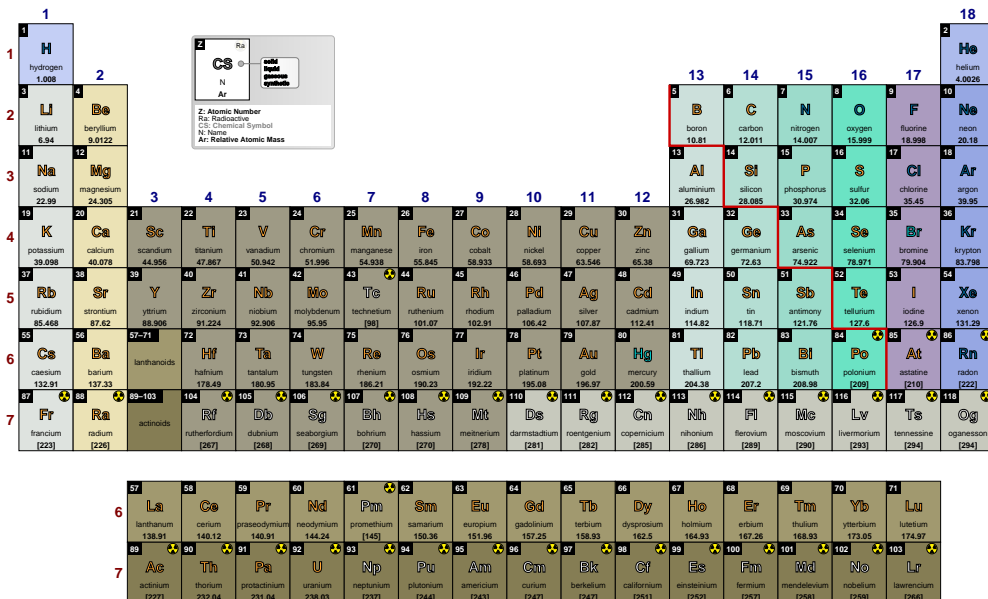
MNM line width

default: *.8pt*

Sets the width of the *MNM line*.

```
\pgfPT[MNM line width=1.5pt]
```

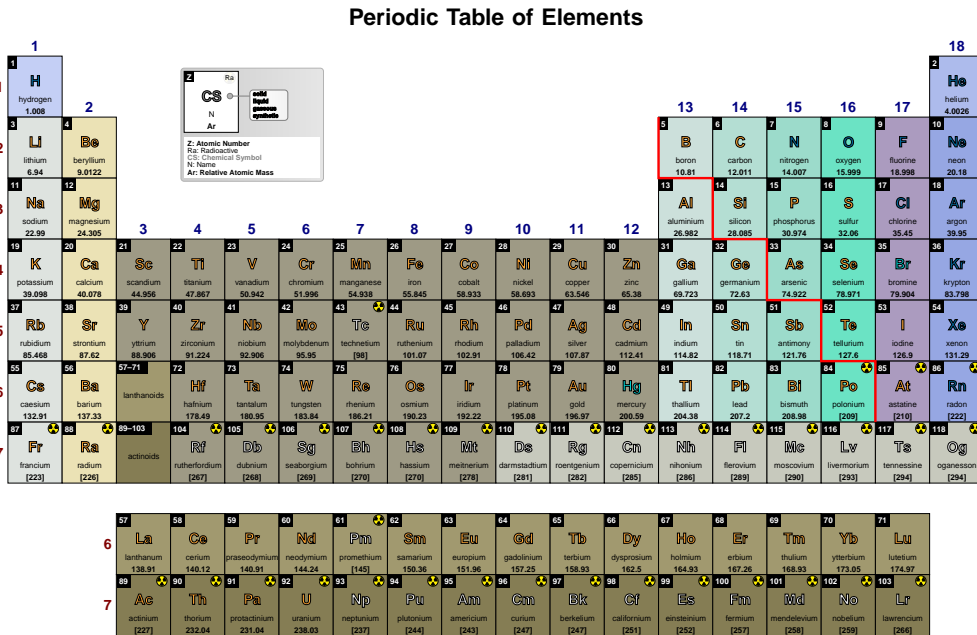
Periodic Table of Elements



MNM default: $\{c=red!80!black,w=.8pt\}$
Pseudo style to set the *MNM line* color and/or width. None of the keys – c and w – are mandatory. The key `show MNM line` is set to `true`.

```
USAGE: MNM={c=<color>,w=<length>}
```

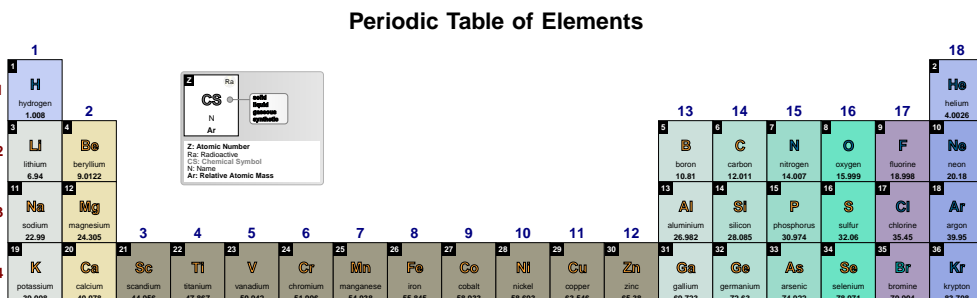
```
\pgfPT[MNM={w=1.5pt,c=red}]
```



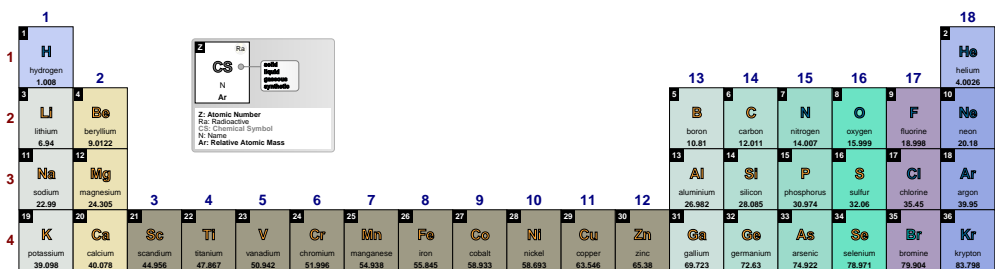
► Title and Legend

show title default: `true`
 When set to `true` the title is shown, otherwise the title (Periodic Table of elements) is not shown.

```
\pgfPT[Z list={1,...,36}]
```



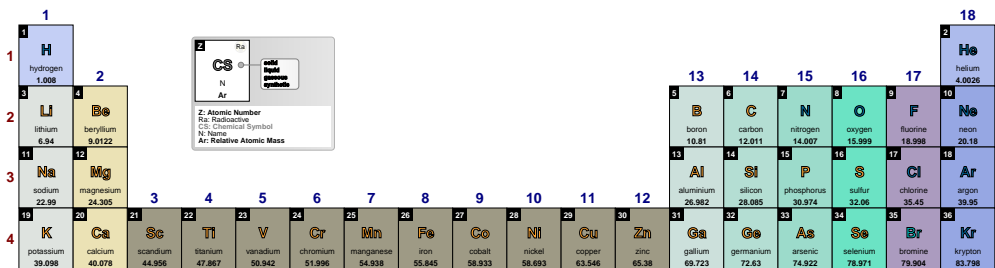
```
\pgfPT[Z list={1,...,36},show title=false]
```



title font default: `\Large\bfseries`
Sets the font used in the title.

```
\pgfPT[Z list={1,...,36},title font=\Huge\itshape]
```

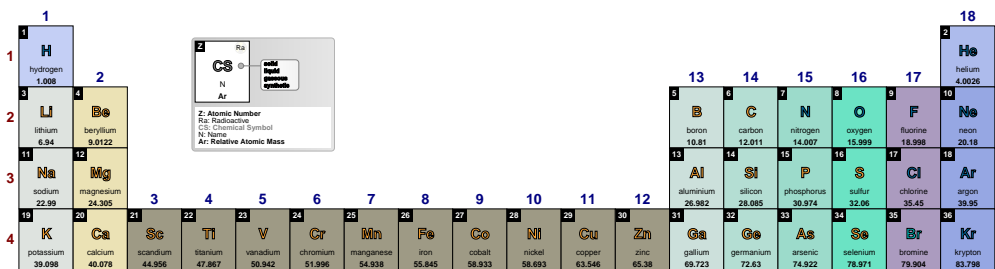
Periodic Table of Elements



title color default: `black`
Sets the title color.

```
\pgfPT[Z list={1,...,36},title color=green!50!black]
```

Periodic Table of Elements



title default: `{f=\Large\bfseries,c=black}`
Pseudo style to set the keys: **title font** and/or **title color**. None of the keys – **f** and **c** – are mandatory. The key **show title** is set to **true**.

```
USAGE: title={f=<font commands>,c=<color>}
```

```
\pgfPT[Z list={1,...,36},title={f=\Huge,c=teal}]
```

Periodic Table of Elements

show legend

default: true

When set to true the legend is shown, otherwise it is not shown.

```
\pgfPT[Z list={1,...,36}]
```

Periodic Table of Elements

```
\pgfPT[Z list={1,...,36},show legend=false]
```

Periodic Table of Elements

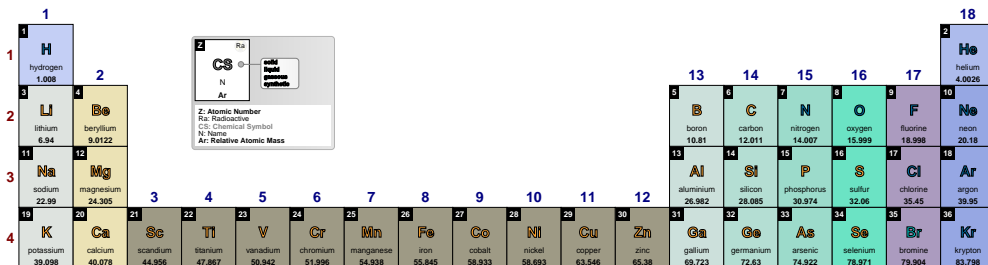
legend acronyms

default: true

When set to true, the legend consists of a cell using acronyms for its contents and the corresponding descriptions below that cell. When set to false, only the cell is displayed with the descriptions in place of the acronyms. In the latter case, the description font size is automatically adjusted to the available box, which can *spoil the appearance of the whole caption*, depending on the described content.

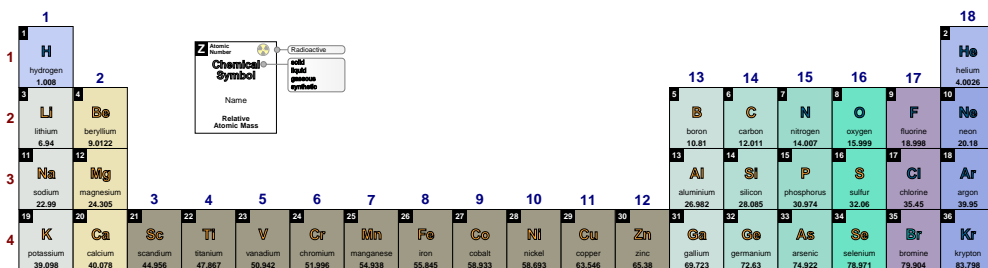
```
\pgfPT[Z list={1,...,36}]
```

Periodic Table of Elements



```
\pgfPT[Z list={1,...,36},legend acronyms=false]
```

Periodic Table of Elements



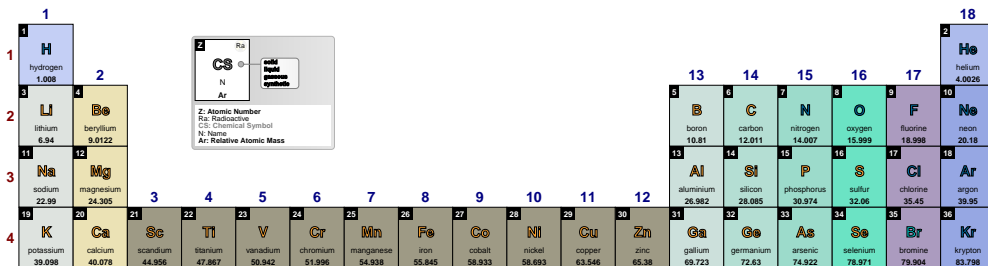
legend box

default: `left color=black!20,right color=black!10,draw=black!30`

Style to define the appearance of the box around the legend, legend pins and acronym descriptions, built with any of the `TikZ` keys that can be applied to a path construction. *It only works when the key `legend acronyms` is set to `true`.*

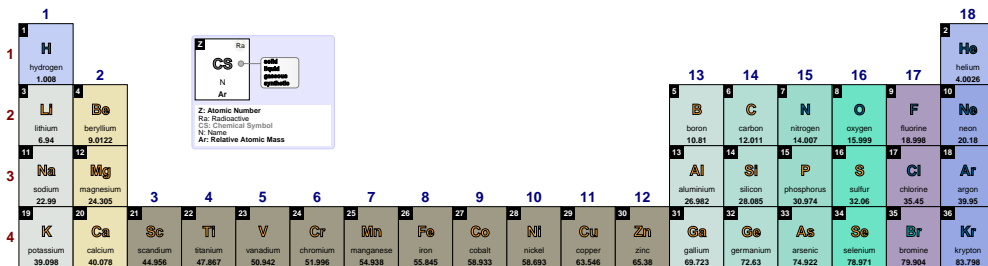
```
\pgfPT[Z list={1,...,36}]
```

Periodic Table of Elements



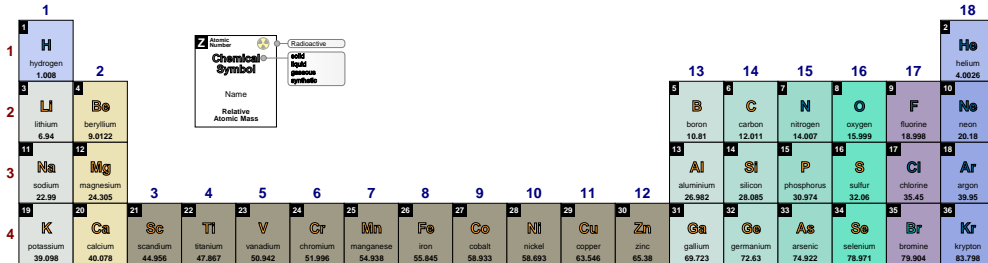
```
\pgfPT[Z list={1,...,36},legend box={draw=blue!20,fill=blue!10}]
```

Periodic Table of Elements



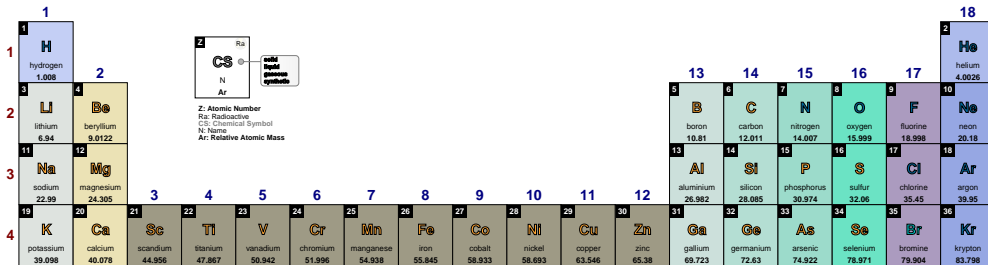
```
\pgfPT[Z list={1,...,36},legend box={draw=blue!20,fill=blue!10,legend
acronyms=false}]
```

Periodic Table of Elements



```
\pgfPT[Z list={1,...,36},legend box={}]
```

Periodic Table of Elements



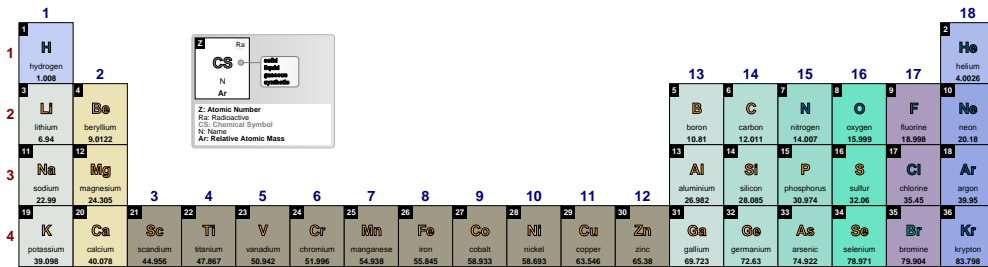
legend back color

default: *white*

Sets the legend background color.

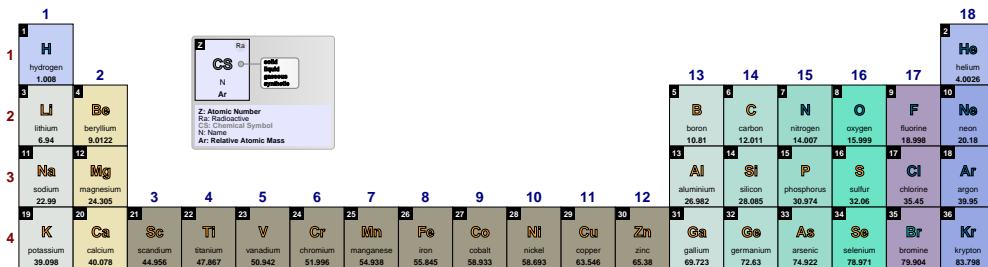
```
\pgfPT[Z list={1,...,36}]
```

Periodic Table of Elements



```
\pgfPT[Z list={1,...,36},legend back color=blue!10]
```

Periodic Table of Elements



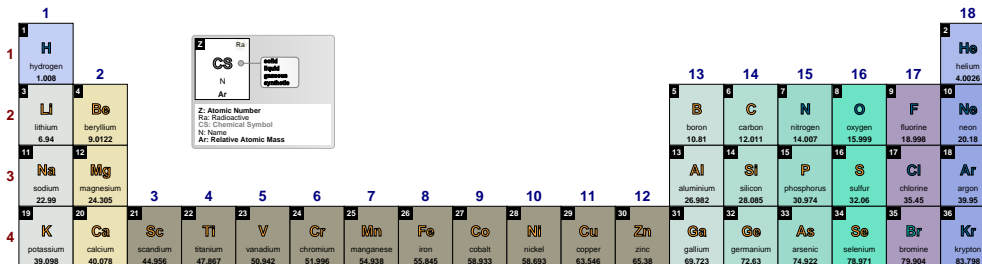
legend radio color

default: *black*

Sets the color of the radioactivity acronym and corresponding description.

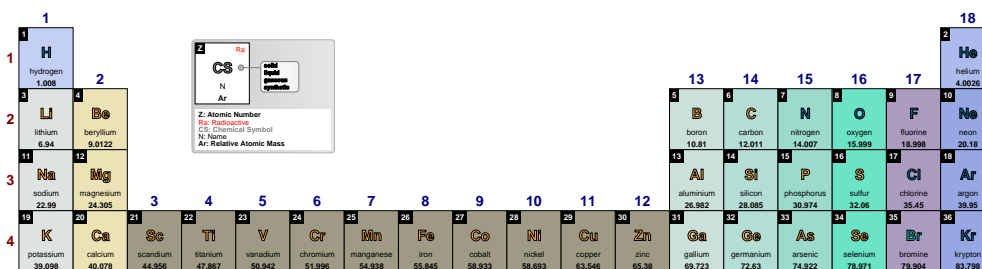
```
\pgfPT[Z list={1,...,36}]
```

Periodic Table of Elements



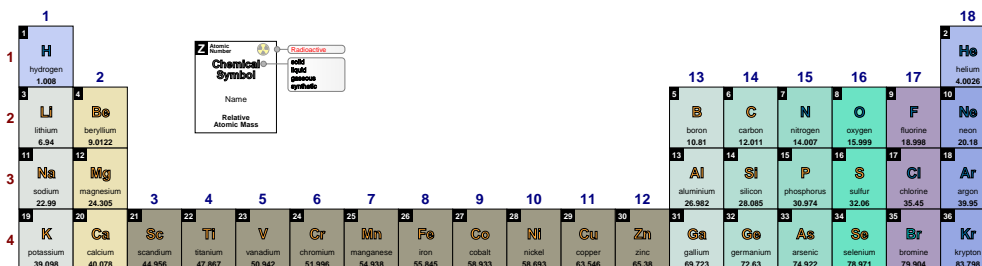
```
\pgfPT[Z list={1,...,36},legend radio color=red]
```

Periodic Table of Elements



```
\pgfPT[Z list={1,...,36},legend radio color=red,legend acronyms=false]
```

Periodic Table of Elements



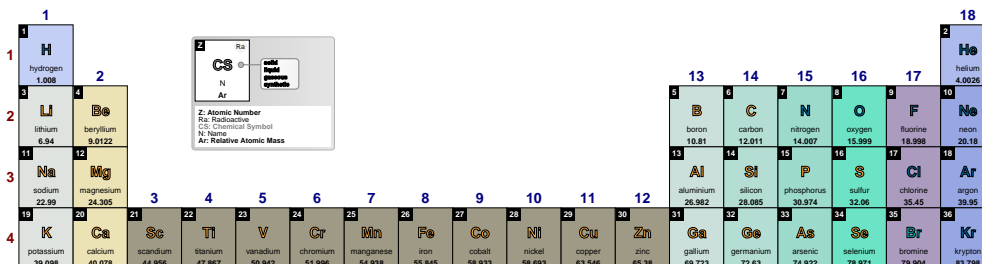
legend CS color

default: *black!50*

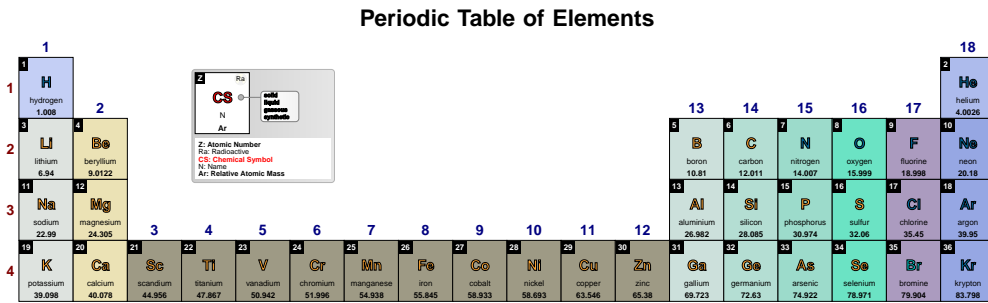
Sets the color of the Chemical Symbol acronym and corresponding description.

```
\pgfPT[Z list={1,...,36}]
```

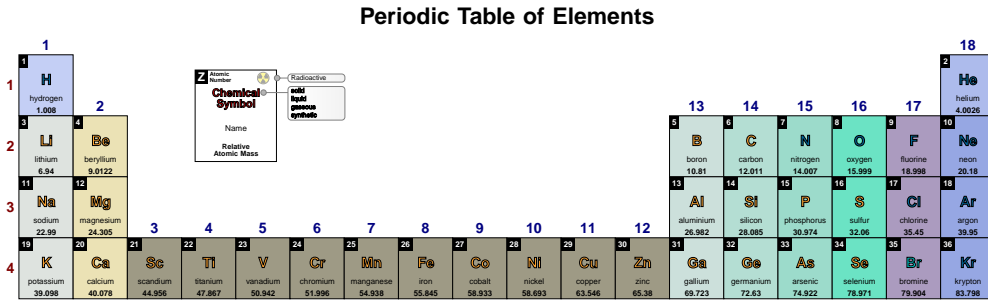
Periodic Table of Elements



```
\pgfPT[Z list={1,...,36},legend CS color=red]
```

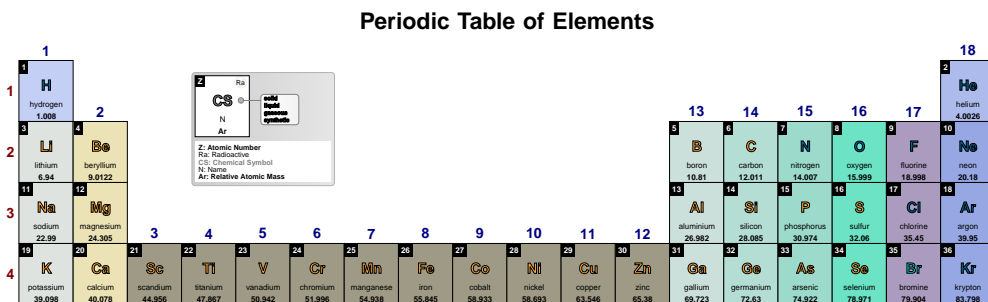


```
\pgfPT[Z list={1,...,36},legend CS color=red,legend acronyms=false]
```

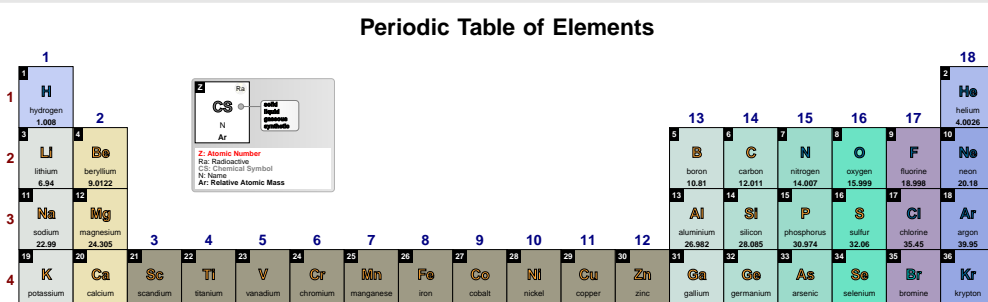


legend Z color default: {}
 Sets the color of the atomic number description (only applies when the key **legend acronyms** is set to **true**.)

```
\pgfPT[Z list={1,...,36}]
```

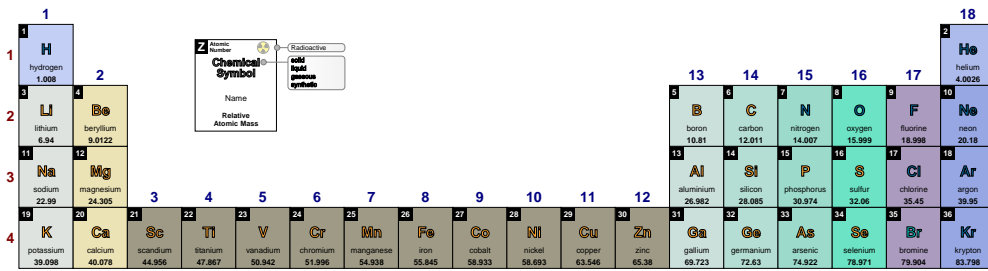


```
\pgfPT[Z list={1,...,36},legend Z color=red]
```



```
\pgfPT[Z list={1,...,36},legend Z color=red,legend acronyms=false]
```


Periodic Table of Elements



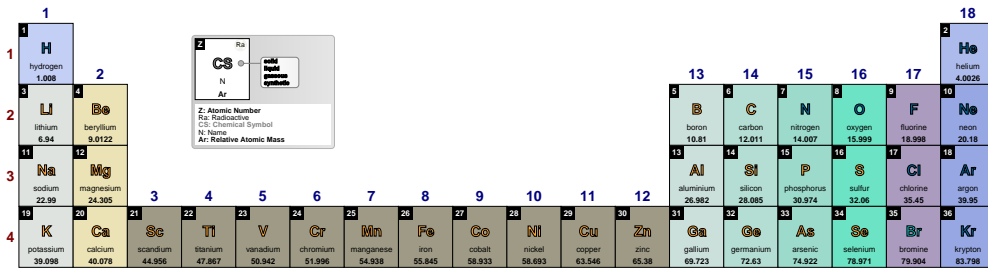
show legend pins

default: true

When set to true the legend pins are shown, otherwise they are not shown.

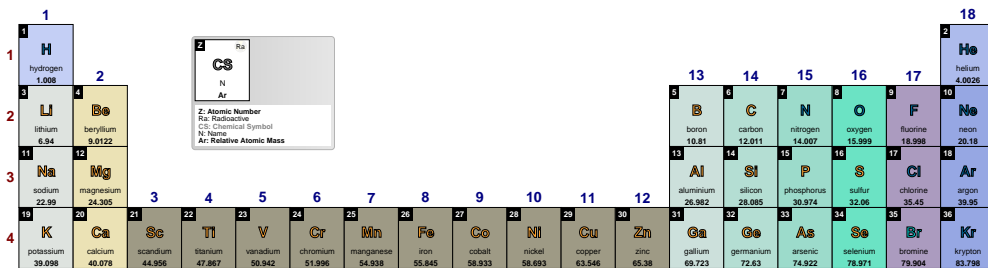
```
\pgfPT[Z list={1,...,36}]
```

Periodic Table of Elements



```
\pgfPT[Z list={1,...,36},show legend pins=false]
```

Periodic Table of Elements



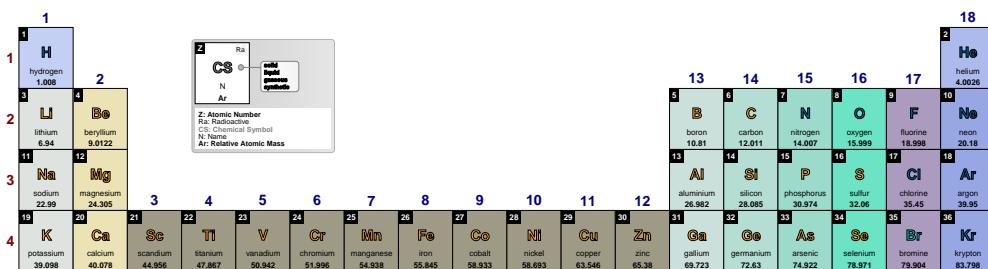
legend pins

default: $\{line\ width=.05pt,rounded\ corners=2pt,right\ color=black!5, left\ color=white,draw=black!50\}$

Style to define the appearance of the legend pins, built with any of the TikZ keys that can be applied to a path construction.

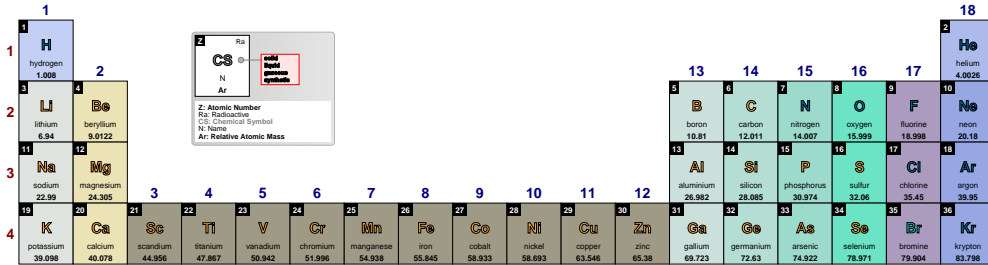
```
\pgfPT[Z list={1,...,36}]
```

Periodic Table of Elements



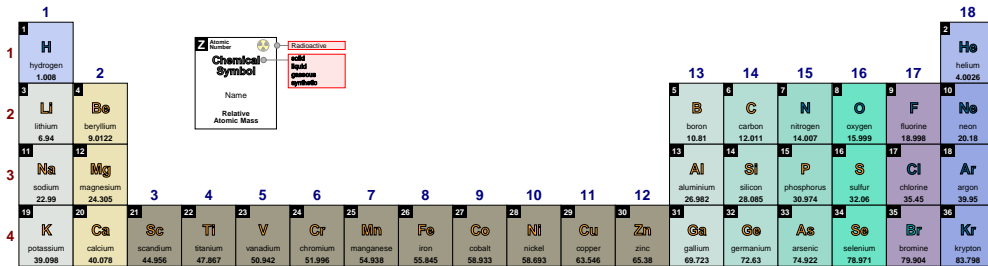
```
\pgfPT[Z list={1,...,36},legend pins={draw=red,fill=red!10}]
```

Periodic Table of Elements



```
\pgfPT[Z list={1,...,36},legend pins={draw=red,fill=red!10},legend acronyms=false]
```

Periodic Table of Elements



show extra legend default: true
 When set to true the extra legend is shown, otherwise it is not shown.

```
\pgfPTbuildcellstyle{myname}(6,3)% 6 rows by 3 columns
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4;1-3;name),(5.25-6.75;1-3;DiscC)]
\pgfPT[Z list={1,...,36},cell style=myname]
```

Periodic Table of Elements



```
\pgfPT[Z list={1,...,36},cell style=myname,show extra legend=false]
```

Periodic Table of Elements



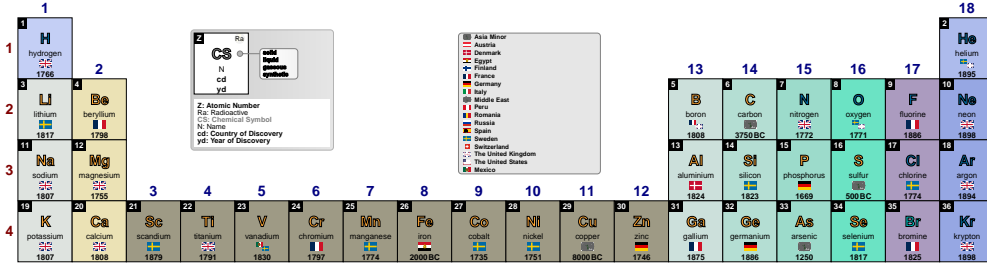
extra legend

default: $\{draw=black!50,fill=black!10,line\ width=.05pt,rounded\ corners=2pt\}$

Style to define the appearance of the extra legend, built with any of the TikZ keys that can be applied to a path construction.

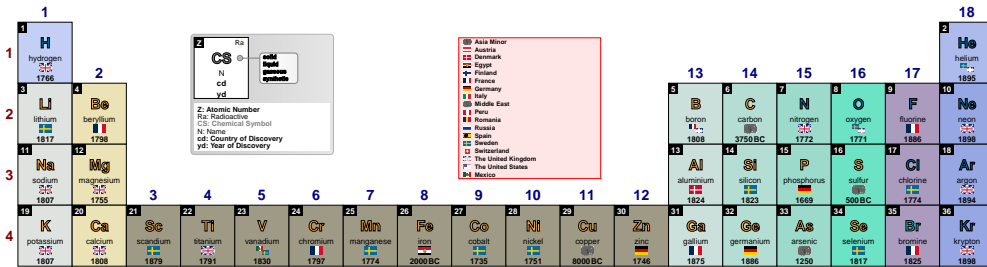
```
\pgfPT[Z list={1,...,36},cell style=pgfPTdisc]
```

Periodic Table of Elements



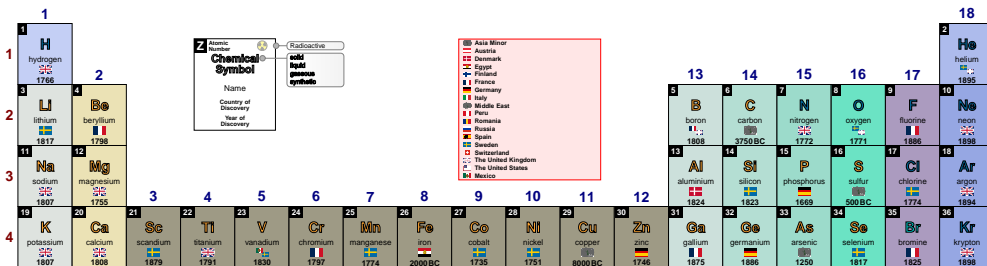
```
\pgfPT[Z list={1,...,36},cell style=pgfPTdisc,extra legend={draw=red,fill=red!10}]
```

Periodic Table of Elements



```
\pgfPT[Z list={1,...,36},cell style=pgfPTdisc,legend\ acronyms=false,extra\ legend={draw=red,fill=red!10}]
```

Periodic Table of Elements



legend

default: $\{bc=white,pins=true,extra=true,acro=true\}$

Pseudo style to set the keys: legend **back** color, show legend **pins**, show **extra** legend, legend **acronyms**, legend **radio** color, legend **CS** color, legend **Z** color, legend **pins (style)**, **extra** legend (**style**) and/or legend **box** (style). None of the keys – bc, pins, extra, acro, radio, CS, Z, pins style, extra style and box – are mandatory. The key **show legend** is set to true.

USAGE:

```
legend={bc=<color>,pins=<true|false>,extra=<true|false>,acro=<true|false>,radio=<color>,CS=<color>,Z=<color>,pins\ style=<tikz\ path\ keys>,extra\ style=<tikz\ path\ keys>,box=<tikz\ path\ keys>}
```

```
\pgfPT[Z list={1,...,36},cell style=myname,legend={bc=black!10,extra=false}]
```

Periodic Table of Elements



```
\pgfPT[Z list={1,...,36},cell style=myname,legend={acro=false,extra=false}]
```

Periodic Table of Elements



► Periods and Groups

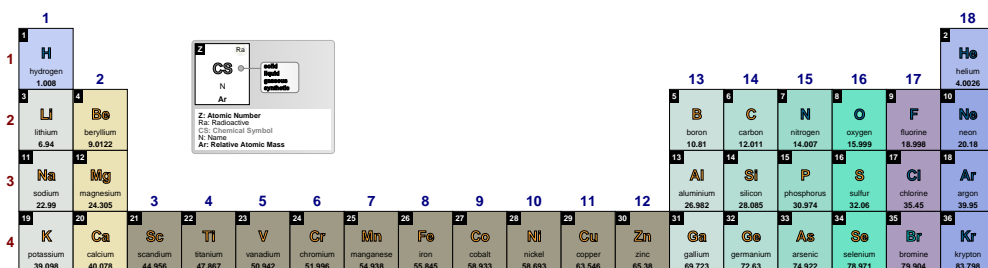
show period numbers

default: true

When set to true the period numbers are shown, otherwise they are not shown.

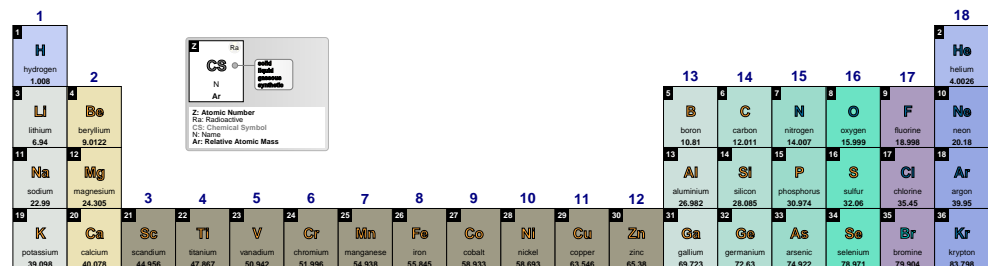
```
\pgfPT[Z list={1,...,36}]
```

Periodic Table of Elements



```
\pgfPT[Z list={1,...,36},show period numbers=false]
```

Periodic Table of Elements



show group numbers

default: *true*

When set to *true* the group numbers are shown, otherwise they are not shown.

```
\pgfPT[Z list={1,...,36}]
```

Periodic Table of Elements

A standard periodic table with group numbers 1 through 18 displayed above the columns. The table includes element symbols, names, atomic numbers, and relative atomic masses. A legend box shows the format for element data: Z: Atomic Number, Ra: Radioactive, CS: Chemical Symbol, N: Name, Ar: Relative Atomic Mass.

```
\pgfPT[Z list={1,...,36},show group numbers=false]
```

Periodic Table of Elements

A standard periodic table without group numbers displayed above the columns. The table includes element symbols, names, atomic numbers, and relative atomic masses. A legend box shows the format for element data: Z: Atomic Number, Ra: Radioactive, CS: Chemical Symbol, N: Name, Ar: Relative Atomic Mass.

period label color

default: *red!50!black*

Sets the period label color.

```
\pgfPT[Z list={1,...,36},period label color=black]
```

Periodic Table of Elements

A standard periodic table with period labels 1 through 4 displayed to the left of the rows. The labels are in black color. The table includes element symbols, names, atomic numbers, and relative atomic masses. A legend box shows the format for element data: Z: Atomic Number, Ra: Radioactive, CS: Chemical Symbol, N: Name, Ar: Relative Atomic Mass.

group label color

default: *blue!50!black*

Sets the group label color.

```
\pgfPT[Z list={1,...,36},group label color=black]
```

Periodic Table of Elements

label font

Sets the label font.

default: `\small\bfseries`

```
\pgfPT[Z list={1,...,36},label font=\itshape]
```

Periodic Table of Elements

per

default: `{gr=true,c=red!50!black,f=\small\bfseries}`

Pseudo style to set the keys: show **g**roup numbers, period label color and/or label font. None of the keys – gr, c and f – are mandatory. The key **show period numbers** is set to true.

```
USAGE: per={gr=<true|false>,c=<color>,f=<font commands>}
```

```
\pgfPT[Z list={1,...,36},per={gr=false,c=green!50!black}]
```

Periodic Table of Elements

gr

default: `{per=true,c=blue!50!black,f=\small\bfseries}`

Pseudo style to set the keys: show **per**iod numbers, group label color and/or label font. None of the keys – per, c and f – are mandatory. The key **show group numbers** is set to true.

```
USAGE: gr={per=<true|false>,c=<color>,f=<font commands>}
```

```
\pgfPT[Z list={1,...,36},gr={per=false,c=green!50!black}]
```

Periodic Table of Elements

The image shows a periodic table where group labels (1-18) are green and period labels (1-4) are black. A legend box for element Cs shows: Z: Atomic Number, Ra: Radioactive, C.S: Chemical Symbol, N: Name, Ar: Relative Atomic Mass.

per+gr default: $\{pc=red!50!black,gc=blue!50!black,f=\small\bfseries\}$
Pseudo style: use **c** to set both keys group label color and period label color with the same color; use **pc** to set period label color, **gc** to set group label color and/or **f** to set label font. None of the keys – c, pc, gc and f – are mandatory. The keys **show period numbers** and **show group numbers** are set to true.

```
USAGE: per+gr={c=<color>,pc=<color>,gc=<color>,f=<font commands>}
```

```
\pgfPT[Z list={1,...,36},per+gr={c=green!50!black, f=\fontfamily{frc}\selectfont\normalsize\bfseries}]
```

Periodic Table of Elements

The image shows a periodic table with green group labels, black period labels, and a pseudo-style font. A legend box for element Cs is included.

► Blocks and Families

show blocks default: *false*
 When set to **true** the blocks **s**, **p**, **d** and **f** are drawn overlaying the Periodic Table and their labels are shown. Note that blocks are only shown when the **Z list** contains, at least, all elements of blocks **s**, **p** and **d**.

```
\pgfPT[Z list={1,...,36},show blocks=true,show title=false]
```

The image shows a periodic table with colored blocks (s, p, d, f) overlaid on the table. A legend box for element Cs is included.

\pgfPT[show blocks,show title=false]

Legend for element properties:

- Z: Atomic Number
- Ra: Radioactive
- CS: Chemical Symbol
- N: Name
- Ar: Relative Atomic Mass

\pgfPT[Z list=spd,show blocks,show title=false]

Legend for element properties:

- Z: Atomic Number
- Ra: Radioactive
- CS: Chemical Symbol
- N: Name
- Ar: Relative Atomic Mass

\pgfPT[Z list=spd,show blocks,show title=false,IUPAC=false]

Legend for element properties:

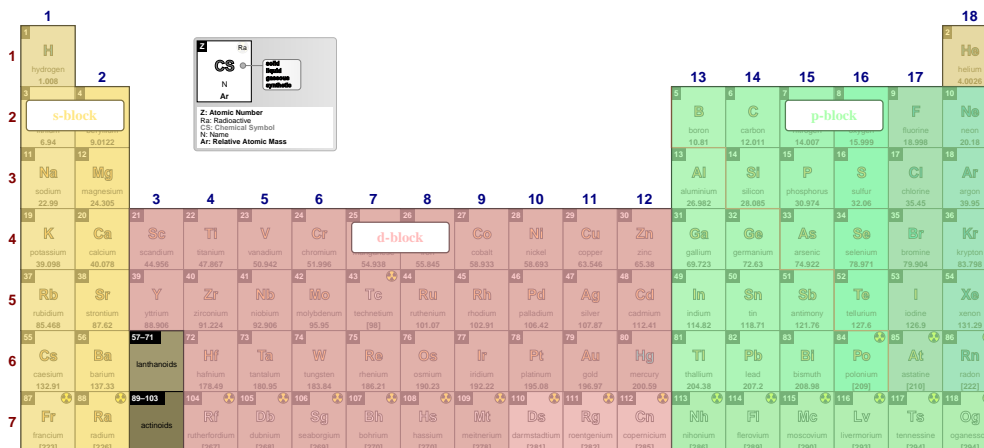
- Z: Atomic Number
- Ra: Radioactive
- CS: Chemical Symbol
- N: Name
- Ar: Relative Atomic Mass

blocks font

default: `\small\bfseries`

Sets the font used in the block labels.

```
\pgfPT[Z list=spd,show blocks,show title=false,blocks
font=\small\bfseries\fontfamily{ptm}\selectfont]
```



s block color

default: `RGB: 255,231,132`

Sets the block s color.

s block font color

default: `{}`

Sets the s block label font color. If no color is provided, the **s block color** will be used as the font color.

s block line width

default: `0.8pt`

Sets the width of the line surrounding the s block.

p block color

default: `RGB: 170,255,172`

Sets the block p color.

p block font color

default: `{}`

Sets the p block label font color. If no color is provided, the **p block color** will be used as the font color.

p block line width

default: `0.8pt`

Sets the width of the line surrounding the p block.

d block color

default: `RGB: 255,187,187`

Sets the block d color.

d block font color

default: `{}`

Sets the d block label font color. If no color is provided, the **d block color** will be used as the font color.

d block line width

default: `0.8pt`

Sets the width of the line surrounding the d block.

f block color

default: `RGB: 177,203,228`

Sets the block f color.

f block font color

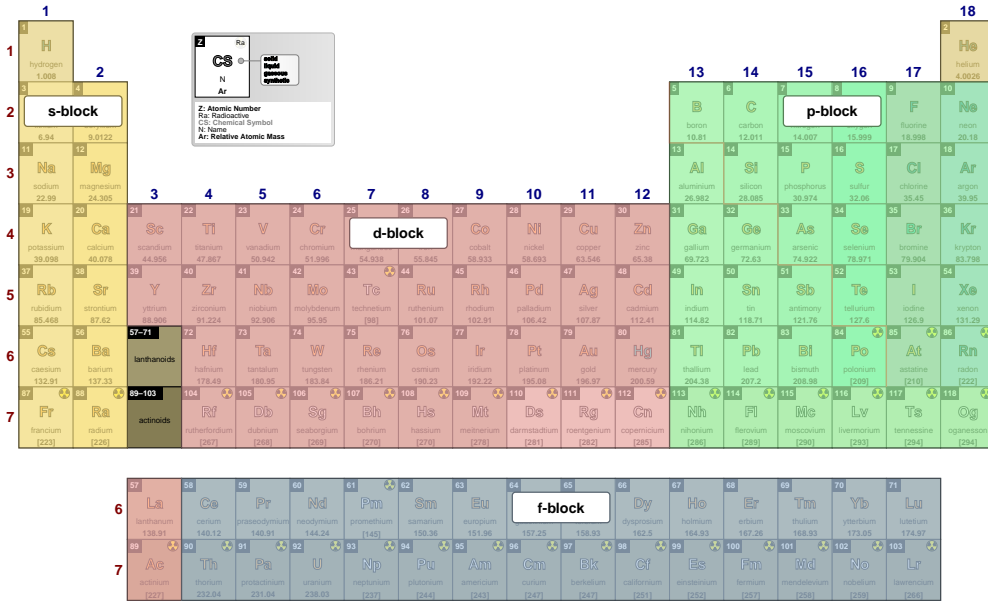
default: `{}`

Sets the f block label font color. If no color is provided, the **f block color** will be used as the font color.

f block line width default: 0.8pt
Sets the width of the line surrounding the f block.

blocks font color default: black
Style to set a common color for the labels of s, p, d and f blocks. The key `show blocks` is set to true.

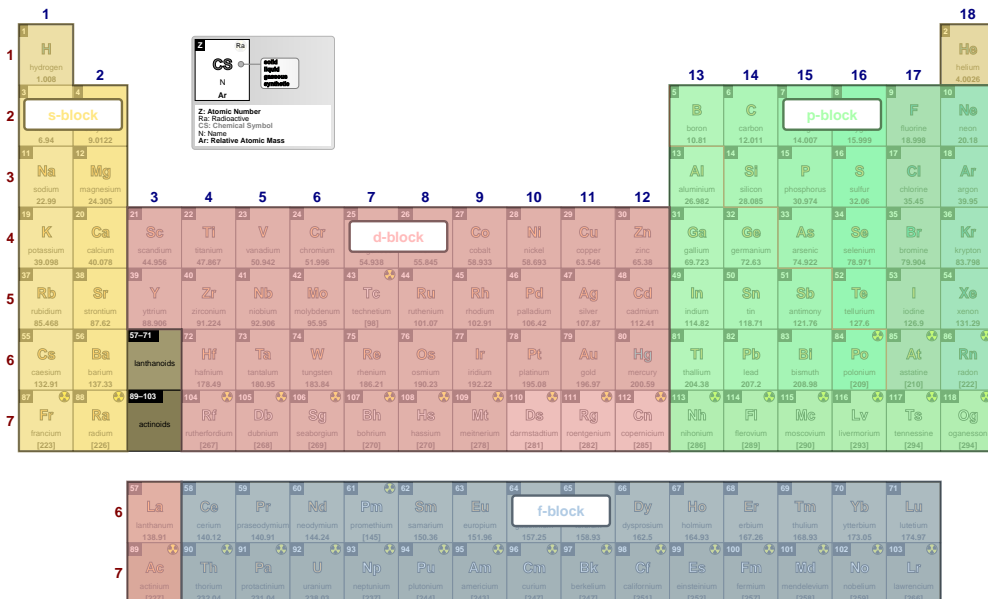
```
\pgfPT[blocks font color,show title=false]
```



blocks line width default: 0.8pt
Style to set a common width of the lines surrounding the s, p, d and f blocks. The key `show blocks` is set to true.

```
\pgfPT[blocks line width=1.5pt]
```

Periodic Table of Elements

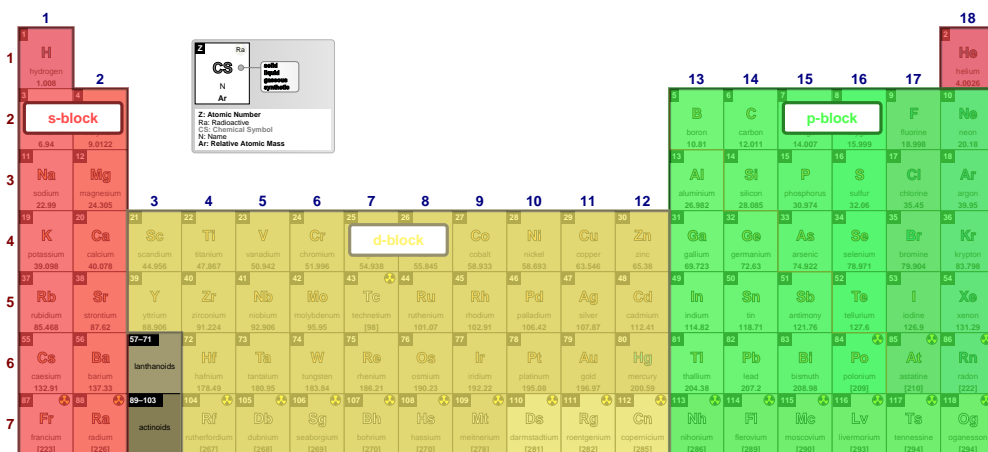


blocks default: $\{sc=blocos,pc=blocop,dc=blocod,fc=blocof,lw=.8pt,font=\small\bfseries\}$
Pseudo style to set the keys: block **s** color, block **p** color, block **d** color, block **f** color, the common line widths of the blocks, the **s** block line width, the **p** block line width, the **d** block line width, the **f** block line width, blocks font, **s** block font color, **p** block font color, **d** block font color and/or **f** block font color. None of the keys – sc, pc, dc, fc, lw, slw, plw, dlw, flw, sfc, pfc, dfc and ffc – are mandatory. The key **show blocks** is set to **true**.

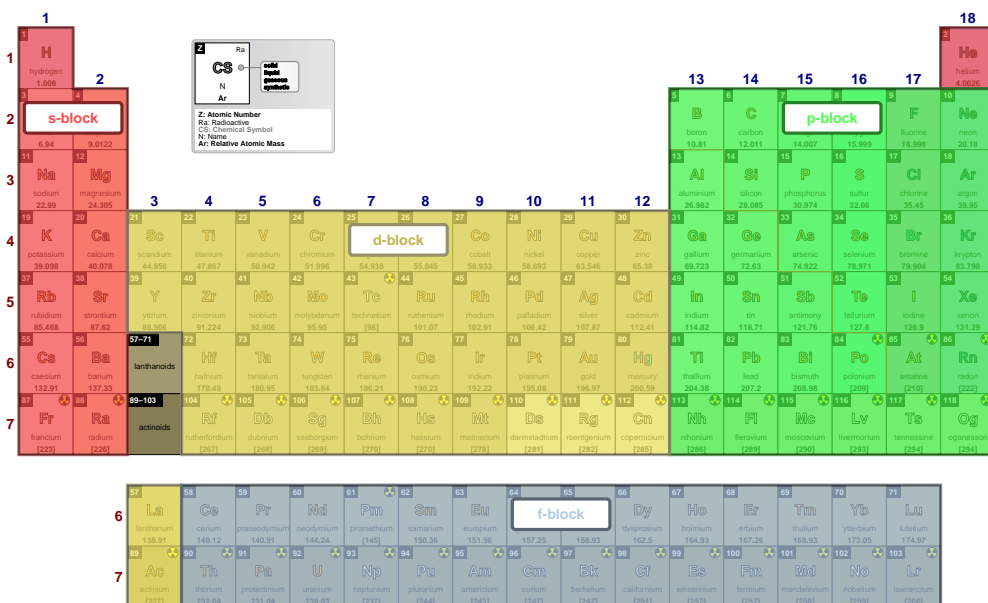
NOTE:
 The colors provided to the color keys of the blocks – **sc**, **pc**, **dc** and **fc** – could be any defined color via the command `\definecolor` or by *mixing* colors, using, for instance, the syntax `color1!value!color2` or `color1!value`, as explained in the `xcolor` package documentation.

USAGE:
 $blocks=\{sc=<color>,pc=<color>,dc=<color>,fc=<color>,lw=<length>,slw=<length>,plw=<length>,dlw=<length>,flw=<length>,f=<font\ commands>,sfc=<color>,pfc=<color>,dfc=<color>,ffc=<color>\}$

`\pgfPT[blocks={sc=red!70!white,pc=green!70!white,dc=yellow!70!white,lw=2pt},show title=false,Z list=spd]`



`\pgfPT[blocks={sc=red!70!white,pc=green!70!white,dc=yellow!70!white,dfc=yellow!70!black,lw=2pt},show title=false]`



show families

default: *false*

When set to **true** the main families – representative elements, transition metals and internal transition metals – are drawn overlaying the Periodic Table and their labels are shown. *Note that families are only shown when the Z list contains, at least, all elements of blocks s, p and d.*

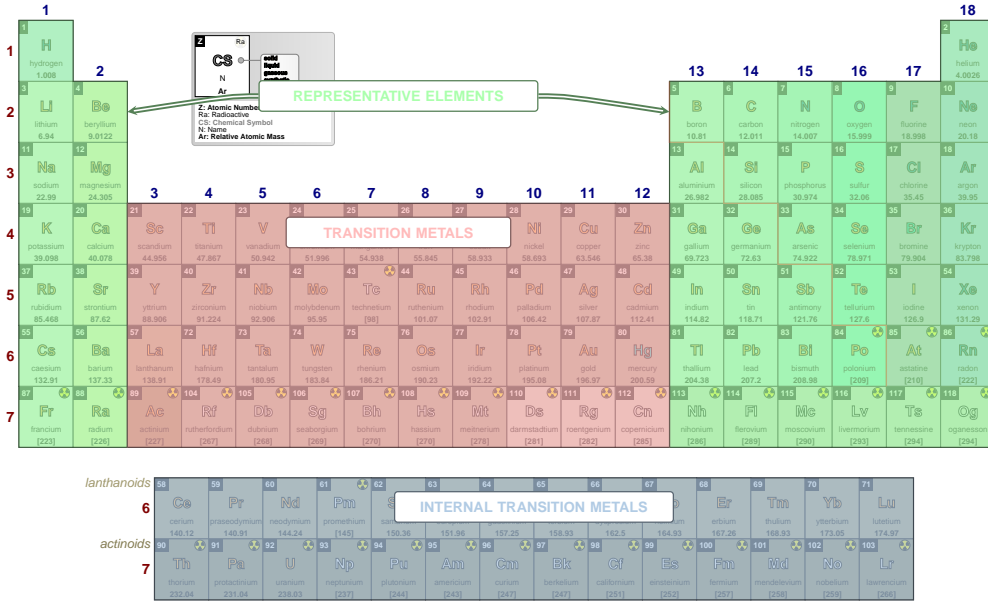
```
\pgfPT[Z list={1,...,111},show families]
```

Periodic Table of Elements

```
\pgfPT[show families]
```

Periodic Table of Elements

```
\pgfPT[show families,show title=false,IUPAC=false]
```

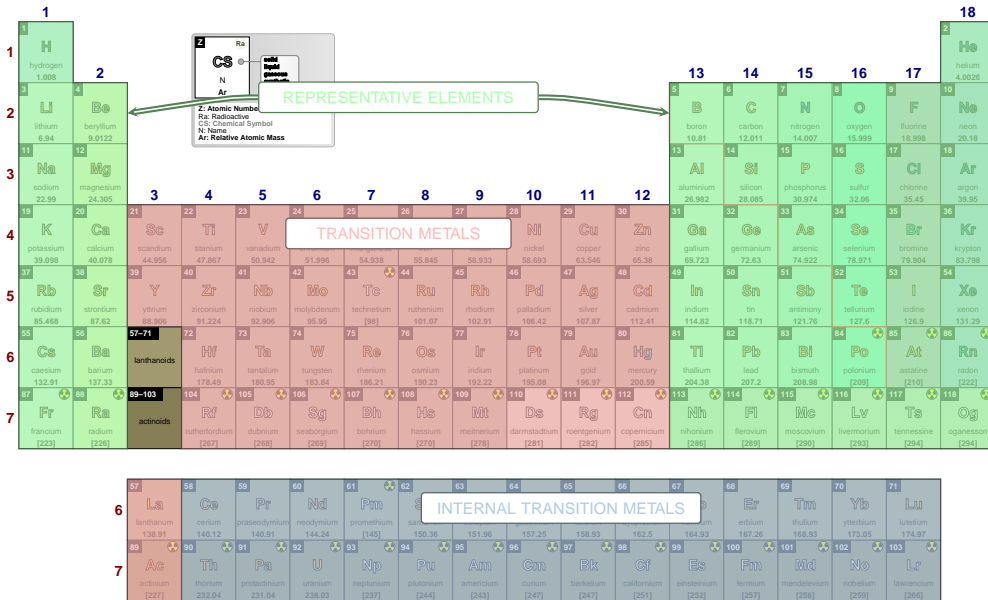


families font

Sets the font used in the family labels.

default: `\small\bfseries`

```
\pgfPT[show families,show title=false,families font=\normalsize]
```



r family color

Sets the representative elements *block* color.

default: RGB: 170,255,172

r family font color

Sets the representative elements *block* label font color. If no color is provided, the *r family color* will be used as the font color.

r family line width default: 0.8pt
 Sets the width of the line surrounding the representative elements *block*.

tm family color default: RGB: 255,187,187
 Sets the transition metals *block* color.

tm family font color default: {}
 Sets the transition metals *block* label font color. If no color is provided, the **tm family color** will be used as the font color.

tm family line width default: 0.8pt
 Sets the width of the line surrounding the transition metals *block*.

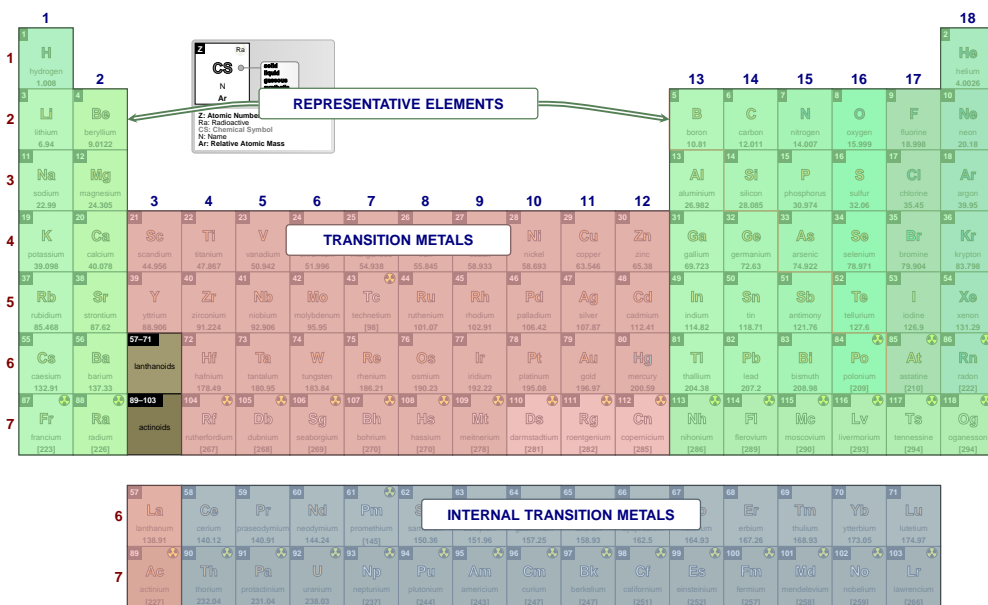
itm family color default: RGB: 177,203,228
 Sets the internal transition metals *block* color.

itm family font color default: {}
 Sets the internal transition metals *block* label font color. If no color is provided, the **itm family color** will be used as the font color.

itm family line width default: 0.8pt
 Sets the width of the line surrounding the internal transition metals *block*.

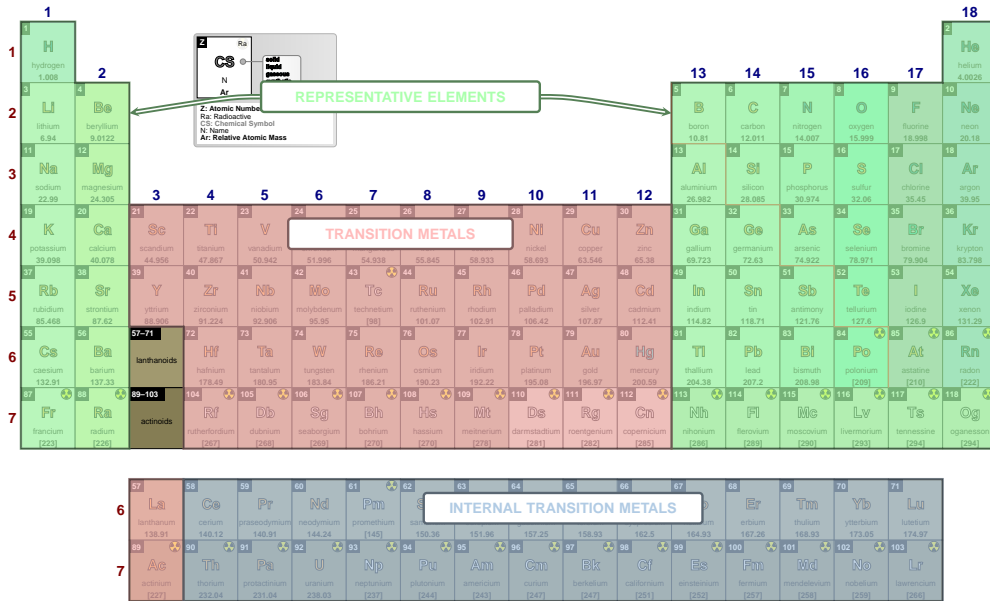
families font color default: black
 Style to set a common color for the labels of representative elements, transition metals and internal transition metals *blocks*. The key **show blocks** is set to **true**.

```
\pgfPT[show title=false,families font color=blue!50!black]
```



families line width default: 0.8pt
 Style to set a common width of the lines surrounding the representative elements, transition metals and internal transition metals *blocks*. The key **show families** is set to **true**.

```
\pgfPT[show title=false,show families,families line width=1.5pt]
```



families

default: $\{rc=blor,tc=blor,ic=blor,lw=.8pt,f=\small\bfseries\}$

Pseudo style to set the keys: **r** family color, **tm** family color, **itm** family color, the common line widths of the families, the **r** family line width, the **tm** family line width, the **itm** family line width, the families font, **r** family font color, **tm** family font color and/or **itm** family font color. None of the keys – rc, tc, ic, lw, rlw, tlw, ilw, f, rfc, tfc and ifc – are mandatory. The key **show families** is set to true.

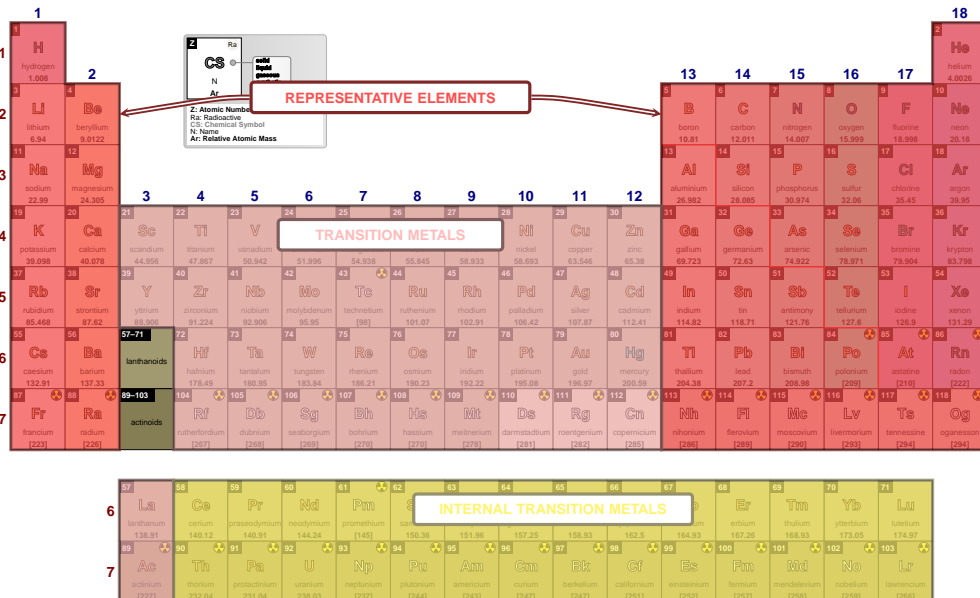
NOTE:

The colors provided to the color keys of the families could be any defined color via the command `\definecolor` or by *mixing* colors, using, for instance, the syntax `color1!value!color2`, as explained in the `xcolor` package documentation.

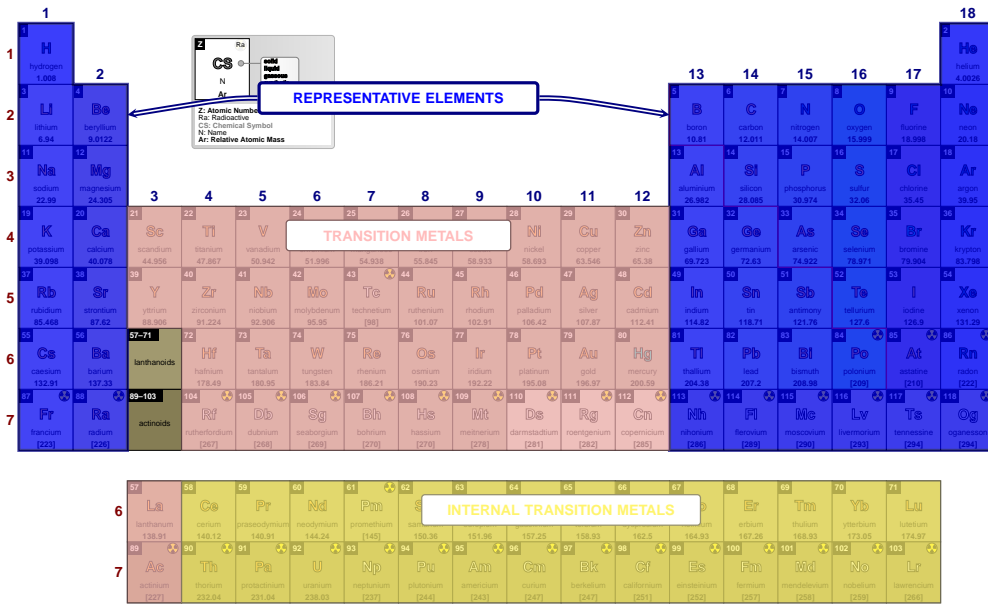
USAGE:

families={rc=<color>,tc=<color>,ic=<color>,lw=<lenght>,rlw=<lenght>,tlw=<lenght>,ilw=<lenght>,f=,rfc=<color>,tfc=<color>,ifc=<color>}

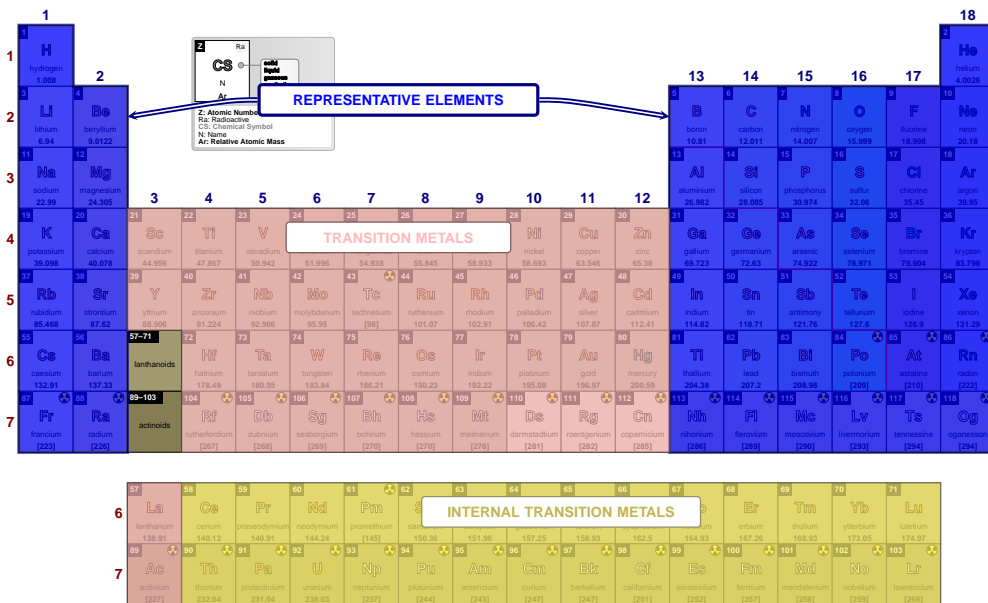
`\pgfPT[families={rc=red!70!white,ic=yellow!70!white,lw=2pt},show title=false]`



\pgfPT[families={rc=blue,ic=yellow!70!white,rlw=2pt},show title=false]



\pgfPT[families={rc=blue,ic=yellow!70!white,rlw=2pt,ifc=yellow!70!black},show title=false]



► Periodic variations

show periodic variations

default: *false*

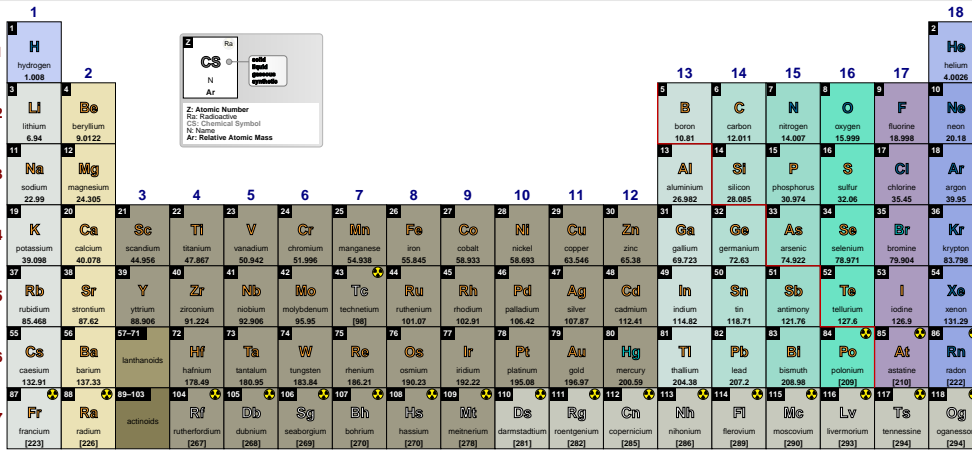
When set to **true** the periodic variations – for atomic radius, ionization energy and/or electron affinity – are shown with two *arrows*. One horizontal arrow is placed at the top of the Periodic Table for the variation over the period and the other vertically to the left of the Periodic Table for the variation over the group.

NOTE:

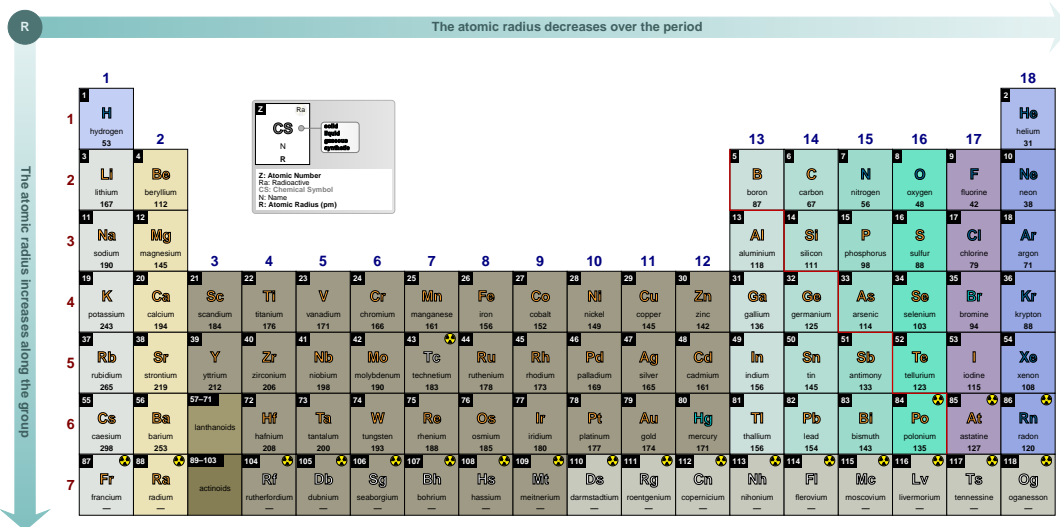
The variations are only shown when the *base cell* of the Periodic Table contains the atomic radius, the ionization energy and/or the electron affinity. If none of them is present setting this key (**show periodic variations**) has no effect.

```
\pgfPTstyle[Z list=spd,show title=false]
```

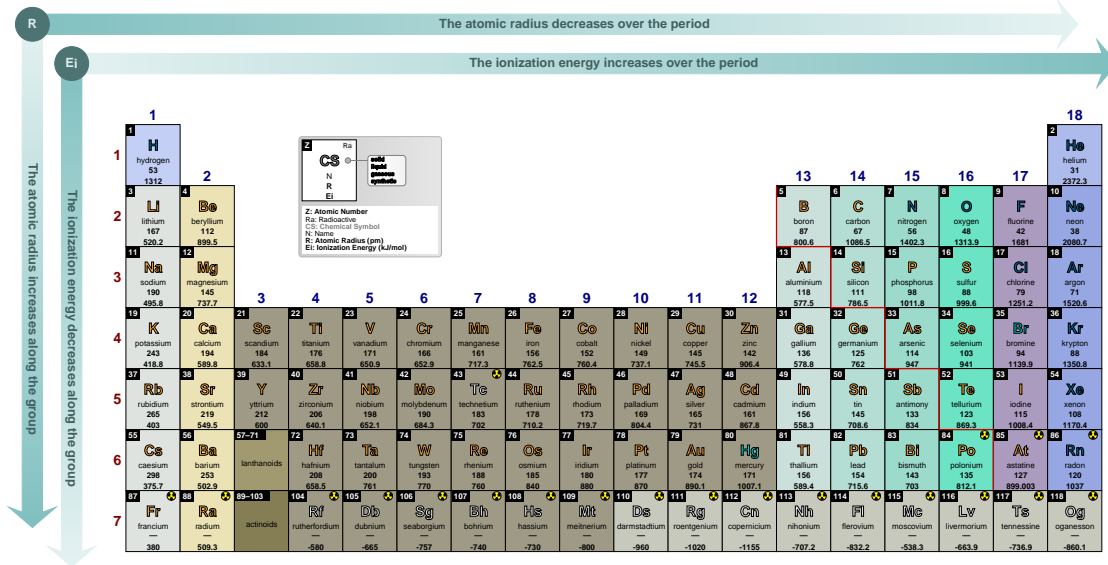
```
\pgfPT[show periodic variations]
```



```
\pgfPT[show periodic variations,cell style=pgfPTR]
```



```
\pgfPT[show periodic variations,cell style=pgfPTREi]
```



varR color

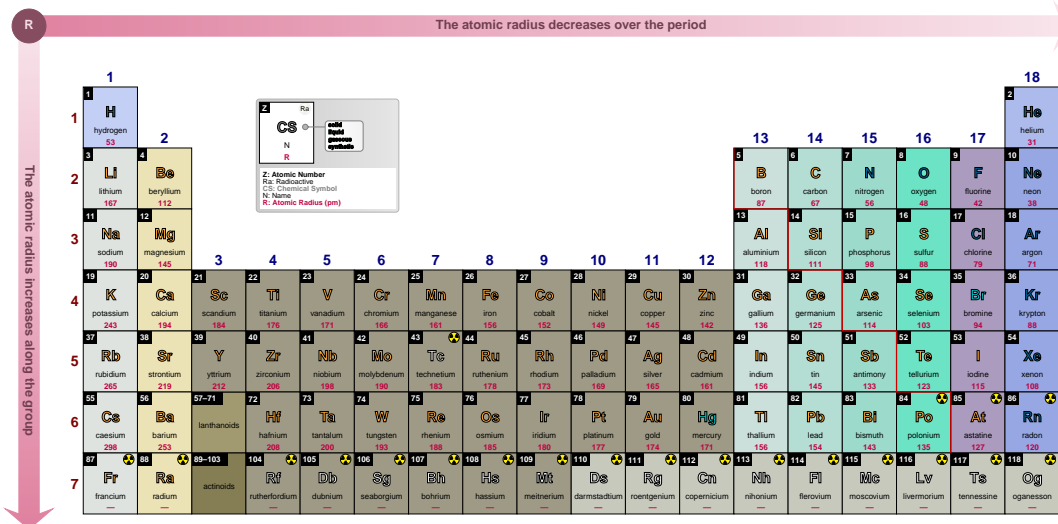
default: RGB: 128,191,191

Sets the color used in the filling of the *arrows* for the atomic radius variations.

NOTE:

The color provided to **varR color** could be any defined color via the command `\definecolor` or by *mixing* colors, using, for instance, the syntax `color1!value!color2`, as explained in the [xcolor](#) package documentation.

```
\pgfPT[show periodic variations,cell style=pgfPTR,varR color=teal,R color=purple]
```

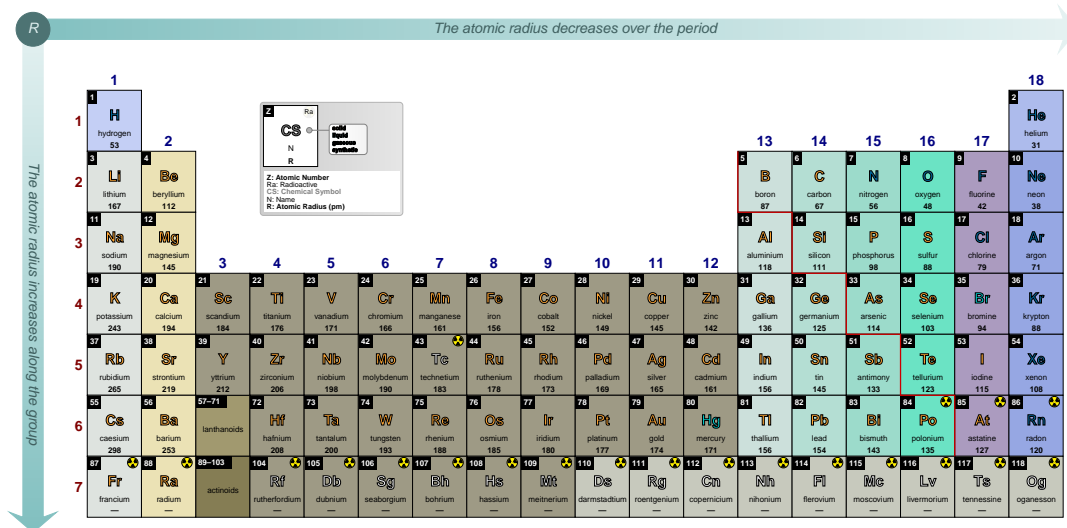


varR font

default: `\footnotesize\bfseries`

Sets the font for the text displayed inside the arrow, describing the variation of the atomic radius.

`\pgfPT[show periodic variations,cell style=pgfPTR,varR font=\small\itshape]`



varR font color default: (*value of varR color*)!50!black

Sets the color of the text showing the atomic radius variations displayed inside the corresponding arrows.
See the note in *varR color*.

varEi color default: RGB: 128,191,191

Sets the color used in the filling of the arrows for the ionization energy variations.
See the note in *varR color*.

varEi font default: `\footnotesize\bfseries`

Sets the font for the text displayed inside the arrow, describing the variation of the ionization energy.

varEi font color default: (*value of varEi color*)!50!black

Sets the color of the text showing the ionization energy variations displayed inside the corresponding arrows.
See the note in *varR color*.

vareaff color default: RGB: 128,191,191

Sets the color used in the filling of the arrows for the electron affinity variations.
See the note in *varR color*.

vareaff font default: `\footnotesize\bfseries`

Sets the font for the text displayed inside the arrow, describing the variation of the electron affinity.

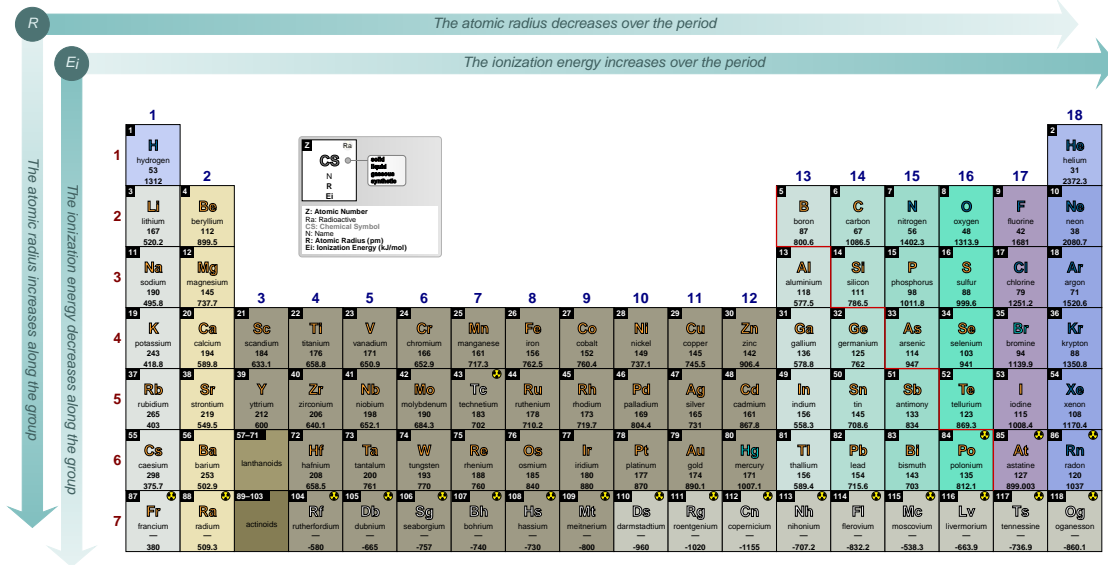
vareaff font color default: (*value of vareaff color*)!50!black

Sets the color of the text showing the electron affinity variations displayed inside the corresponding arrows.
See the note in *varR color*.

var font default: `\footnotesize\bfseries`

Style to set a common font for the variations along the Periodic Table.
Setting `var font=` is equivalent to setting `{varR font=, varEi font=, vareaff font=}`.

\pgfPT[show periodic variations,cell style=pgfPTREi,var font=\small\itshape]



var color

default: RGB: 128,191,191

Style to set a common color for the variations along the Periodic Table.

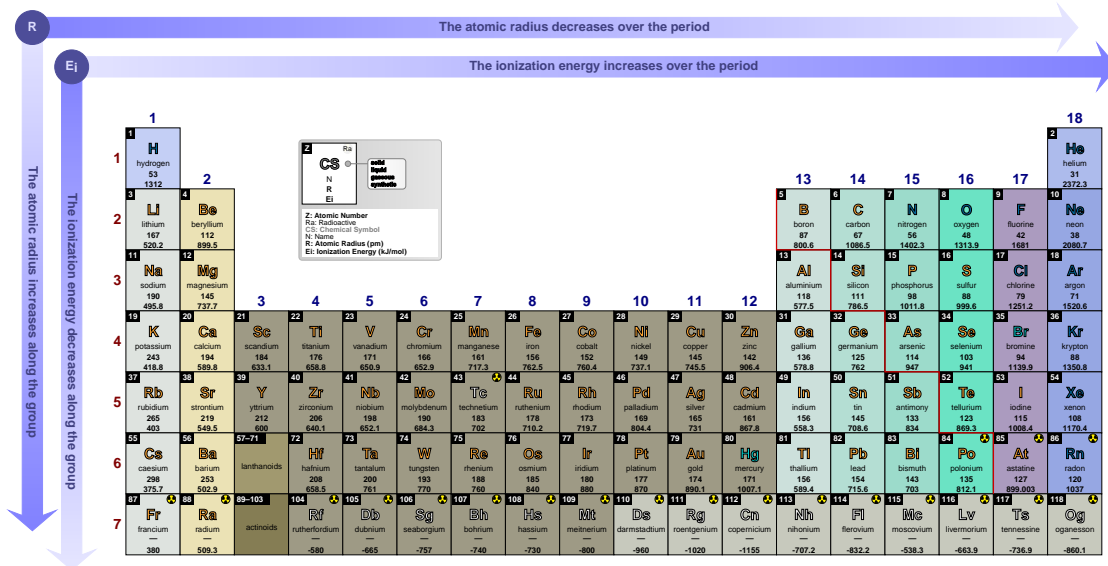
Setting `var color=<color>` is equivalent to setting `{varR color=<color>,varEi color=<color>,vareaff color=<color>}`.

NOTE:

The color provided to `var color` could be any defined color via the command `\definecolor` or by *mixing* colors, using, for instance, the syntax `color1!value!color2`, as explained in the `xcolor` package documentation.

Keep in mind that setting the variations colors also changes the default text colors for them.

\pgfPT[show periodic variations,cell style=pgfPTREi,var color=blue!50!white]



varR default: $\{c=colorvariations,f=\footnotesize\bfseries\}$

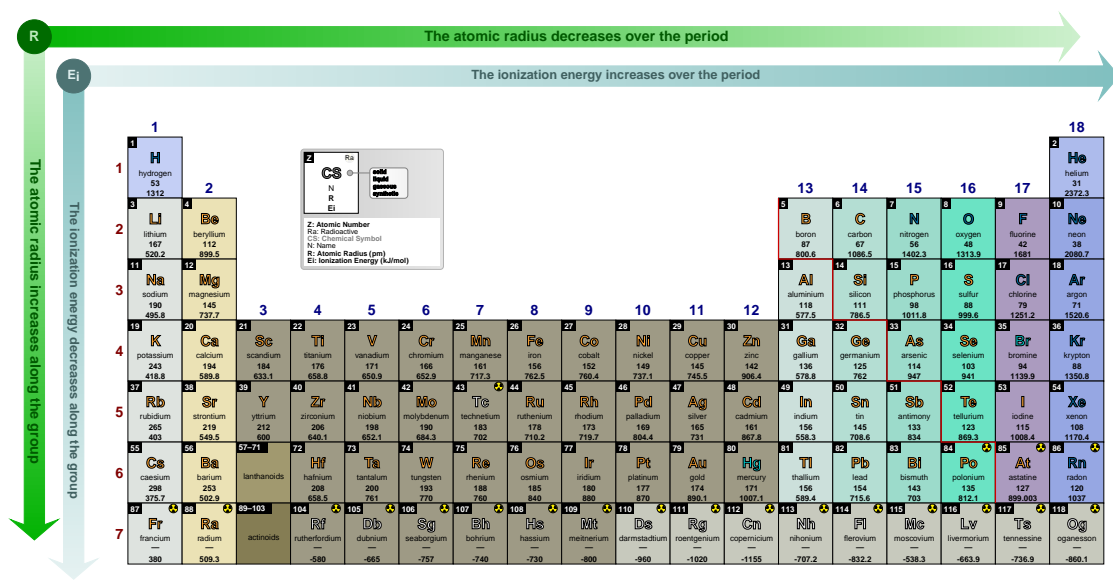
Pseudo style to set the keys: varR color, varR font and/or varR font color. None of the keys – c, f and fc – are mandatory.

NOTE:

The color provided to varR color could be any defined color via the command \definecolor or by mixing colors, using, for instance, the syntax color!value!color2, as explained in the xcolor package documentation.

USAGE: varR={c=<color>,f=,fc=<color>}

\pgfPT[show periodic variations,cell style=pgfPTREi,
varR={c=green!70!black,f=\small\bfseries}]



varEi default: $\{c=colorvariations,f=\footnotesize\bfseries\}$

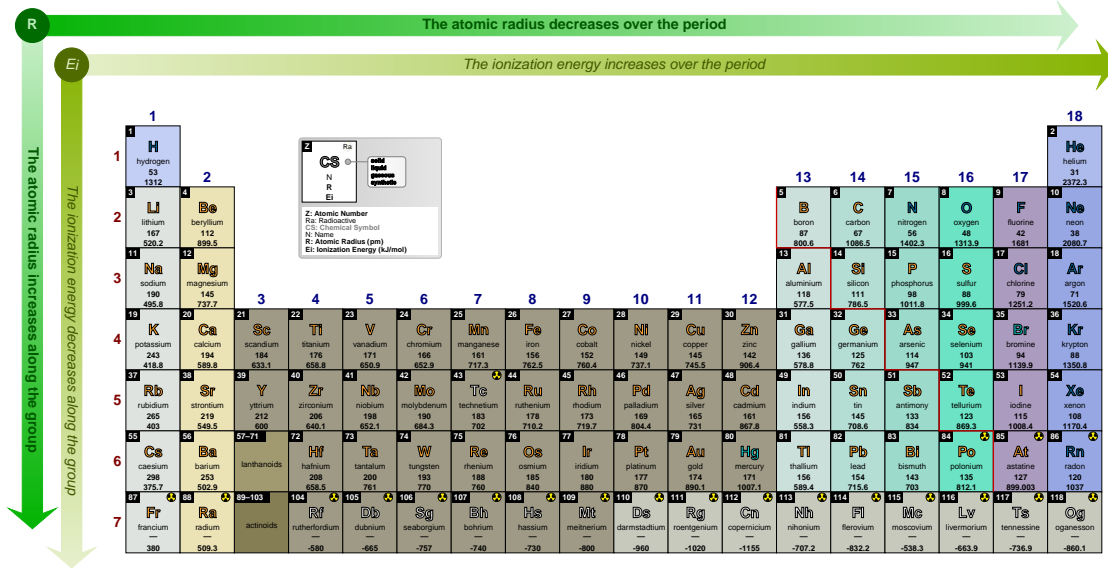
Pseudo style to set the keys: varEi color, varEi font and/or varEi font color. None of the keys – c, f and fc – are mandatory.

NOTE:

The color provided to varEi color could be any defined color via the command \definecolor or by mixing colors, using, for instance, the syntax color!value!color2, as explained in the xcolor package documentation.

USAGE: varEi={c=<color>,f=,fc=<color>}

\pgfPT[show periodic variations,cell style=pgfPTREi,
varR={c=green!70!black,f=\small\bfseries},
varEi={c=lime!70!black,f=\small\bfseries}]



vareaff

default: {c=colorvariations,f=\footnotesize\bfseries}

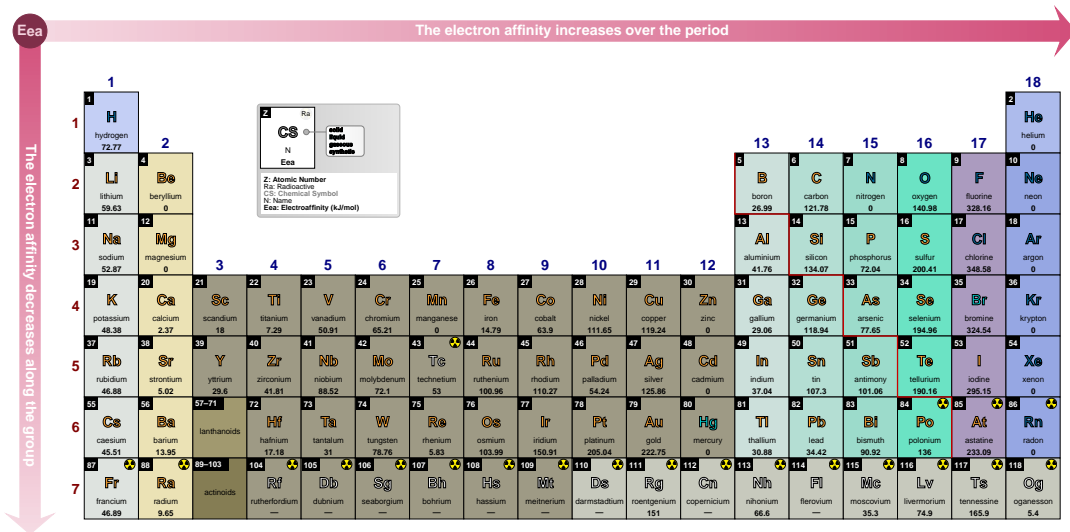
Pseudo style to set the keys: vareaff color, vareaff font and/or vareaff font color. None of the keys – c, f and fc – are mandatory.

NOTE:

The color provided to vareaff color could be any defined color via the command \definecolor or by mixing colors, using, for instance, the syntax color!value!color2, as explained in the xcolor package documentation.

USAGE: vareaff={c=<color>,f=,fc=<color>}

\pgfPT[show periodic variations,cell style=pgfPTeaff, vareaff={c=purple!70!white,f=\small\bfseries,fc=white}]



\pgfPTresetstyle

► Dark mode

dark mode

default: *no value*

Style to change the overall appearance of the Periodic Table to a dark mode suitable for on-screen viewing.

This style sets the following keys with the values:

back color scheme=solid, back color=black!80, cell line color=black!10, CS outline color=white, cell color=white, Z backcolor=black!30, Z color=black, background={fill=black}, varR font color=black!20, varEi font color=black!20, vareaff font color=black!20, per+gr={c=white}, title color=white, other languages color=black!40, legend={bc=black!70,radio=white,CS=white,Z=white,pins style={draw=white,right color=black!75, left color=black!60,line width=.05pt,rounded corners=2pt},extra style={draw=white,fill=black!70,line width=.05pt, rounded corners=2pt},box={left color=black!70,right color=black!40,draw=white}}

\pgfPT[**dark mode**]

► Exercise layout

The **keys** described in this section enable the *exercise layout* of the Periodic Table, *i.e.*, in this mode the *structure* of the Periodic Table is drawn, but there are only a few contents available in the cells.

only cells

default: *false*

When set to **true** the Periodic Table is drawn with only the cells without any contents.

NOTE:

The following keys are also set: *back color scheme=solid, show title=false, show period numbers=false, show group numbers=false, show legend=false, show MNM line=false*

`\pgfPT[only cells]`
`\pgfPT[Z list={1,...,54},only cells]`
only cells plus Zdefault: *false*

When set to **true** the Periodic Table is drawn with only the cells without any contents, except the atomic number (Z).

NOTE:

The following keys are also set: `back color scheme=solid`, `show title=false`, `show period numbers=false`, `show group numbers=false`, `show legend=false`, `show MNM line=false`

`\pgfPT[only cells plus Z]`

The image displays a periodic table where each cell contains only its atomic number. The Z-block (lanthanides and actinides) is shown as a separate row below the main table, with elements numbered 57-71 and 89-103 respectively.

`\pgfPT[only cells plus Z,IUPAC=false]`

This image shows the same periodic table as above, but with the IUPAC symbols removed. Only the atomic numbers are present in each cell, and the Z-block elements are also numbered.

only cells with periods and group numbers

default: *false*

When set to *true* the Periodic Table is drawn with only the cells without any contents. The period and group numbers are shown.

NOTE:

The following keys are also set: *back color scheme=solid*, *show title=false*, *show legend=false*, *show MNN line=false*

```
\pgfPT[Z list={1,...,36},only cells with periods and group numbers]
```

only cells with periods and group numbers plus Z default: *false*

When set to **true** the Periodic Table is drawn with only the cells without any contents, except the atomic number (Z). The period and group numbers are shown.

NOTE:

The following keys are also set: `back color scheme=solid`, `show title=false`, `show legend=false`, `show MNM line=false`

```
\pgfPT[Z list={1,...,36},only cells with periods and group numbers plus Z]
```

Z exercise list default: `{}`

Sets the list of atomic numbers to display as letters instead of their chemicals symbols.

NOTES:

- ✓ When values are provided to the *Z exercise list* and none of the above *exercise layout* is set, the *exercise layout only cells* is used.
- ✓ The line dots - ... - notation is not available in the *Z exercise list*, mainly to avoid *errors* on the desired list. For example `{1,...,4,8,...,16}` is expanded by the `\foreach` statement of `TikZ` to `{1,2,3,4,8,15}` instead of `{1,2,3,4,8,9,10,11,12,13,14,15,16}`. For achieving that purpose it must be typed `{1,...,4,8,9,...,16}`. Since the goal of *Z exercise list* is typing only a list of specific elements, it will often be easier to type element by element.

```
\pgfPT[Z exercise list={1,2,3,4,9,12,17,18,19,20,25,27,32,34,35,49,54,74,86,87}, cell size=3em,Z list={1,...,36}]
```

A																		B	
C	D																	E	
	F																	G	H
I	J					K	L					M	N	O					

cells+Z

no value

Style to set the key **only cells plus Z** to true.

```
\pgfPT[cells+Z]
```



cells+p+g

no value

Style to set the key **only cells with periods and group numbers** to true.

```
\pgfPT[cells+p+g]
```



cells+p+g+Z *no value*
 Style to set the key only cells with periods and group numbers plus Z to true.

```
\pgfPT[cells+p+g+Z]
```

	1																	2	18
1																			
2																			
3																			
4																			
5																			
6																			
7																			
	3	4	5	6	7	8	9	10	11	12		13	14	15	16	17			
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59-71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
89	90	91-103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180

exnocaps *no value*
 Style to set the key exercise list in capitals to false.

```
\pgfPT[Z exercise list={1,2,3,4,9,12,17,18,19,20,25,27,32,34,35,49,54,74,86,87},
cell size=3em,Z list={1,...,36},exnocaps]
```

a																		b
c	d																e	
	f																g	h
i	j					k	l					m	n	o				

exColor *default: black*
 Style to set the key exercise list color.

```
\pgfPT[Z exercise list={1,2,3,4,9,12,17,18,19,20,25,27,32,34,35,49,54,74,86,87},
cell size=3em,Z list={1,...,36},exColor=red!50!black]
```

A																		B
C	D																E	
	F																G	H
I	J					K	L					M	N	O				

exFont default: \bfseries\large
 Style to set the key exercise list font.

```
\pgfPT[Z exercise list={1,2,3,4,9,12,17,18,19,20,25,27,32,34,35,49,54,74,86,87},
cell size=3em,Z list={1,...,36},exFont=\Large]
```

A															B		
C	D											E					
	F											G	H				
I	J														M	N	O

ex default: {caps=true,c=black,f=\bfseries\large}
 Pseudo style to set the keys: exercise list in **capitals**, exercise list **color** and/or exercise list **font**.
 None of the keys – caps, c and f – are mandatory.

```
USAGE: ex={caps=<true|false>,c=<color>,f=<font commands>}
```

```
\pgfPT[Z exercise list={1,2,3,4,9,12,17,18,19,20,25,27,32,34,35,49,54,74,86,87},
cell size=3em,Z list={1,...,36},ex={c=blue,f=\Large\bfseries}]
```

A															B		
C	D											E					
	F											G	H				
I	J														M	N	O

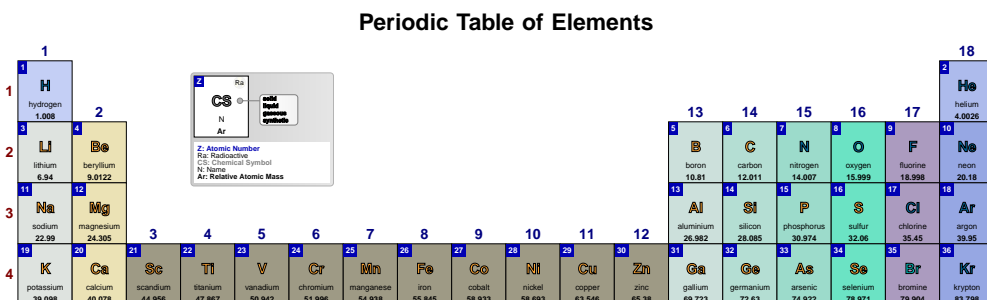
✂ Cell contents options: keys, styles and pseudo styles

The following options and styles are used for customizing the contents available in each individual cell of the Periodic Table, like the *fonts* or the *colors* used in the shown contents.

➡ The atomic number

Z bgcolor default: black
 Sets the background color of the box where the atomic number is displayed.

```
\pgfPT[Z list={1,...,36},Z bgcolor=blue!70!black]
```

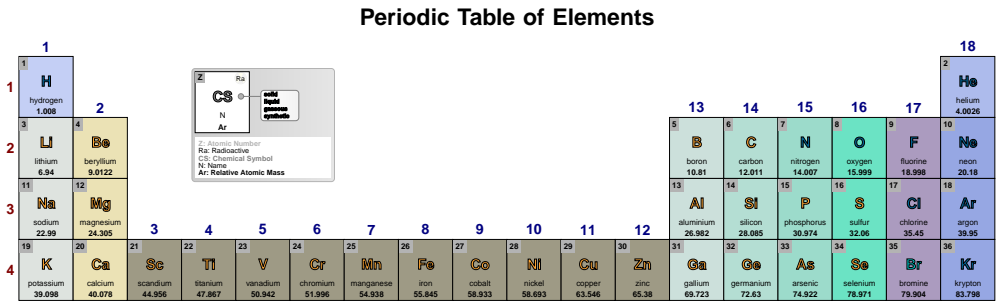


Z color

default: *white*

Sets the color of the atomic number.

```
\pgfPT[Z list={1,...,36},Z bgcolor=black!30,Z color=black]
```

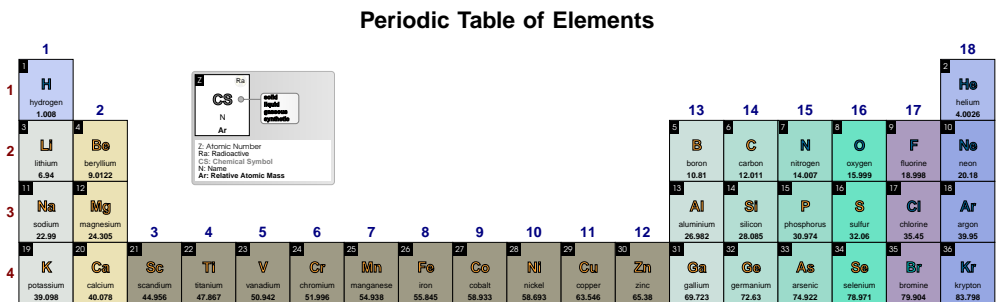


Z font

default: `\tiny\bfseries`

Sets the font of the atomic number.

```
\pgfPT[Z list={1,...,36},Z font=\fontfamily{pag}\selectfont\tiny]
```

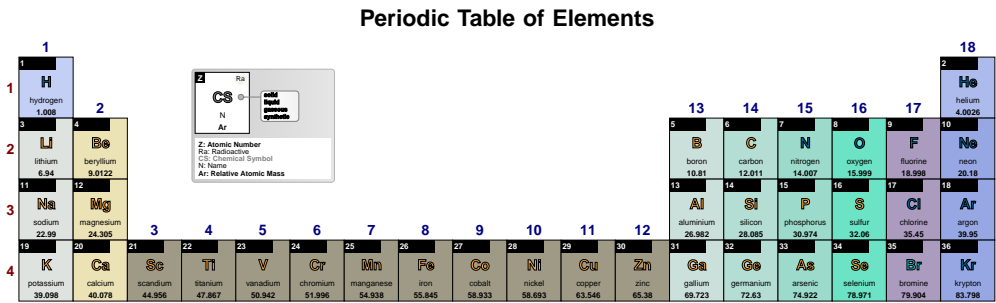


Z use box width

default: *false*

If true, the width specified in the constructed cell is used, otherwise, the *natural* width of the box containing Z value is used.

```
\pgfPT[Z list={1,...,36},Z use box width]
```



Z align

default: *left*

Sets the alignment of the atomic number value to *left*, *center* or *right* with respect to its containing box. It only takes effect when *Z use box width* is true.

```
\pgfPT[Z list={1,...,36},Z use box width,Z align=center]
```

Periodic Table of Elements

Z padding default: 0.25ex

Sets the padding between the atomic number value and the box that contains it. It only takes effect when **Z use box width** is true.

```
\pgfPT[Z list={1,...,36},Z use box width,Z align=right, Z padding=1em]
```

Periodic Table of Elements

Z box no value

Style equivalent to **Z use box width=true**.

```
\pgfPT[Z list={1,...,36},Z box]
```

Periodic Table of Elements

Z default: {bc=black,c=white,f=\tiny\bfseries,boxwd=false,align=left,pad=.25ex}

Pseudo style to set the keys: **Z backcolor**, **Z color**, **Z font**, **Z use box width**, **Z align** and/or **Z padding**. None of the keys – bc, c, f, boxwd, align and pad – are mandatory.

USAGE: $Z = \{bc = \langle color \rangle, c = \langle color \rangle, f = \langle font commands \rangle, boxwd = \langle true | false \rangle, align = \langle left | center | right \rangle, pad = \langle length \rangle\}$


```
\pgfPT[Z list={1,...,36},Z={bc=blue,f=\tiny\bfseries\itshape}]
```

Periodic Table of Elements

► The chemical symbol

CS solid

default: RGB: 255,166,51

Sets the color of the chemical symbol for elements that are in the solid state at normal temperature and pressure (NTP).

```
\pgfPT[Z list={1,...,54},CS solid=red]
```

Periodic Table of Elements

CS liquid

default: RGB: 0,204,204

Sets the color of the chemical symbol for elements that are in a liquid state at normal temperature and pressure (NTP).

```
\pgfPT[Z list={1,...,54},CS liquid=red]
```

Periodic Table of Elements

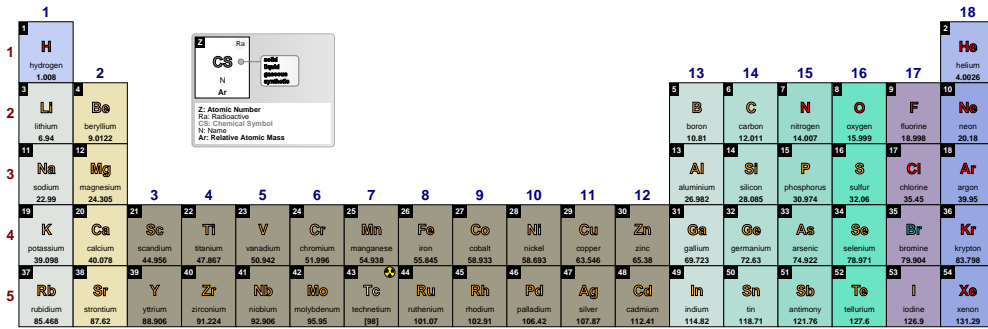
CS gas

default:  RGB: 0,102,153

Sets the color of the chemical symbol for elements that are in a gaseous state at normal temperature and pressure (NTP).

```
\pgfPT[Z list={1,...,54},CS gas=red]
```

Periodic Table of Elements



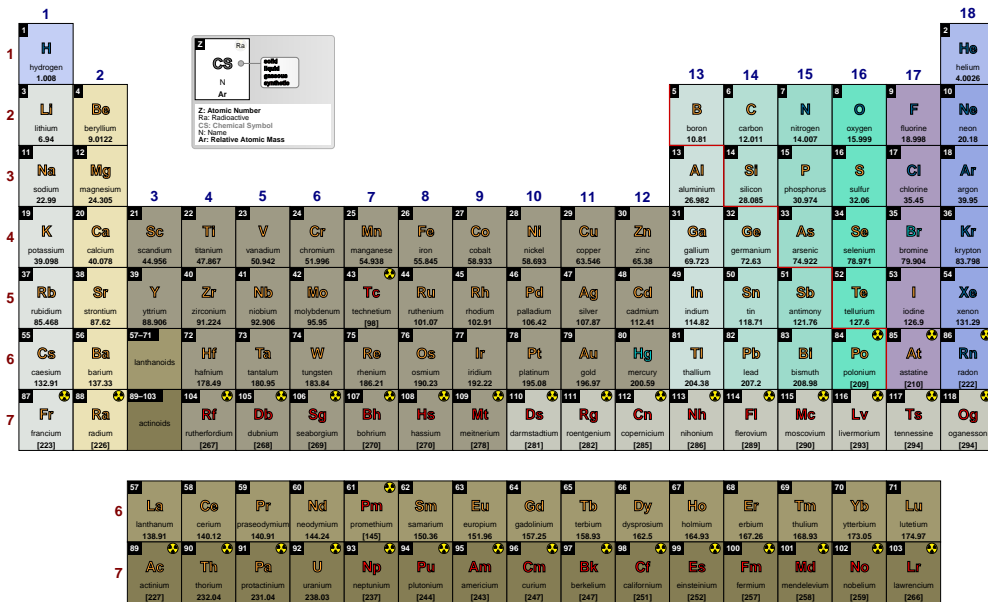
CS synt

default:  RGB: 236,236,236

Sets the color of the chemical symbol for elements that are synthetic.

```
\pgfPT[CS synt=red]
```

Periodic Table of Elements



CS all

default: *black*

Style to set a common color to the chemical symbols, equivalent to CS solid=<color>, CS liquid=<color>,CS gas=<color>,CS synt=<color>.

`\pgfPT[CS all=red]`

Periodic Table of Elements

CS font

Sets the font for the chemical symbol.

default: `\small\bfseries`

`\pgfPT[Z list={1,...,36},CS font=\small\fontfamily{fmm}\selectfont]`

Periodic Table of Elements

CS render mode

Sets the chemical symbol render mode. Available modes are `fill`, `outline` or `fill and outline`.

default: `fill and outline`

`\pgfPT[Z list={1,...,36}]`

Periodic Table of Elements

```
\pgfPT[Z list={1,...,36},CS render mode=fill]
```

Periodic Table of Elements

1																	18					
1	H hydrogen 1.008																	He helium 4.0026				
2	Li lithium 6.94	Be beryllium 9.0122															B boron 10.81	C carbon 12.011	N nitrogen 14.007	O oxygen 15.999	F fluorine 18.998	Ne neon 20.18
3	Na sodium 22.99	Mg magnesium 24.305															Al aluminum 26.982	Si silicon 28.085	P phosphorus 30.974	S sulfur 32.06	Cl chlorine 35.45	Ar argon 39.95
4	K potassium 39.098	Ca calcium 40.078	Sc scandium 44.956	Ti titanium 47.867	V vanadium 50.942	Cr chromium 51.996	Mn manganese 54.938	Fe iron 55.845	Co cobalt 58.933	Ni nickel 58.693	Cu copper 63.546	Zn zinc 65.38	Ga gallium 69.723	Ge germanium 72.63	As arsenic 74.922	Se selenium 78.971	Br bromine 79.904	Kr krypton 83.798				

```
\pgfPT[Z list={1,...,36},CS render mode=outline]
```

Periodic Table of Elements

1																	18					
1	H hydrogen 1.008																	He helium 4.0026				
2	Li lithium 6.94	Be beryllium 9.0122															B boron 10.81	C carbon 12.011	N nitrogen 14.007	O oxygen 15.999	F fluorine 18.998	Ne neon 20.18
3	Na sodium 22.99	Mg magnesium 24.305															Al aluminum 26.982	Si silicon 28.085	P phosphorus 30.974	S sulfur 32.06	Cl chlorine 35.45	Ar argon 39.95
4	K potassium 39.098	Ca calcium 40.078	Sc scandium 44.956	Ti titanium 47.867	V vanadium 50.942	Cr chromium 51.996	Mn manganese 54.938	Fe iron 55.845	Co cobalt 58.933	Ni nickel 58.693	Cu copper 63.546	Zn zinc 65.38	Ga gallium 69.723	Ge germanium 72.63	As arsenic 74.922	Se selenium 78.971	Br bromine 79.904	Kr krypton 83.798				

CS outline color

default: *black*

Sets the outline color for the chemical symbol.

```
\pgfPT[Z list={1,...,36},CS outline color=red]
```

Periodic Table of Elements

1																	18					
1	H hydrogen 1.008																	He helium 4.0026				
2	Li lithium 6.94	Be beryllium 9.0122															B boron 10.81	C carbon 12.011	N nitrogen 14.007	O oxygen 15.999	F fluorine 18.998	Ne neon 20.18
3	Na sodium 22.99	Mg magnesium 24.305															Al aluminum 26.982	Si silicon 28.085	P phosphorus 30.974	S sulfur 32.06	Cl chlorine 35.45	Ar argon 39.95
4	K potassium 39.098	Ca calcium 40.078	Sc scandium 44.956	Ti titanium 47.867	V vanadium 50.942	Cr chromium 51.996	Mn manganese 54.938	Fe iron 55.845	Co cobalt 58.933	Ni nickel 58.693	Cu copper 63.546	Zn zinc 65.38	Ga gallium 69.723	Ge germanium 72.63	As arsenic 74.922	Se selenium 78.971	Br bromine 79.904	Kr krypton 83.798				

CS outline width

default: *0.05*

Sets the outline width of the chemical symbol. It is any positive numerical value **without dimensions** (1.0 is roughly 1.0pt).

```
\pgfPT[Z list={1,...,36},CS outline width=.2]
```

Periodic Table of Elements

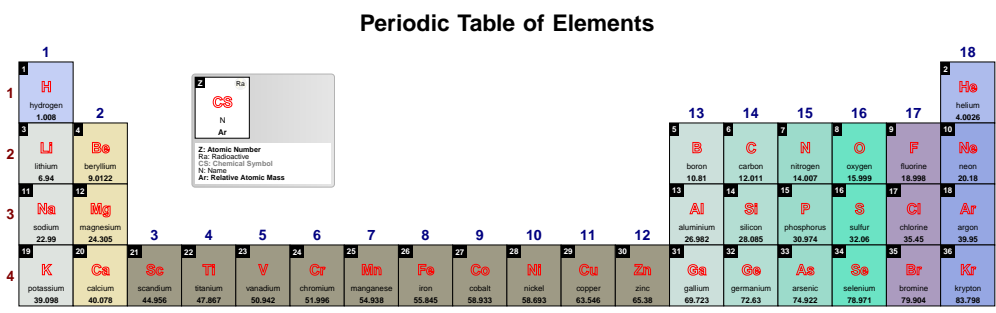
1																	18					
1	H hydrogen 1.008																	He helium 4.0026				
2	Li lithium 6.94	Be beryllium 9.0122															B boron 10.81	C carbon 12.011	N nitrogen 14.007	O oxygen 15.999	F fluorine 18.998	Ne neon 20.18
3	Na sodium 22.99	Mg magnesium 24.305															Al aluminum 26.982	Si silicon 28.085	P phosphorus 30.974	S sulfur 32.06	Cl chlorine 35.45	Ar argon 39.95
4	K potassium 39.098	Ca calcium 40.078	Sc scandium 44.956	Ti titanium 47.867	V vanadium 50.942	Cr chromium 51.996	Mn manganese 54.938	Fe iron 55.845	Co cobalt 58.933	Ni nickel 58.693	Cu copper 63.546	Zn zinc 65.38	Ga gallium 69.723	Ge germanium 72.63	As arsenic 74.922	Se selenium 78.971	Br bromine 79.904	Kr krypton 83.798				

CS default: $\{r=fill\ and\ outline,c=black,w=.05,f=\small\bfseries,s=solido,l=liquido,g=gasoso,sy=sintetico\}$

Pseudo style to set the keys: CS **render mode**, CS **outline color**, CS **outline width**, CS **font**, CS **solid**, CS **liquid**, CS **gas** and/or CS **synt** and/or the style CS **all**. None of the keys – r, olc, olw , f, s, l, g, sy and all – are mandatory.

```
USAGE: CS={r=<fill|outline|fill and outline>,olc=<color>,olw=<positive numerical value>
f=<font commands>,s=<color>,l=<color>,g=<color>,sy=<color>,all=<color>}
```

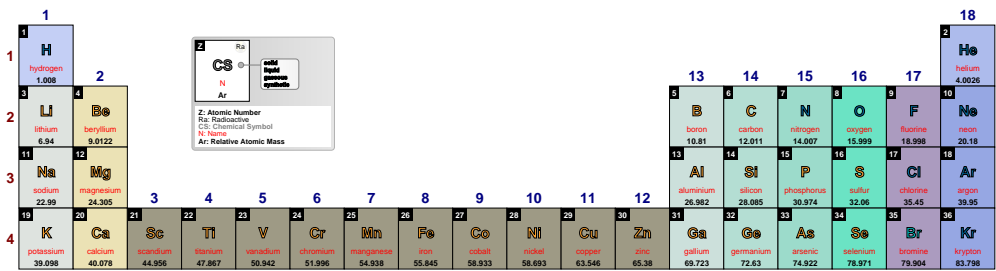
```
\pgfPT[Z list={1,...,36},CS={r=outline,olc=red,olw=.4},show legend pins=false]
```



➔ The name

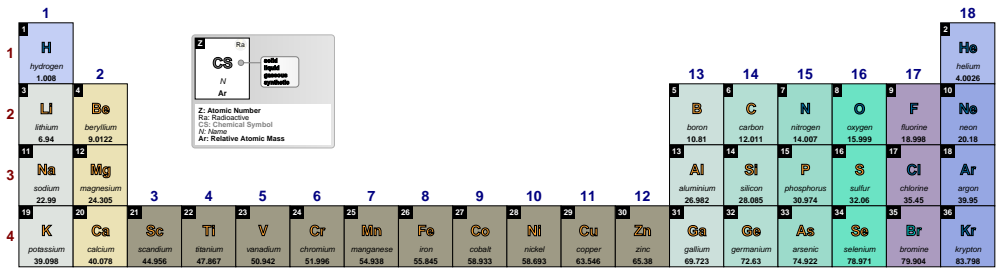
name color default: *black*
Sets the color of the element name.

```
\pgfPTstyle[show title=false]
\pgfPT[Z list={1,...,36},name color=red]
```



name font default: $\fontseries{1}\selectfont\tiny$
Sets the font of the element name.

```
\pgfPT[Z list={1,...,36},name font=\itshape\tiny]
```



name align

default: *center*

Sets the alignment of the element name to *left*, *center* or *right* with respect to its containing box.

(*new in v1.0.1*)

```
\pgfPT[Z list={1,...,36},name align=left]
```

capitalize element names

default: *false*

If set to **true** the first letter of the name of the elements is a capital letter (except in German where names start with a capital letter since version 2.0.1). If set to **TRUE** the whole name of the elements is in capital letters

(*changed in v1.0.1*)

```
\pgfPT[Z list={1,...,36},capitalize element names=true]
```

```
\pgfPT[Z list={1,...,36},capitalize element names=TRUE]
```

name

no value

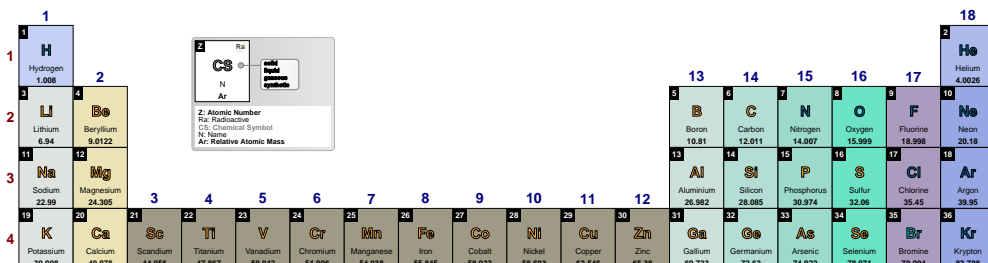
A style equivalent to `capitalize element names=false`

```
\pgfPT[Z list={1,...,36},name]
```

Name no value

A style equivalent to `capitalize element names=true`

```
\pgfPT[Z list={1,...,36},Name]
```

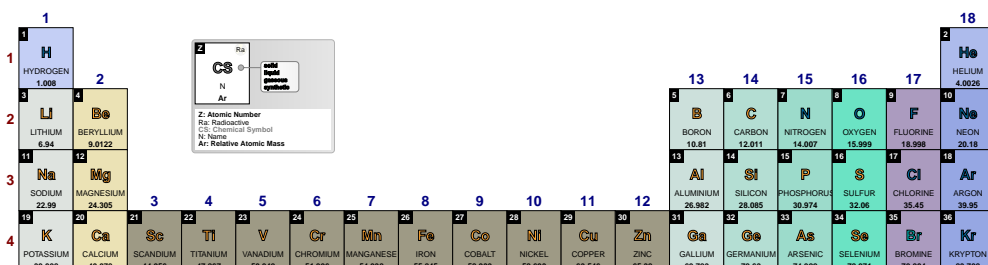


NAME no value

A style equivalent to `capitalize element names=TRUE`

(new in v1.0.1)

```
\pgfPT[Z list={1,...,36},NAME]
```

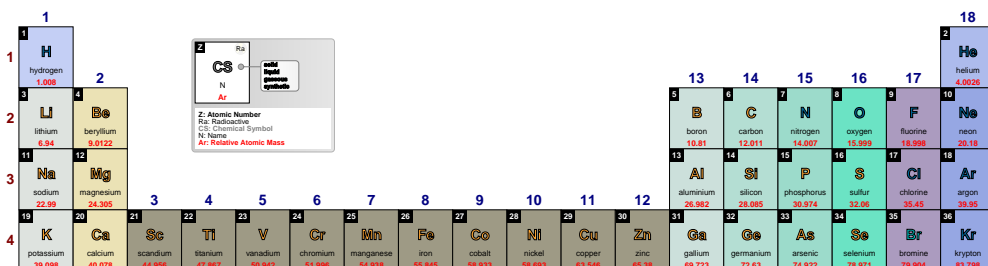


➡ The atomic weight

Ar color default: black

Sets the relative atomic mass color.

```
\pgfPT[Z list={1,...,36},Ar color=red]
```



Ar font

default: `\tiny\bfseries`

Sets the relative atomic mass font.

```
\pgfPT[Z list={1,...,36},Ar font=\scriptsize\bfseries]
```

Ar label

default: `m`

Sets the label to be used within the relative atomic mass description. When set to 'm' the term **mass** is used and when set to 'w' the term **weight** is used, resulting in *Relative Atomic Mass* and *Atomic Weight* labels respectively.

```
\pgfPT[Z list={1,...,36}]
```

```
\pgfPT[Z list={1,...,36},Ar label=w]
```

Ar precision

default: `-1`

Sets the relative atomic mass precision, *i.e.*, the decimal places displayed in the relative atomic mass value, performing the respective rounding, without zero padding the value.

NOTE:

Rounding is performed over the relative atomic mass data values which actually have a maximum of 4 decimal places. So giving this key a value of -1 (the value of relative atomic mass as-is) or 4 has the same effect.

Therefore the values provided to this key should be any integer between -1 and 3, *i.e.*, -1, 0, 1, 2 or 3. Any other integer provided will be processed as -1.

`\pgfPT[Z list={1,...,36}]`

1	2											18						
1	H																2	
	hydrogen																helium	
	1.008																4.0026	
2	3	4											10					
	Li	Be															Ne	
	lithium	beryllium															neon	
	6.94	9.0122															20.18	
3	11	12											16	17	18			
	Na	Mg															Ar	
	sodium	magnesium															argon	
	22.99	24.305															39.95	
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
	potassium	calcium	scandium	titanium	vanadium	chromium	manganese	iron	cobalt	nickel	copper	zinc	gallium	germanium	arsenic	selenium	bromine	krypton
	39.098	40.078	44.956	47.87	50.942	51.996	54.938	55.845	58.933	58.693	63.546	65.38	69.723	72.63	74.922	78.971	79.904	83.798

`\pgfPT[Z list={1,...,36},Ar precision=2]`

1	2											18						
1	H																	2
	hydrogen																	helium
	1.01																	4.00
2	3	4											10					
	Li	Be																Ne
	lithium	beryllium																neon
	6.94	9.01																20.18
3	11	12											16	17	18			
	Na	Mg																Ar
	sodium	magnesium																argon
	22.99	24.31																39.95
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
	potassium	calcium	scandium	titanium	vanadium	chromium	manganese	iron	cobalt	nickel	copper	zinc	gallium	germanium	arsenic	selenium	bromine	krypton
	39.10	40.08	44.96	47.87	50.94	52.00	54.94	55.85	58.93	58.69	63.55	65.38	69.72	72.63	74.92	78.97	79.90	83.80

`\pgfPT[Z list={1,...,36},Ar precision=1]`

1	2											18						
1	H																	2
	hydrogen																	helium
	1.0																	4.0
2	3	4											10					
	Li	Be																Ne
	lithium	beryllium																neon
	6.9	9.0																20.2
3	11	12											16	17	18			
	Na	Mg																Ar
	sodium	magnesium																argon
	23.0	24.3																40.0
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
	potassium	calcium	scandium	titanium	vanadium	chromium	manganese	iron	cobalt	nickel	copper	zinc	gallium	germanium	arsenic	selenium	bromine	krypton
	39.1	40.1	45.0	47.9	50.9	52.0	54.9	55.9	58.9	58.7	63.6	65.4	69.7	72.6	74.9	79.0	79.9	83.8

Ar default: $\{c=black,f=\tiny\bffseries,l=m,p=-1\}$
Pseudo style to set the keys: Ar color, Ar font, Ar label and/or Ar precision. None of the keys - c, f, l and p - are mandatory.
USAGE: `Ar={c=<color>,f=,l=<m|w>p=<integer value>}`

`\pgfPT[Z list={1,...,36},Ar={c=red!50!black,p=2}]`

1	2											18						
1	H																	2
	hydrogen																	helium
	1.01																	4.00
2	3	4											10					
	Li	Be																Ne
	lithium	beryllium																neon
	6.94	9.01																20.18
3	11	12											16	17	18			
	Na	Mg																Ar
	sodium	magnesium																argon
	22.99	24.31																39.95
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
	potassium	calcium	scandium	titanium	vanadium	chromium	manganese	iron	cobalt	nickel	copper	zinc	gallium	germanium	arsenic	selenium	bromine	krypton
	39.10	40.08	44.96	47.87	50.94	52.00	54.94	55.85	58.93	58.69	63.55	65.38	69.72	72.63	74.92	78.97	79.90	83.80

```
\pgfPT[Z list={1,...,36},Ar={c=red!50!black,p=1,l=w}]
```

► The density

d color

default: *black*

Sets the density value text color.

```
\pgfPTbuildcellstyle{myd}(5,3)% 5 rows by 3 columns
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4;1-3;name),(5;1-3;d)]
\pgfPT[Z list={1,...,36},cell style=myd,show title=false]
```

```
\pgfPT[Z list={1,...,36},cell style=myd,show title=false,d color=red]
```

d font

default: *\tiny\bfseries*

Sets the density value text font.

```
\pgfPT[Z list={1,...,36},cell style=myd,show title=false]
```

`\pgfPT[Z list={1,...,36},cell style=myd,show title=false,d font=\tiny\itshape]`

The periodic table shows elements with their atomic number (Z), chemical symbol (CS), name (N), and density (d). The density unit is 'd'. A legend box explains the keys: Z: Atomic Number, Ra: Radioactive, CS: Chemical Symbol, N: Name, d: Density (g/cm³, g/dm³ for the gases).

d unit

default: *both*

Sets the unit for the density of the elements. The two possible values to this key are *g/dm3* (g/dm^3), *g/cm3* (g/cm^3) and *both* (g/dm^3 for elements in the gaseous state and g/cm^3 for all other elements). *(new in v1.0.1)*

`\pgfPT[Z list={1,...,36},cell style=myd,show title=false]`

The periodic table shows elements with their atomic number (Z), chemical symbol (CS), name (N), and density (d). The density unit is 'd'. A legend box explains the keys: Z: Atomic Number, Ra: Radioactive, CS: Chemical Symbol, N: Name, d: Density (g/cm³, g/dm³ for the gases).

`\pgfPT[Z list={1,...,36},cell style=myd,show title=false,d unit=g/cm3]`

The periodic table shows elements with their atomic number (Z), chemical symbol (CS), name (N), and density (d). The density unit is 'g/cm3'. A legend box explains the keys: Z: Atomic Number, Ra: Radioactive, CS: Chemical Symbol, N: Name, d: Density (g/cm³).

`\pgfPT[Z list={1,...,36},cell style=myd,show title=false,d unit=g/dm3]`

The periodic table shows elements with their atomic number (Z), chemical symbol (CS), name (N), and density (d). The density unit is 'g/dm3'. A legend box explains the keys: Z: Atomic Number, Ra: Radioactive, CS: Chemical Symbol, N: Name, d: Density (g/dm³).

d precision

default: -1

Sets the density precision, *i.e.*, the decimal places displayed in their value, performing the respective rounding, without zero padding the value.

NOTE:

Rounding is performed over density values which actually have a maximum 5 or 8 decimal places, when the values are in g/dm³ or in g/cm³, respectively. So giving this key a value of -1 (the value of the melting or boiling point as-is) or 5 or 8 has the same effect. Therefore the values provided to this key should be any integer between -1 and 4 (g/dm³) or 7 (g/cm³). Any other integer provided will be processed as -1.

```
\pgfPTstyle[Z list={1,...,54},cell style=myd,show title=false]
```

\pgfPT

```
\pgfPT[d precision=0]
```

```
\pgfPT[d precision=1]
```

\pgfPT[d precision=2]

Periodic table showing atomic weights with 2 decimal precision. The table includes elements from Hydrogen (H) to Xenon (Xe). A legend box shows the format for element data: Z : Atomic Number, Ra : Radioactive, CS : Chemical Symbol, N : Name, d : Density (g/cm³; g/dm³ for the gases).

\pgfPT[d precision=3]

Periodic table showing atomic weights with 3 decimal precision. The table includes elements from Hydrogen (H) to Xenon (Xe). A legend box shows the format for element data: Z : Atomic Number, Ra : Radioactive, CS : Chemical Symbol, N : Name, d : Density (g/cm³; g/dm³ for the gases).

\pgfPT[d precision=4]

Periodic table showing atomic weights with 4 decimal precision. The table includes elements from Hydrogen (H) to Xenon (Xe). A legend box shows the format for element data: Z : Atomic Number, Ra : Radioactive, CS : Chemical Symbol, N : Name, d : Density (g/cm³; g/dm³ for the gases).

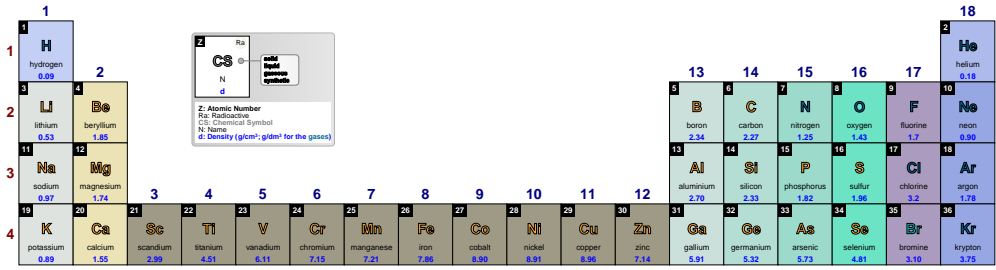
\pgfPT[d precision=5]

Periodic table showing atomic weights with 5 decimal precision. The table includes elements from Hydrogen (H) to Xenon (Xe). A legend box shows the format for element data: Z : Atomic Number, Ra : Radioactive, CS : Chemical Symbol, N : Name, d : Density (g/cm³; g/dm³ for the gases).

d default: $\{c=black,f=\tiny\bfseries,p=-1,u=both\}$
Pseudo style to set the keys: **d color**, **d font**, **d precision** and/or **d unit**. None of the keys – c, f, p and u – are mandatory.

USAGE: $d=\{c=<color>,f=<font\ commands>,p=<integer\ value>,u=<pm|A>\}$

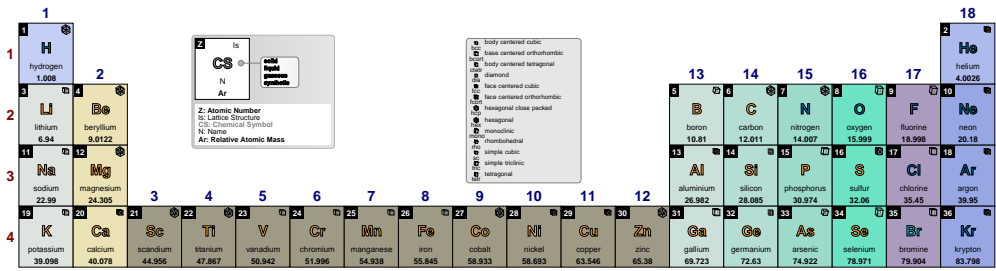
$\backslash\text{pgfPT}[Z\ list=\{1,\dots,36\},cell\ style=myd,show\ title=false,d=\{c=blue,p=2\}]$



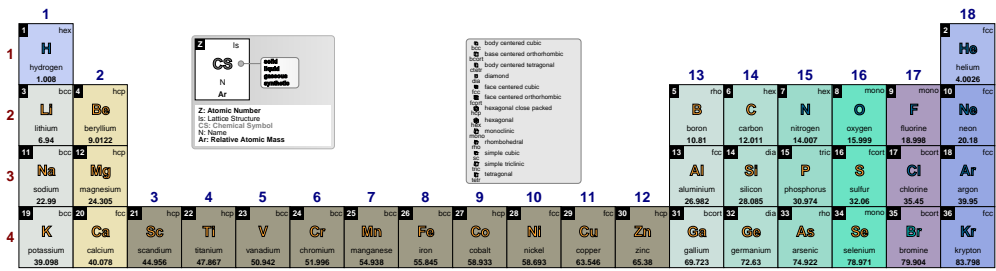
► The lattice structure

ls default: *fig*
 Sets what is displayed for the lattice structure: a figure (*fig*) or text (*txt*) or both (*fig+txt* or *txt+fig*).

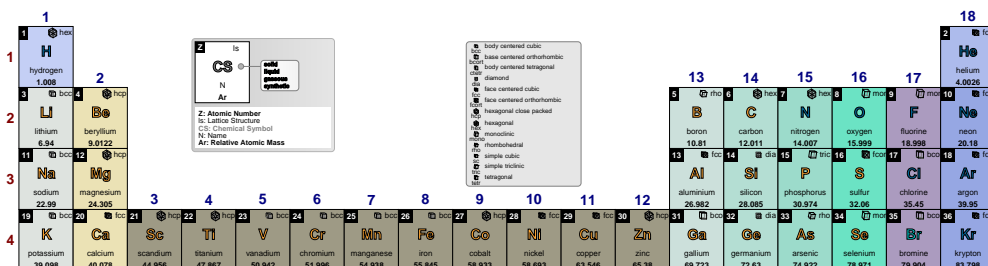
$\backslash\text{pgfPT}[Z\ list=\{1,\dots,36\},cell\ style=pgfPTIs]$



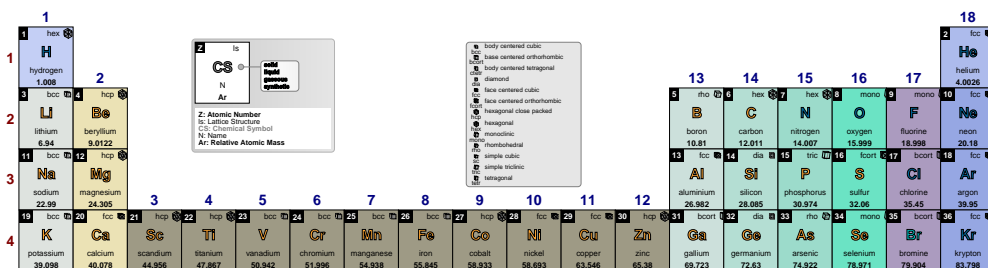
$\backslash\text{pgfPT}[Z\ list=\{1,\dots,36\},cell\ style=pgfPTIs,ls=txt]$



```
\pgfPT[Z list={1,...,36},cell style=pgfPTIs,ls=fig+txt]
```



```
\pgfPT[Z list={1,...,36},cell style=pgfPTIs,ls=txt+fig]
```

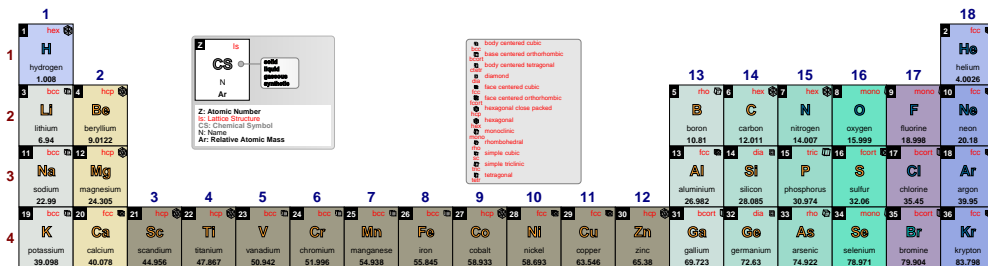


Is color

Sets the lattice structure text color.

default: *black*

```
\pgfPT[Z list={1,...,36},cell style=pgfPTIs,ls=txt+fig,ls color=red]
```

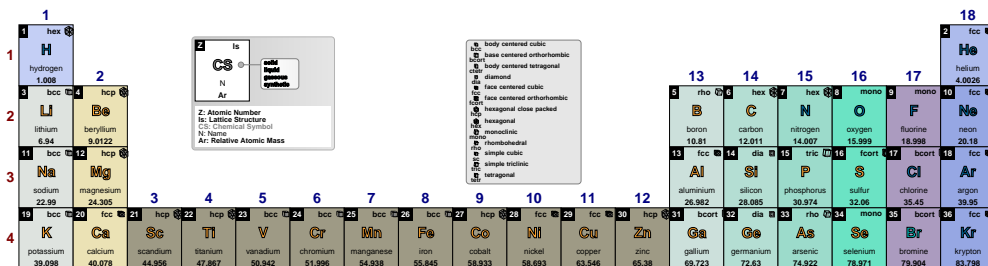


Is font

Sets the lattice structure text font.

default: *\tiny*

```
\pgfPT[Z list={1,...,36},cell style=pgfPTIs,ls=txt+fig,ls font=\tiny\bfseries]
```

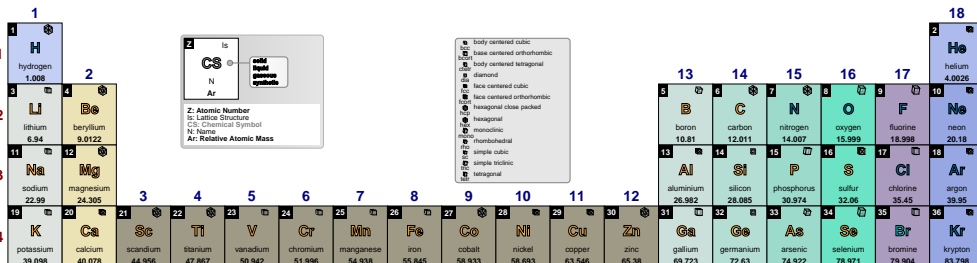


Is align

default: *right*

Sets the alignment of the lattice structure to *left* or *center* or *right*.

```
\pgfPT[Z list={1,...,36},cell style=pgfPTIs,Is align=center]
```



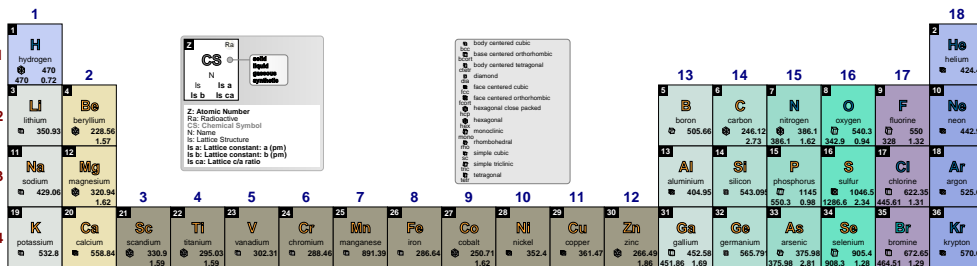
Is unit

default: *pm*

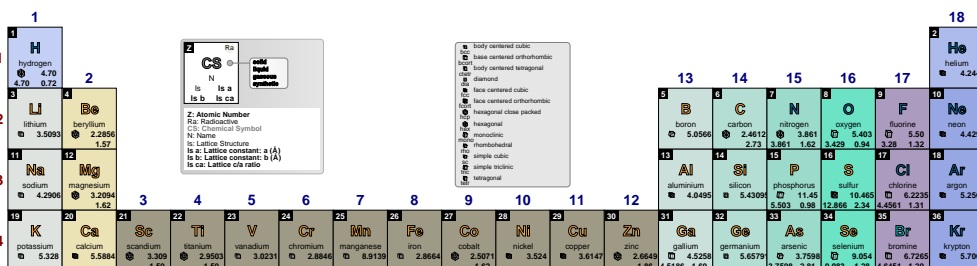
Sets the unit for the lattice structure constants: a, b and c. The two possible values to this key are *pm* (picometers) and *A* (Å – angstroms).

```
\pgfPTbuildcellstyle{mys}{6,3}% 6 rows by 3 columns
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4;1-3;name),(5;1-2.5;Is),(5;2.5-3;Isa),
(6;1-2.5;Isb),(6;2.5-3;Isca)]
```

```
\pgfPTstyle[Z list={1,...,36},cell style=mys,show title=false,Is align=center]
\pgfPT
```



```
\pgfPT[Is unit=A]
```



Is precision

default: *-1*

Sets the lattice structure constants - a, b, and c - precision, as also the lattice c/a ratio, *i.e.*, the decimal places displayed in their value, performing the respective rounding, without zero padding the value.

NOTE:

Rounding is performed over the constants data or c/a ratio values with actually have a maximum of 2 or 4 decimal places, when the values are in picometers or in angstroms, respectively. So giving this key a value of -1 (the value of the constants or c/a ratio as-is) or 2 or 4 has the same effect.

Therefore the values provided to this key should be any integer between -1 and 1 (pm) or 3 (A). Any other integer provided will be processed as -1.


```
\pgfPTbuildcellstyle{mys}{6,3}% 6 rows by 3 columns
[(1;1-2;Z),(1;2-3;ls),(2-3;1.5-3.5;CS),(4;1-3;name),(5;1-2.5;lsa),
(5;2.5-3;lsb),(6;1-2.5;lsc),(6;2.5-3;lsa)]
\pgfPTstyle[Z list={1,...,36},cell={w=36pt,h=42pt,style=mys}]
\pgfPT
```

Periodic Table of Elements

```
\pgfPT[ls precision=0]
```

Periodic Table of Elements

```
\pgfPT[ls precision=1]
```

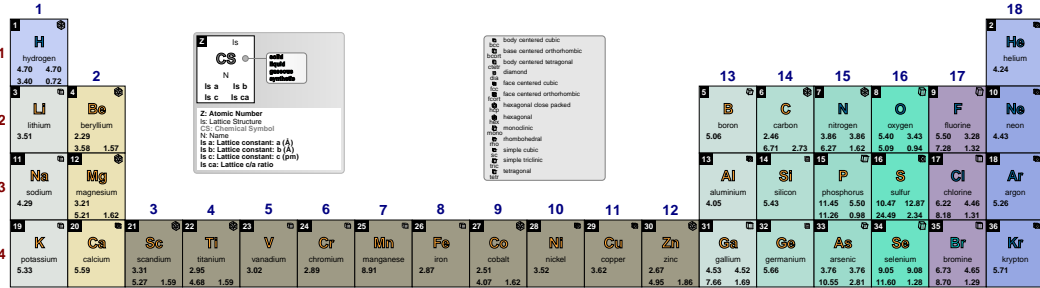
Periodic Table of Elements

```
\pgfPT[ls precision=2]
```

Periodic Table of Elements

```
\pgfPT[ls precision=2,ls unit=A]
```

Periodic Table of Elements



lat

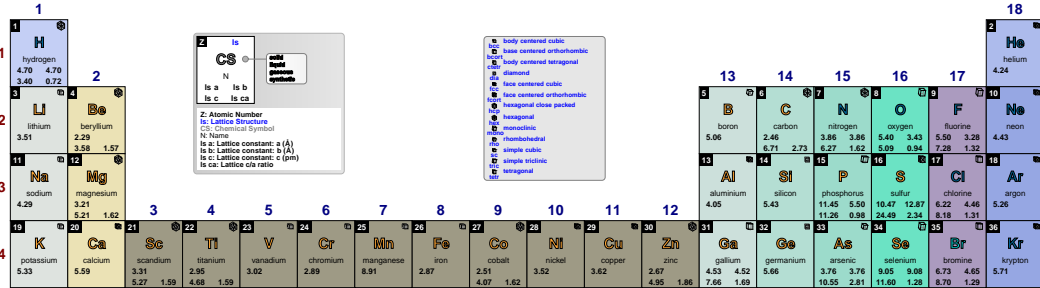
default: {ls=fig,c=black,f=\tiny,align=right,p=-1,u=pm}

Pseudo style to set the keys: **ls**, **ls color**, **ls font**, **ls align**, **ls precision** and/or **ls unit**. None of the keys – ls, c, f, align, p and u – are mandatory. (new in v1.0.1)

```
USAGE: lat={ls=<fig|txt|fig+txt|txt+fig>,c=<color>,f=<font commands>,align=<left|center|right>,p=<integer value>,u=<pm|A>}
```

```
\pgfPT[Z list={1,...,36},lat={c=blue,f=\tiny\bfseries,u=A,p=2}]
```

Periodic Table of Elements



→ The discovery year

DiscY color

default: black

Sets the discovery year color.

```
\pgfPT[Z list={1,...,36},cell style=pgfPTdisc,DiscY color=red]
```

Periodic Table of Elements



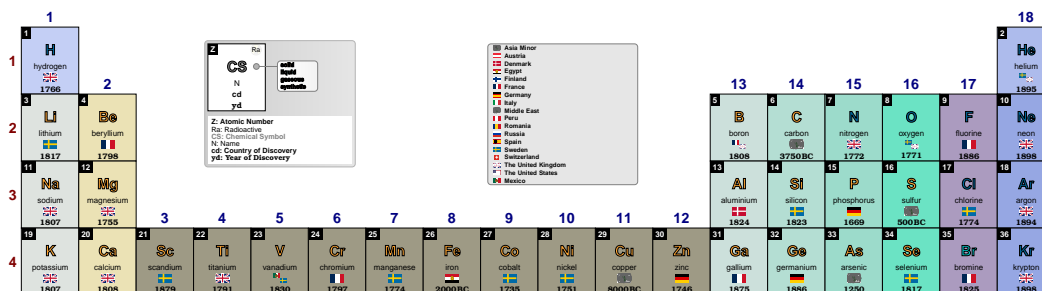
DiscY font

default: `\tiny\bfseries`

Sets the discovery year font.

```
\pgfPT[Z list={1,...,36},cell style=pgfPTdisc,DiscY
font=\fontfamily{pbk}\selectfont\tiny\bfseries]
```

Periodic Table of Elements



DiscY BC scale

default: `1`

Sets the font factor scaling for the Before Christ (BC) acronym in the discovery year.

```
\pgfPT[Z list={1,...,36},cell style=pgfPTdisc,DiscY BC scale=.8]
```

Periodic Table of Elements



➡ **The electron distribution**

```
\pgfPTbuildcellstyle{electron}(6,3)% 6 rows by 3 columns
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4;1-3;name),
(5;1-3;eDist),(6;1-3;eConfignl)]
```

eDist color

default: `black`

Sets the electron distribution color.

```
\pgfPT[Z list={1,...,54},cell style=electron,eDist color=red]
```

Periodic Table of Elements

eDist font

Sets the electron distribution font.

default: `\tiny\bfseries`

```
\pgfPT[Z list={1,...,54},cell style=electron,eDist font=\fontfamily{pbk}\selectfont\tiny\bfseries]
```

Periodic Table of Elements

eDist sep

Sets the separator character between energy levels in electron distribution. *If the separator character is a comma it must be provided between curly braces - {,}.*

default: `:`

```
\pgfPT[Z list={1,...,54},cell style=electron,eDist sep=-]
```

Periodic Table of Elements

```
\pgfPT[Z list={1,...,54},cell style=electron,eDist sep={,}]
```

Periodic Table of Elements

► The other contents

For all the *other contents* available for the cells of the periodic table, two keys can be set: **<content name> color** and **<content name> font**.

The **<content name>**'s list:

- ✓ **R**: atomic radius
- ✓ **Rcov**: covalente radius
- ✓ **Rion**: ionic radius
- ✓ **Ei**: first ionization energy
- ✓ **eneg**: electronegativity (Pauling)
- ✓ **eaff**: electroaffnity
- ✓ **O**: oxidation states
- ✓ **Tmelt**: melting point (Kelvin)
- ✓ **TmeltC**: melting point (Celsius degrees)
- ✓ **Tboil**: boiling point (Kelvin)
- ✓ **TboilC**: boiling point (Celsius degrees)
- ✓ **eConfig**: electronic configuration (increasing n)
- ✓ **eConfignl**: electronic configuration (increasing n+l)
- ✓ **Cp**: specific heat capacity
- ✓ **kT**: thermal conductivity
- ✓ **lsa**: lattice constant – a
- ✓ **lsb**: lattice constant – b
- ✓ **lsc**: lattice constant – c
- ✓ **Isca**: lattice c/a ratio
- ✓ **DiscC**: discover country
- ✓ **spectra**: visible range spectral lines

<content name> color default: *black*

Sets the **<content name>** color.

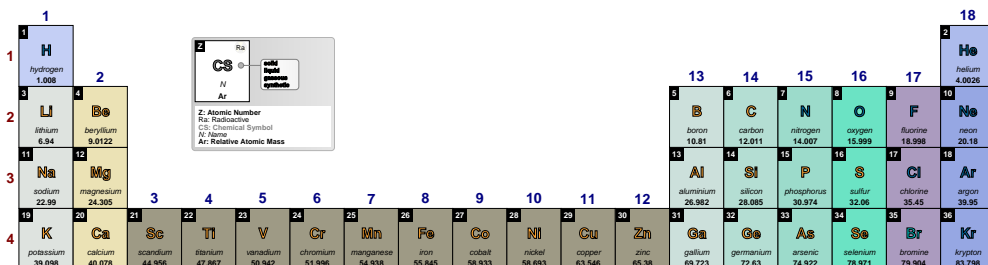
```
\pgfPT[Z list={1,...,36},name color=blue]
```

Periodic Table of Elements

<content name> font default: \tiny\bfseries
 Sets the <content name> font.

```
\pgfPT[Z list={1,...,36},name font=\tiny\itshape]
```

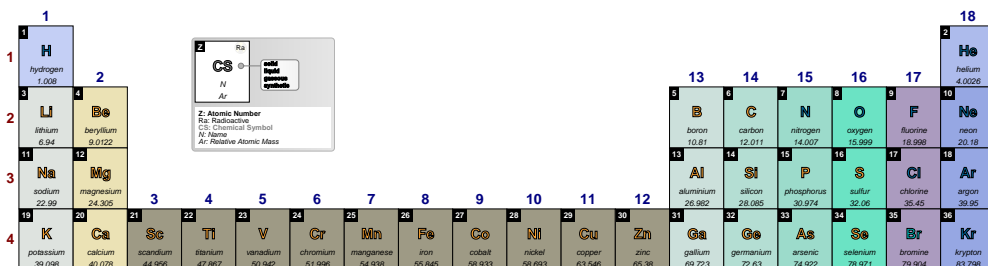
Periodic Table of Elements



cell font default: \bfseries\tiny
 Style to set the font for all cell contents, except for the Z and Chemical Symbol fonts.

```
\pgfPT[Z list={1,...,36},cell font=\tiny\itshape]
```

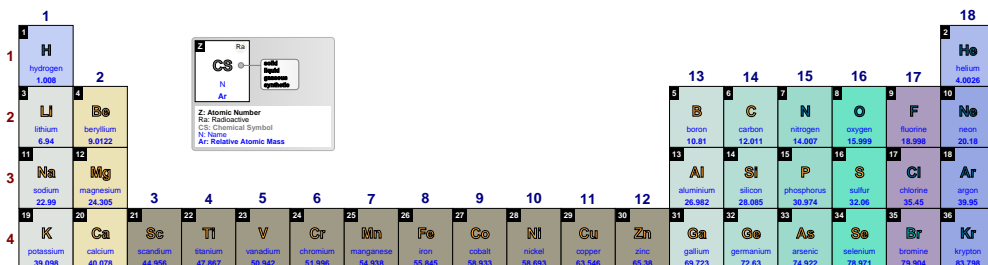
Periodic Table of Elements



cell color default: black
 Style to set the color for all cell contents, except for the Z and Chemical Symbol colors.

```
\pgfPT[Z list={1,...,36},cell color=blue]
```

Periodic Table of Elements



The precision of the *other contents*, which have numerical values, can also be set by a key. *Atomic radius, covalent radius, and ionic radius all have integer values, so precision does not apply to them.*

E precision

default: -1

Sets the first ionization energy and the electroaffinity precision, *i.e.*, the decimal places displayed in their value, performing the respective rounding, without zero padding the value.

NOTE:

Rounding is performed over energy values with actually have a maximum of 3 decimal places. So giving this key a value of -1 (the value of the energy as-is) or 3 has the same effect. Therefore the values provided to this key should be any integer between -1 and 2, *i.e.*, -1, 0, 1 or 2. Any other integer provided will be processed as -1.

```
\pgfPTbuildcellstyle{myE}{5,3}% 5 rows by 3 columns
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4;1-3;name),(5;1-2.5;Ei), (5;2.5-3;eaff)]
\pgfPTstyle[Z list={1,...,54},cell style=myE,show title=false]
\pgfPT
```

\pgfPT[E precision=0]

\pgfPT[E precision=1]

\pgfPT[E precision=2]

\pgfPT[E precision=3]

T precision

default: -1

Sets the melting point an boiling point precision, *i.e.*, the decimal places displayed in their value, performing the respective rounding, without zero padding the value.

NOTE:

Rounding is performed over melting or boiling point values witch actually have a maximum, respectively, of 4 or 2 decimal places. So giving this key a value of -1 (the value of the melting or boiling point as-is) or, respectively, 4 or 2 has the same effect. *Therefore the values provided to this key should be any integer between -1 and 3 or 2. Any other integer provided will be processed as -1.*

```
\pgfPTbuildcellstyle{myT}(6,3)% 6 rows by 3 columns
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4;1-3;name),(5;1-2.5;Tmelt),
(5;2.5-3;Tboil),(6;1-2.5;TmeltC),(6;2.5-3;TboilC)]
```

```
\pgfPTstyle[Z list={1,...,36},cell style=myT,Tmelt color=blue!50!black,TmeltC
color=blue,Tboil color=red!50!black,TboilC color=red,show title=false]
```

\pgfPT

\pgfPT[T precision=0]

\pgfPT[T precision=1]

\pgfPT[T precision=2]

\pgfPT[T precision=3]

\pgfPT[T precision=4]

Cp precision

default: -1

Sets the specific heat capacity precision, *i.e.*, the decimal places displayed in their value, performing the respective rounding, without zero padding the value.

NOTE:

Rounding is performed over density values with actually have a maximum 3 decimal places. So giving this key a value of -1 (the value of the melting or boiling point as-is) or 3 has the same effect.

Therefore the values provided to this key should be any integer between -1 and 2. Any other integer provided will be processed as -1.

```
\pgfPTbuildcellstyle{myCp}(5,3)% 5 rows by 3 columns
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4;1-3;name),(5;1-3;Cp)]
\pgfPTstyle[Z list={1,...,36},cell style=myCp]
\pgfPT
```

Periodic Table of Elements

1																	18			
1	H																	He		
	hydrogen																	helium		
	29.836																	20.786		
2	3	4													13	14	15	16	17	18
	Li	Be													B	C	N	O	F	Ne
	lithium	beryllium													boron	carbon	nitrogen	oxygen	fluorine	neon
	24.86	16.443													11.087	8.517	29.124	29.376	31.304	20.786
3	11	12										13	14	15	16	17	18			
	Na	Mg										Al	Si	P	S	Cl	Ar			
	sodium	magnesium										aluminum	silicon	phosphorus	sulfur	chlorine	argon			
	28.23	24.869										24.2	19.789	23.824	22.75	33.949	20.786			
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36		
	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr		
	potassium	calcium	scandium	titanium	vanadium	chromium	manganese	iron	cobalt	nickel	copper	zinc	gallium	germanium	arsenic	selenium	bromine	krypton		
	29.6	29.929	29.52	29.06	24.89	23.35	26.32	25.1	24.81	26.07	24.44	25.39	25.86	23.222	24.64	25.363	75.69	20.786		

```
\pgfPT[Cp precision=0]
```

Periodic Table of Elements

1																	18			
1	H																	He		
	hydrogen																	helium		
	29																	21		
2	3	4													13	14	15	16	17	18
	Li	Be													B	C	N	O	F	Ne
	lithium	beryllium													boron	carbon	nitrogen	oxygen	fluorine	neon
	25	16													11	9	29	29	31	21
3	11	12										13	14	15	16	17	18			
	Na	Mg										Al	Si	P	S	Cl	Ar			
	sodium	magnesium										aluminum	silicon	phosphorus	sulfur	chlorine	argon			
	28	25										24	28	24	23	34	21			
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36		
	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr		
	potassium	calcium	scandium	titanium	vanadium	chromium	manganese	iron	cobalt	nickel	copper	zinc	gallium	germanium	arsenic	selenium	bromine	krypton		
	30	26	26	25	25	23	26	25	25	26	24	25	26	23	25	25	76	21		

```
\pgfPT[Cp precision=1]
```

Periodic Table of Elements

1																	18			
1	H																	He		
	hydrogen																	helium		
	29.8																	20.8		
2	3	4													13	14	15	16	17	18
	Li	Be													B	C	N	O	F	Ne
	lithium	beryllium													boron	carbon	nitrogen	oxygen	fluorine	neon
	24.9	16.4													11.1	8.5	29.1	29.4	31.3	20.8
3	11	12										13	14	15	16	17	18			
	Na	Mg										Al	Si	P	S	Cl	Ar			
	sodium	magnesium										aluminum	silicon	phosphorus	sulfur	chlorine	argon			
	28.2	24.9										24.2	19.8	23.8	22.8	34.0	20.8			
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36		
	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr		
	potassium	calcium	scandium	titanium	vanadium	chromium	manganese	iron	cobalt	nickel	copper	zinc	gallium	germanium	arsenic	selenium	bromine	krypton		
	29.6	25.9	25.5	25.1	24.9	23.4	26.3	25.1	24.8	26.1	24.4	25.4	25.9	23.2	24.6	25.4	75.7	20.8		

`\pgfPT[Cp precision=2]`

Periodic Table of Elements

`\pgfPT[Cp precision=3]`

Periodic Table of Elements

KT precision

default: -1

Sets the thermal conductivity precision, *i.e.*, the decimal places displayed in their value, performing the respective rounding, without zero padding the value.

NOTE:

Rounding is performed over density values which actually have a maximum 5 decimal places. So giving this key a value of -1 (the value of the melting or boiling point as-is) or 5 has the same effect.

Therefore the values provided to this key should be any integer between -1 and 4. Any other integer provided will be processed as -1.

```
\pgfPTbuildcellstyle{mykT}(5,3)% 5 rows by 3 columns
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4;1-3;name),(5;1-3;kT)]
\pgfPTstyle[Z list={1,...,36},cell style=mykT,show title=false]
\pgfPT
```

\pgfPT[kT precision=0]

Periodic table showing thermal conductivity values (kT) rounded to 0 decimal places. The values are integers. A callout box for Cesium (Cs) shows: Z: Atomic Number, Ra: Radioactive, CS: Chemical Symbol, N: Name, kT: Thermal Conductivity (Wm⁻¹K⁻¹).

\pgfPT[kT precision=1]

Periodic table showing thermal conductivity values (kT) rounded to 1 decimal place. A callout box for Cesium (Cs) shows: Z: Atomic Number, Ra: Radioactive, CS: Chemical Symbol, N: Name, kT: Thermal Conductivity (Wm⁻¹K⁻¹).

\pgfPT[kT precision=2]

Periodic table showing thermal conductivity values (kT) rounded to 2 decimal places. A callout box for Cesium (Cs) shows: Z: Atomic Number, Ra: Radioactive, CS: Chemical Symbol, N: Name, kT: Thermal Conductivity (Wm⁻¹K⁻¹).

\pgfPT[kT precision=3]

Periodic table showing thermal conductivity values (kT) rounded to 3 decimal places. A callout box for Cesium (Cs) shows: Z: Atomic Number, Ra: Radioactive, CS: Chemical Symbol, N: Name, kT: Thermal Conductivity (Wm⁻¹K⁻¹).

\pgfPT[kT precision=4]

Periodic table showing thermal conductivity values (kT) rounded to 4 decimal places. A callout box for Cesium (Cs) shows: Z: Atomic Number, Ra: Radioactive, CS: Chemical Symbol, N: Name, kT: Thermal Conductivity (Wm⁻¹K⁻¹).

`\pgfPT[kT precision=5]`

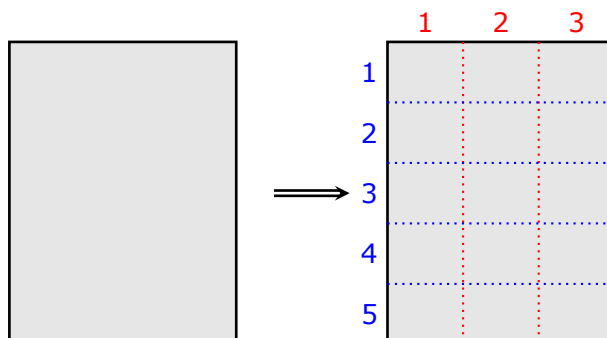
1																	18	
1	H hydrogen 0.18895																	He helium 0.1513
2	Li lithium 84.9	Be beryllium 200											B boron 27.4	C carbon 140	N nitrogen 0.02563	O oxygen 0.02658	F fluorine 0.0277	Ne neon 0.0491
3	Na sodium 142	Mg magnesium 156											Al aluminium 237	Si silicon 149	P phosphorus 0.236	S sulfur 0.205	Cl chlorine 0.0089	Ar argon 0.01772
4	K potassium 102.5	Ca calcium 201	Sc scandium 15.8	Ti titanium 21.9	V vanadium 30.7	Cr chromium 93.9	Mn manganese 7.81	Fe iron 80.4	Co cobalt 100	Ni nickel 90.9	Cu copper 401	Zn zinc 116	Ga gallium 40.6	Ge germanium 60.2	As arsenic 50.2	Se selenium 0.519	Br bromine 0.122	Kr krypton 0.00943

`\pgfPTresetstyle`

Designing cells with \pgfPTbuildcell

To start designing the *base cell* of the Periodic Table it is necessary to keep in mind that each cell will be split into **n** rows and **k** columns.

As a running example, 5 rows and 3 columns will be used:

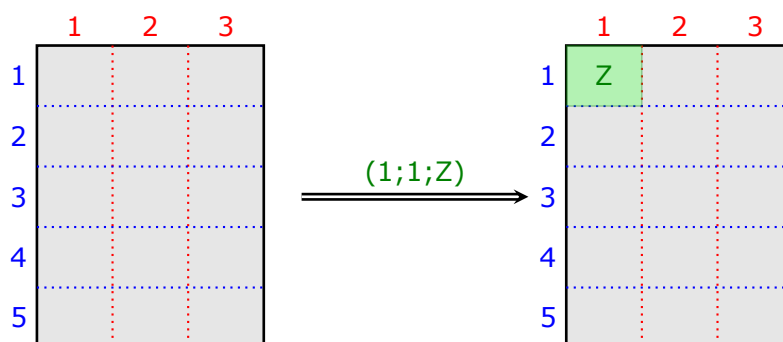


The next task is to assign contents to the cell by typing *trios* with the structure

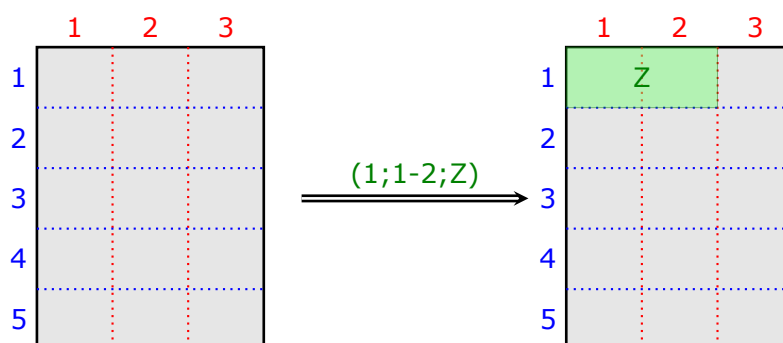
- **(row;column;content)**
- or **(start row-end row;start column-end column;content)**
- or a combination of both.

The available **contents** are: Z, name, CS, Ar, Ar*, radio, R, Rcov, Rion, Ei, eneg, eaff, O, Tmelt, TmeltC, Tboil, TboilC, eDist, eConfig, eConfigI, d, Cp, kT, Is, Isa, Isb, Isc, Isca, DiscY, DiscC and spectra.

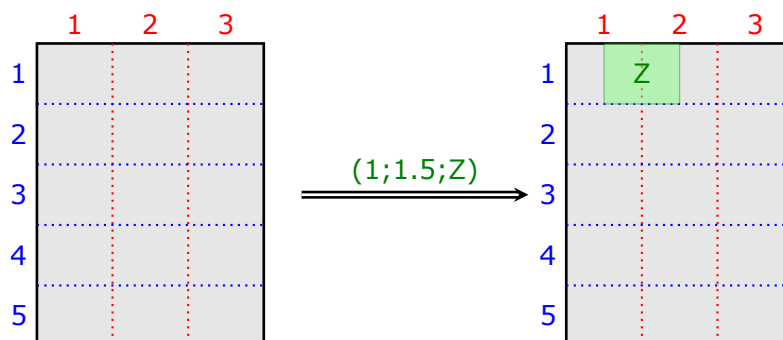
Assigning, for instance, (1;1;Z) will show the atomic number in the first row and in the first column,



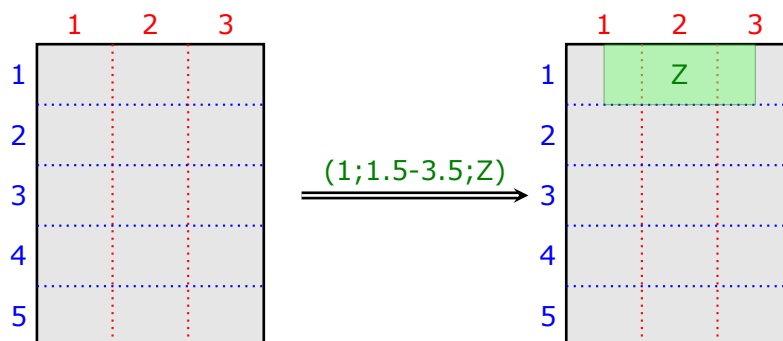
while the assignment (1;1-2;Z) will show the atomic number in the first row and filling the first and second columns,



It is also possible to start at a *fraction* of a line or column. If it is intended to start a line at the middle of the first column the value used should be **1.5**, which means that the start value is at the half (*0.5*) of the first column (*1*), observing that *1.5* is *0.5* plus *1*:



As in the second example above it is possible to end up in a specified *fraction* of a line or column:



The row, column syntax

Both lines and columns share the same syntax, where *n* is any integer between 1 and the number of rows and *f* is the fractional part of any number between 0 and 1:

- (1) If only the row number *n* is provided the *content* is placed at the row *n*.
- (2) If the row number *n* is provided followed by a *dot* and a number *f*, the *content* is placed at the fraction *f* of the row *n*.
- (3) If the start row *n_s* and the end row *n_e* are provided separated by a *dash*, i.e., *n_s-n_e*, the *content* is placed filling all the rows from *n_s* to *n_e*.
The *dot* notation described in (2) can be used both on *n_s* and *n_e*.
- (4) All of the items above apply to columns in the same way.

✂ The cell contents

- ✓ **Z** – the atomic number of the elements.
- ✓ **name** – the name of the elements.
- ✓ **CS** – the chemical symbol of the elements.
- ✓ **Ar** – the relative atomic mass (atomic weight) of the elements.
- ✓ **Ar*** – the standard relative atomic mass (standard atomic weight) of the elements.

- ✓ **radio** – radioactivity of the elements. If the element is radioactive the figure ☼ is placed in the cell, otherwise nothing is shown.
- ✓ **R** – the atomic radius of the elements. The atomic radius shown is the calculated radius and is expressed in picometers.
- ✓ **Rcov** – the covalent radius of the elements. The covalent radius shown is for single bonds and is expressed in picometers.
- ✓ **Rion** – the ionic radius of the elements. The radius shown is the effective ionic radius in picometers.
- ✓ **Ei** – the first ionization energy of the elements, measured in $\text{kJ} \cdot \text{mol}^{-1}$. All data from rutherfordium onwards is predicted.
- ✓ **eneg** – the Pauling electronegativity of the elements.
- ✓ **eaff** – the electroaffinity (electron affinity) of the elements, measured in $\text{kJ} \cdot \text{mol}^{-1}$. Estimated negative values have been replaced by zero, since the negative ions formed in these cases are always unstable (they may have lifetimes of the order of microseconds to milliseconds, and invariably autodetach after some time).
- ✓ **O** – the common oxidation states of the elements.
- ✓ **Tmelt** – the melting point, in Kelvin, of the elements.
- ✓ **TmeltC** – the melting point, in degrees Celsius, of the elements.
- ✓ **Tboil** – the boiling point, in Kelvin, of the elements.
- ✓ **TboilC** – the boiling point, in degrees Celsius, of the elements.
- ✓ **eDist** – the electron distribution of the elements.
- ✓ **eConfig** – the electronic configuration, in increasing n (principal quantum number), of the element, corresponding to the *spectroscopic* order of orbital energies, that is, the reverse of the order in which electrons are removed from a given atom to form positive ions.

Note: the short version of the electronic configuration is used, i.e., [previous noble gas]remaining electrons. For example, for scandium it is: [Ar]3d⁴4s²
- ✓ **eConfigl** – the electronic configuration, in increasing sum of n and ℓ (azimuthal quantum number), of the element, following the order based on the Madelung rule.

Note: the short version of the electronic configuration is used, i.e., [previous noble gas]remaining electrons. For example, for scandium it is: [Ar]4s²3d¹
- ✓ **d** – the density of the elements, in the corresponding physical state, at 25°C and 1 atm.
- ✓ **Cp** – the specific heat capacity of the elements in $\text{J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$ at 25°C and 100 kPa.
- ✓ **kT** – the thermal conductivity of the elements in $\text{J} \cdot \text{m}^{-1} \cdot \text{K}^{-1}$ at 25°C.
- ✓ **Is** – the lattice structure of the elements at 1 bar and mostly at 25°C.
- ✓ **Isa** – the lattice constant a of the elements in picometers at 1 bar and mostly at 25°C.
- ✓ **Isb** – the lattice constant b of the eligible elements in picometers at 1 bar and mostly at 25°C.
- ✓ **Isc** – the lattice constant c of the eligible elements in picometers at 1 bar and mostly at 25°C.
- ✓ **Isca** – the lattice c/a ratio of the eligible elements at 1 bar and mostly at 25°C.
- ✓ **DiscY** – the discovery year of the elements.
- ✓ **DiscC** – the discovery country or in, a few cases, region (Middle East or Asia Minor) of the elements.
- ✓ **spectra** – the emission spectrum of the elements. The spectrum is only shown if available. The spectra are pre-built using the package `pgf-spectra` via the commands:


```
\pgfspectraStyle[back=visible40,line width=1pt,width=180pt,height=45pt,%
  relative intensity,relative intensity threshold=.375,%
  brightness=.5,charge=all,Imin=.125,gamma=1]
\foreach \SQ in {H,He,...},Bi,Po,Rn,Fr,...,Es}% Z=1,2,...,83,84,86,87,...,99
{
  \pgfspectra[element=\SQ]%
}
```

✦ Built-in cell styles

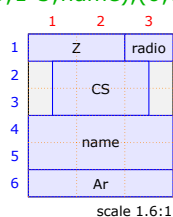
There is a set of *built-in* cell styles that could be used for the described purposes:

- ✓ **pgfPT2lang** – a cell layout to use with the name in two languages.

Built-in style pgfPT2lang

The build command:

```
\pgfPTbuildcell(6,3)%
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4-5;1-3;name),(6;1-3;Ar)]
```

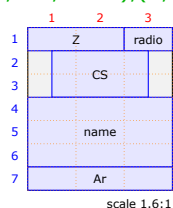


- ✓ **pgfPT3lang** – a cell layout to use with the name in three languages.

Built-in style pgfPT3lang

The build command:

```
\pgfPTbuildcell(7,3)%
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4-6;1-3;name),(7;1-3;Ar)]
```

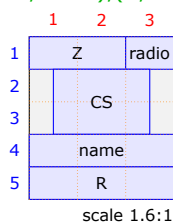


- ✓ **pgfPTR** – a cell layout to display the atomic radius and its periodic variations (if of course the **show periodic variations** key is set to true).

Built-in style pgfPTR

The build command:

```
\pgfPTbuildcell(5,3)%
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4;1-3;name),(5;1-3;R)]
```



- ✓ **pgfPTEi** – a cell layout to display the first ionization energy and its periodic variations (if of course the **show periodic variations** key is set to true).

Built-in style **pgfPTEi**

The build command:

```
\pgfPTbuildcell(5,3)%
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4;1-3;name),(5;1-3;Ei)]
```

	1	2	3
1	Z		radio
2		CS	
3			
4	name		
5	Ei		

scale 1.6:1

- ✓ **pgfPTEaff** – a cell layout to display the electron affinity and its periodic variations (if of course the **show periodic variations** key is set to true).

Built-in style **pgfPTEaff**

The build command:

```
\pgfPTbuildcell(5,3)%
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4;1-3;name),(5;1-3;eaff)]
```

	1	2	3
1	Z		radio
2		CS	
3			
4	name		
5	eaff		

scale 1.6:1

- ✓ **pgfPTREi** – a cell layout to display the atomic radius and first ionization energy and their periodic variations (if of course the **show periodic variations** key is set to true).

Built-in style **pgfPTREi**

The build command:

```
\pgfPTbuildcell(6,3)%
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4;1-3;name),(5;1-3;R),(6;1-3;Ei)]
```

	1	2	3
1	Z		radio
2		CS	
3			
4	name		
5	R		
6	Ei		

scale 1.6:1

- ✓ **pgfPTIs** – a cell layout to display the lattice system.

Built-in style **pgfPTIs**

The build command:

```
\pgfPTbuildcell(5,3)%
[(1;1-2.5;Z),(1;2.5-3;Is),(2-3;1.5-3.5;CS),(4;1-3;name),(5;1-3;Ar)]
```

	1	2	3
1	Z		Is
2		CS	
3			
4	name		
5	Ar		

scale 1.6:1

✓ **pgfPTdisc** – a cell layout to display the discovery country and discovery year.

Built-in style **pgfPTdisc**

The build command:

```
\pgfPTbuildcell(6,3)%
```

```
[(1;1-2;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4;1-3;name),(5;1-3;DiscC),(6;1-3;DiscY)]
```

	1	2	3
1	Z		radio
2			
3		CS	
4	name		
5	DiscC		
6	DiscY		

scale 1.6:1

Designing color schemes

There are three ways to make a new color scheme:

- with the command `\pgfPTnewColorScheme`
- using the *script* in the file [pgfPTcolorSchemes.html](#)
- with the commands provided by the [colorSchemes library](#) (see the [libraries section](#)).

✦ Designing a color scheme with `\pgfPTnewColorScheme`

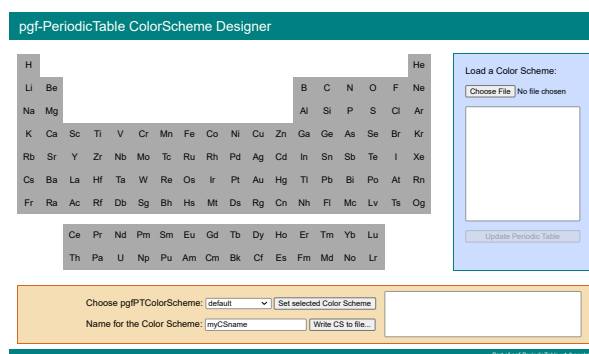
This command provides a way to set the cell background color of each of the 118 elements of the Periodic Table. *If the intention is to set the background color for all of them, it is highly recommended to use the file [pgfPTcolorSchemes.html](#), unless the trailing color begin at a small atomic number.*

Despite that, this command can always be used taking into account:

1. It has the form `\pgfPTnewColorScheme[trailing color]{name}{color list}` where:
 - the first argument (enclosed by square brackets) is optional. If provided, the specified trailing color will be used, otherwise the default color (white) will be used as trailing color.
 - the second and third arguments are mandatory and specify, respectively, the color scheme name and the color list.
2. The **name** is any name made up of letters (only the characters a,...,z and A,...,Z).
3. The **color list** is a comma-separated list where each entry has the format `r/g/b`, representing the red, blue and green values, between 0 and 1, of the color: the first entry of the list will be the background color used in the cell of the element with atomic number 1, the second entry, the background color of the cell of the element with atomic number 2, and so on.

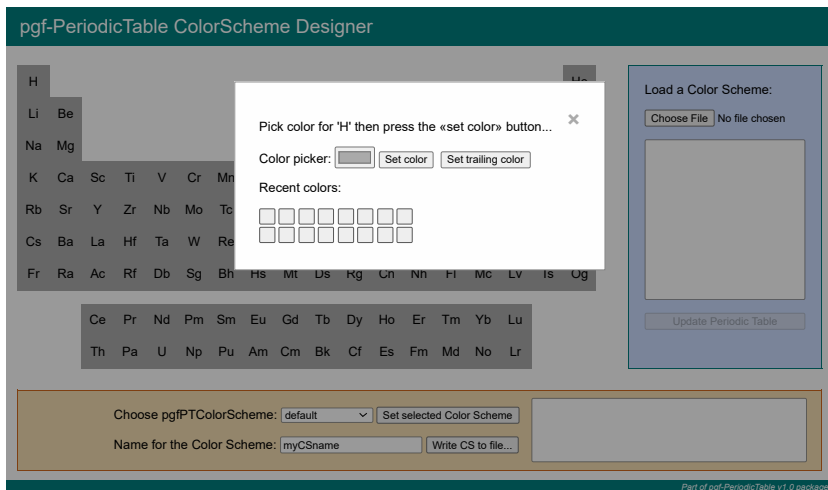
*If the color list has ten entries, these entries will set the background colors of the elements with atomic numbers from 1 to 10. For the following atomic numbers, greater than or equal to 11, the **trailing color** will be used in the color background.*


✦ Designing a color scheme with [pgfPTcolorSchemes.html](#)

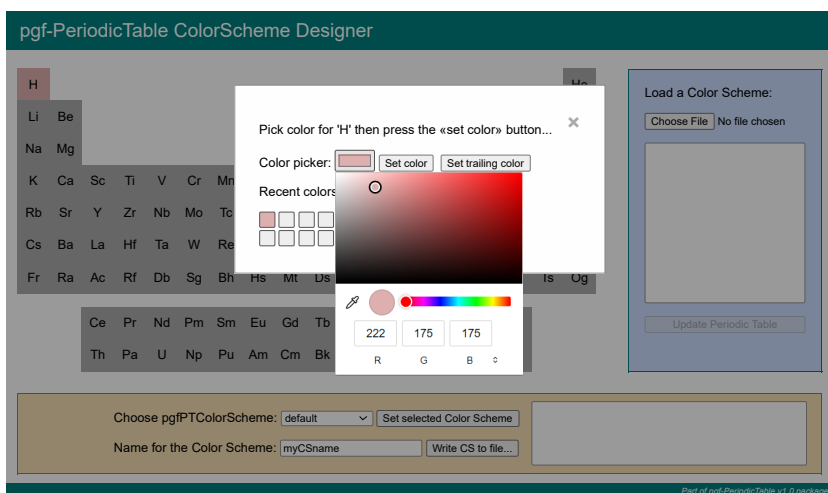


The [pgfPTcolorSchemes.html](#) designer is an *html* file with a little *javascript* code to perform the task of building a color scheme to use with the `back color scheme` key associated with the `\pgfPT` command.

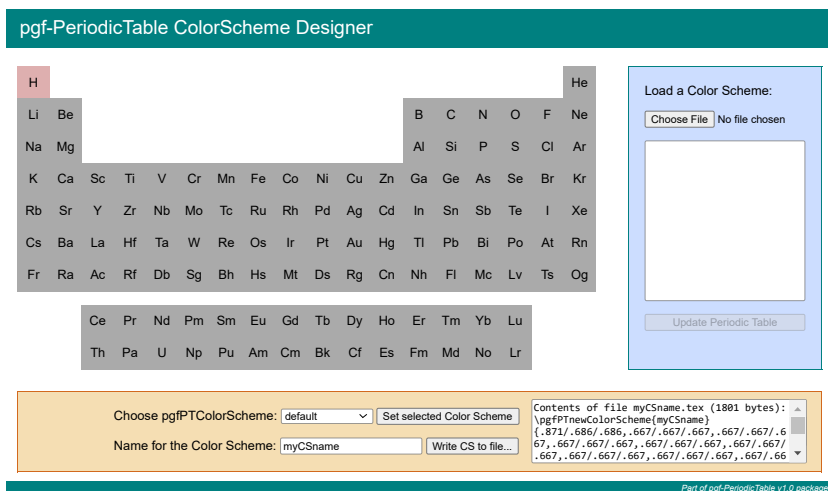
The Periodic Table of the Elements is displayed on the page and clicking on an element opens a color dialog:



Clicking on the Color picker:  button opens a color dialog, where there is the possibility to choose the desired color or manually enter one color using one of the three models available (RGB, HSL or HEX):



After changing the desired colors it is possible to save the color scheme in a file by clicking on **Write CS to file...**:

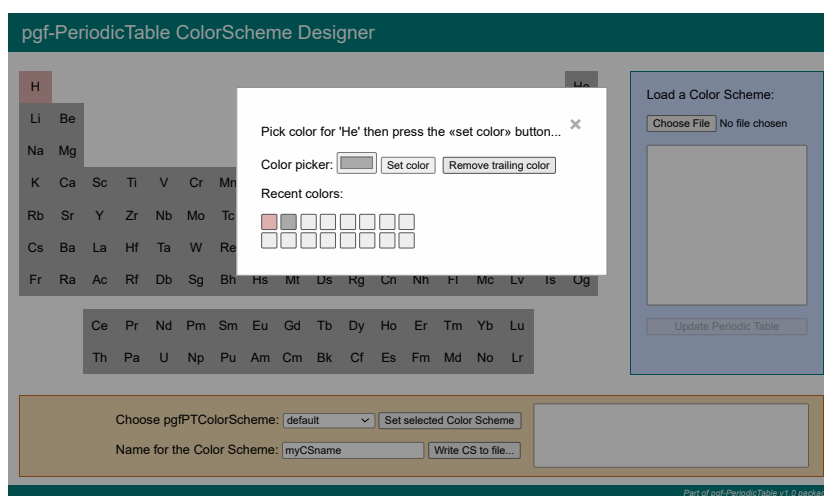


To use a color scheme saved in a file there are two possible ways:

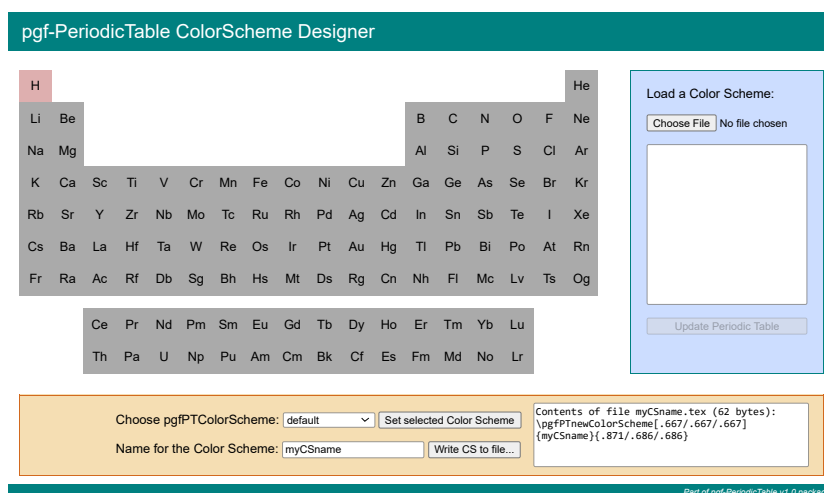
- loading the file in the working document via the \input \LaTeX command, for instance, $\input{myCSname.tex}$.
- or by opening the file and copying and pasting its contents into the working document.

In either case, the operation can be performed at any location in the document, but before the named color scheme is used.

Note that in the previous example there is only one color that has been defined (for hydrogen). In that case, it is useful to set the trailing color in helium by clicking in **Set trailing color** (which automatically changes to **Remove trailing color**). After that only the hydrogen and helium are clickable, all the other elements are locked to click:



Then the saved color scheme will have the optional trailing color and the size will be smaller as only the color codes of the changed elements are stored:



To remove the trailing color click on the last enabled element (in the above case helium) and then click on **Remove trailing color**. After that, all elements can be clicked again.

It is also possible to load a color scheme saved to a file by clicking on **Choose File** and then clicking on **Update Periodic Table** for the color scheme to take effect:

pgf-PeriodicTable ColorScheme Designer

Choose pgfPTColorScheme: default Set selected Color Scheme

Name for the Color Scheme: myCSname Write CS to file...

Load a Color Scheme:

Choose File CSTemp.tex

```

\pgfPtnewColorScheme[0.5/.25/.333]{(colortest)}
{1/0.5987,.5/.33/0.25,.25/.25/.57}
    
```

Update Periodic Table

Part of pgf-PeriodicTable v1.0 package

Finally its possible to load a built-in color scheme by choosing a named *pgfPTColorScheme* in the corresponding combo box and then clicking on **Set selected Color Scheme**:

pgf-PeriodicTable ColorScheme Designer

Choose pgfPTColorScheme: Soft Set selected Color Scheme

Name for the Color Scheme: myCSname Write CS to file...

Load a Color Scheme:

Choose File No file chosen

Update Periodic Table

Part of pgf-PeriodicTable v1.0 package

All the operations described are always available.

Libraries

In this part the library packages are documented. They provide additional commands to extend the capabilities provided by this package out of the box. The libraries are not loaded by default since many users will not need them.

► Color Schemes Library

pgf-PeriodicTable Library `colorschemes`

USAGE: `\usepgfPTlibrary{colorschemes}`

This library extends the features provided by the command `\pgfPTnewColorScheme`. It defines a set of commands that automatically generate a new color scheme.

- `\pgfPTGroupColors{name of the new color scheme}{list of colors,options}`
- `\pgfPTPeriodColors{name of the new color scheme}{list of colors,options}`
- `\pgfPTCScombine[proportion,mode]{name of the first color scheme,name of the second color scheme,name of the new color scheme}`
- `\pgfPTCSwrite[filename]{list of color schemes names}`

Color arguments for this library's commands can use both the base package syntax – `namedColor` or `namedColorA!##!namedColorB<!##><!named...>` – or any color model supported by the `xcolor` package^a using the *special syntax* `*[model:values]`, e.g., `*[rgb:.5;.2;.3]` or `*[cmyk:.5;.2;.3;.3]` or `*[HTML:5FA287]`. **The values for the individual color components of a color specified this way must be separated by semicolons instead of commas**, except for the HTML, Gray and wave color models as explained in the `xcolor` package.

^aSee Table 3: Supported color models on page 10 of the documentation of `xcolor` v2.14 2022/06/12

►►► `\pgfPTGroupColors[default group color]{name of the new color scheme}{list of colors,options}`

This command **creates a Color Scheme** with the name `name of the new color scheme`. **Group colors** can be configured in three different ways:

- ✓ **setting the colors one by one**, using the *key=value* mechanism in the *list of colors*. For example:

```
\pgfPTGroupColors{name of the new color scheme}%
{G1=red,G2=red!50,G3=orange,<...>,G18=blue,options}
```

This will set the specified color for each group. If no color is specified for a group, default group color will be used.

NOTE: default group color is initially set to white.

- ✓ **defining a gradient** using the keys *left color=<color>*, *middle color=<color>* and *right color=<color>* as the *list of colors*. Note that all the keys are optional, but at least one of them is required. This produces a gradient starting from group 1, with *left color*, to group 18, with *right color*. If the *middle color* key is used then the gradient starts at group 1 with *left color*, goes to the middle position of the groups (between groups 9 and 10) with *middle color* and ends at group 18 with *right color*. For example:

```
\pgfPTGroupColors{name of the new color scheme}%
{left color=red,right color=blue,options}
```

defines a gradient from red (group 1) to blue (group 18).

- ✓ **defining a custom gradient** as the *list of colors* by using the *key=value* mechanism inside the *gradient* key. For example:

```
\pgfPTGroupColors{name of the new color scheme}%
{gradient={G1=red,G4=red!50,G18=blue},options}
```

defines a gradient from red (group 1) to red!50 (group 4) and to blue (group 18).

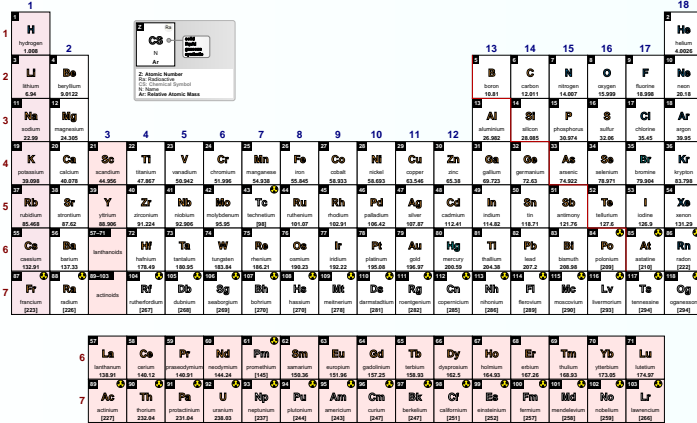
The *options* available to this command are:

- ✓ *H=<color>*, sets the color of the *hydrogen* cell. If not set, group 1's color will be used. If set, the color of the *hydrogen* cell won't be affected by period blending.
- ✓ *La=<color>*, sets the color of the *lanthanum* cell. If not set, group 3's color will be used.
- ✓ *Lanta=<color>*, sets the color of the *lanthanoids* cells. If not set, *lanthanum's* color will be used.
- ✓ *Ac=<color>*, sets the color of the *actinium* cell. If not set, group 3's color will be used.
- ✓ *Actin=<color>*, sets the color of the *actinoids* cells. If not set, *actinium's* color will be used.
- ✓ *period blending={color=<color>, percentage=<positive or negative integer>, mode=<add|sub|linear>}*, performs a *mode* blend over the periods up to the specified percentage with the provided color.

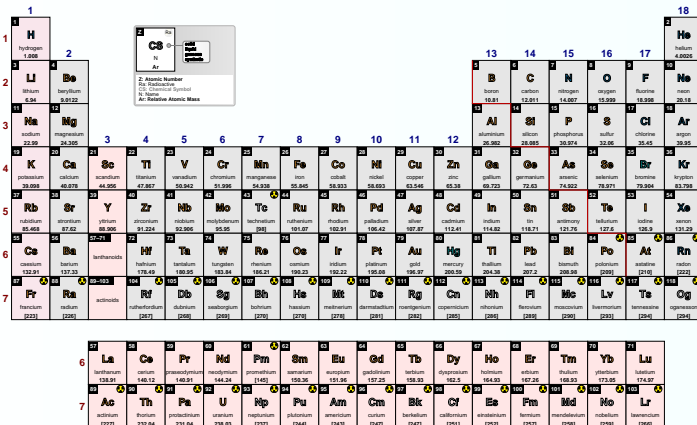
NOTES:

- ✓ *percentage* refers to how much of the color, in total, was mixed over the 7 periods. For example 60% adds 10% to each period: P1▶0% ~> P2▶10% ~> P3▶20% ~> ... ~> P7▶60%. If the percentage is positive, the mixing is done in descending order (from P1 to P7); if the percentage is negative, the mixing is done in ascending order (from P7 to P1).
- ✓ The *mode's* values are *add* for *additive* blending, *sub* for *subtractive* blending and *linear* for *linear* blending (as in the `xcolor` package).
- ✓ **If *period blending* is used without further options** all the default values are used, so *period blending* is equivalent to *period blending={color=white,percentage=60,mode=linear}*.
- ✓ None of the keys *color*, *percentage* and *mode* are mandatory. If omitted the default value is used.

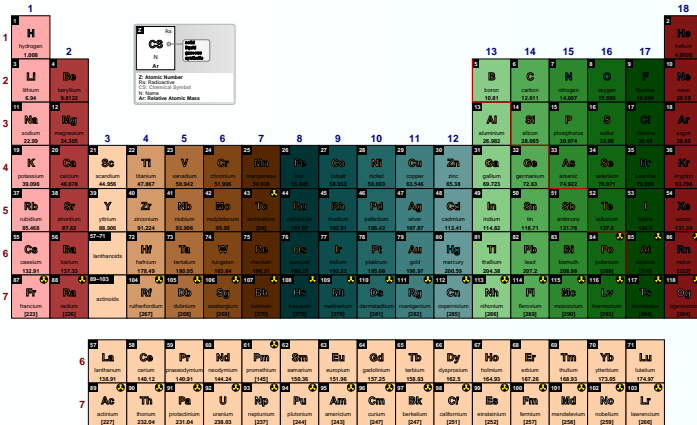
```
\pgfPTGroupColors{example}{G1=purple!10,G3=red!10}
\pgfPT[back color scheme=example,show title=false]
```



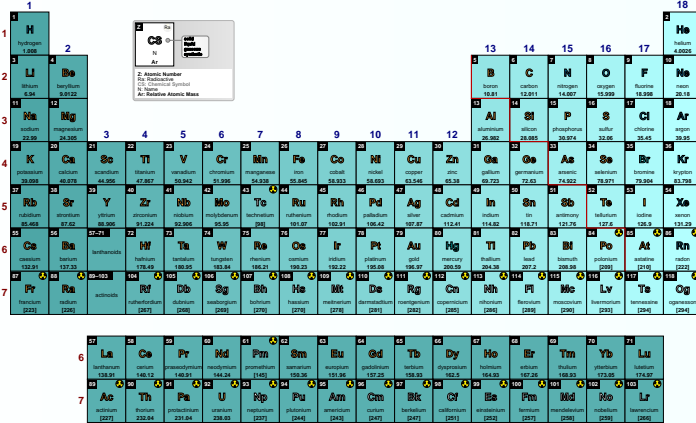
```
\pgfPTGroupColors[black!10]{example}{G1=purple!10,G3=red!10}
\pgfPT[back color scheme=example,show title=false]
```



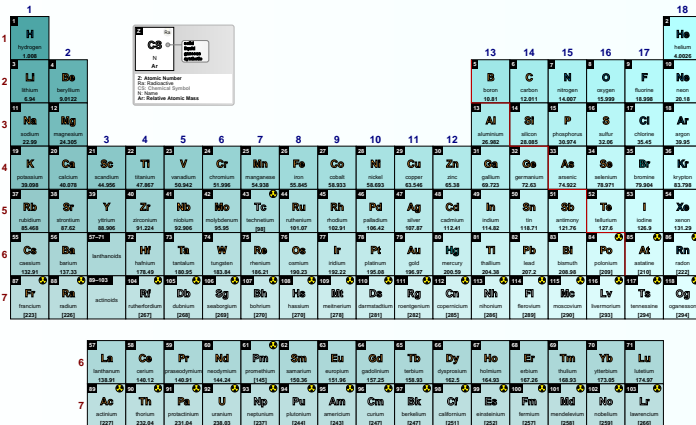
```
\pgfPTGroupColors{example}{G1=*[HTML:FFAAA],G2=*[HTML:AA3939],
G3=*[HTML:FFD1AA],G4=*[HTML:D49A6A],G5=*[HTML:AA6C39],
G6=*[HTML:804515],G7=*[HTML:552700],G8=*[HTML:003333],
G9=*[HTML:0D4D4D],G10=*[HTML:226666],G11=*[HTML:407F7F],
G12=*[HTML:669999],G13=*[HTML:88CC88],G14=*[HTML:55AA55],
G15=*[HTML:2D882D],G16=*[HTML:116611],G17=*[HTML:004400],
G18=*[HTML:801515] }
\pgfPT[back color scheme=example,show title=false]
```



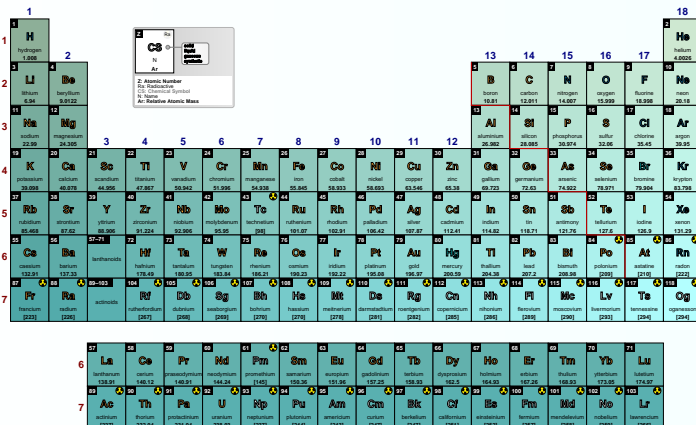
```
\pgfPTGroupColors{example}{left color=teal!70,right color=cyan!30}
\pgfPT[back color scheme=example,show title=false]
```



```
\pgfPTGroupColors{example}{left color=teal!70,right color=cyan!30,period blending}
\pgfPT[back color scheme=example,show title=false]
```



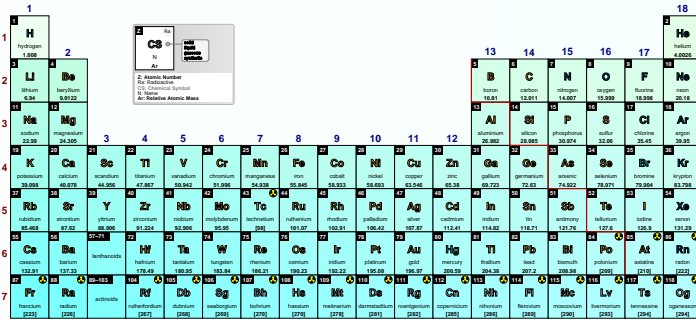
```
\pgfPTGroupColors{example}{left color=teal!70,right color=cyan!30,
period blending={color=orange!50,percentage=-40}}
\pgfPT[back color scheme=example,show title=false]
```



```

\pgfPTGroupColors{example}{left color=teal!70,right color=cyan!30,
period blending={color=orange!50,percentage=-40,mode=add},
H={*[cmymk:.071,0,.055,.035]}
\pgfPT[back color scheme=example,show title=false]

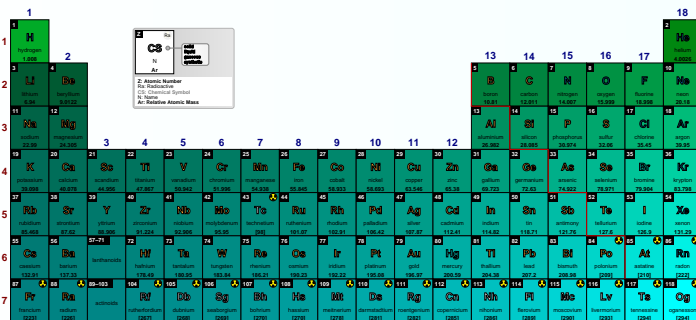
```



```

\pgfPTGroupColors{example}{left color=teal!70,right color=cyan!30,
period blending={color=orange!50,percentage=-40,mode=sub},
H={*[cmymk:.071;0;.055;.035]}
\pgfPT[back color scheme=example,show title=false]

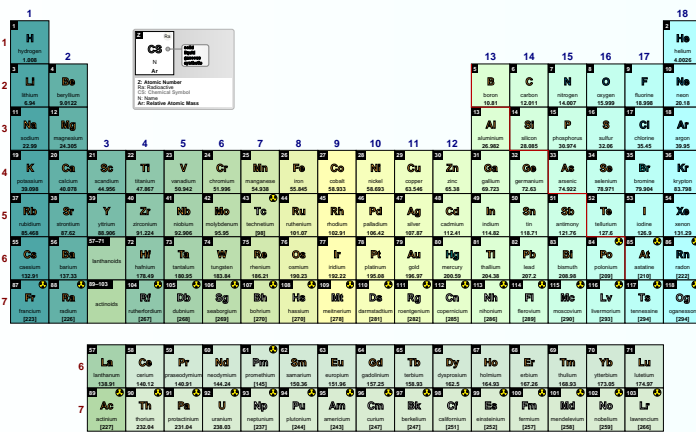
```



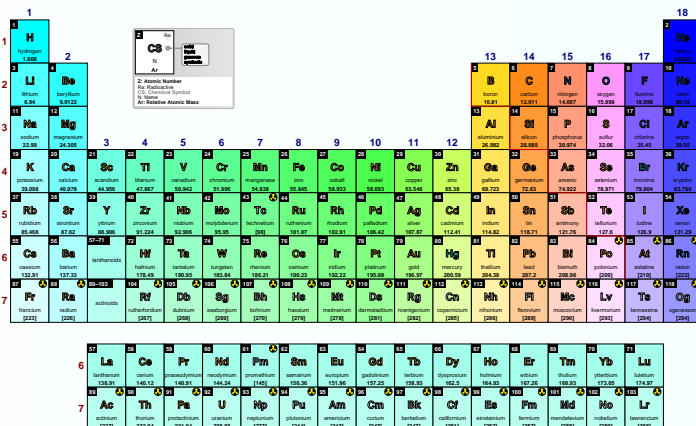
```

\pgfPTGroupColors{example}{left color=teal!70,middle color=yellow!30,right
color=cyan!30,La=teal!70!yellow!50,Ac=teal!60!yellow!50,
Lanta=teal!70!yellow!50!white!50,Actin=teal!60!yellow!50!white!50}
\pgfPT[back color scheme=example,show title=false]

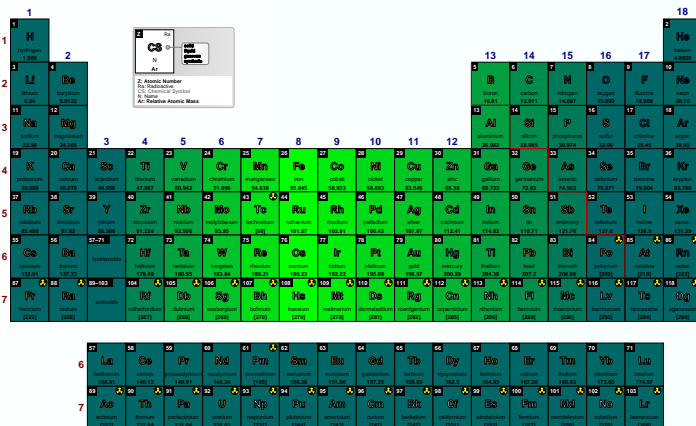
```



```
\pgfPTGroupColors{example}{gradient={G1=teal!50!black,G2=teal,G10=green,
G14=orange,G18=blue},period blending={mode=add}}
\pgfPT[back color scheme=example,show title=false]
```



```
\pgfPTGroupColors{example}{gradient={G3=teal!80!black,G16=teal!80!black,
G8=green}}
\pgfPT[back color scheme=example,show title=false]
```



Note: the group numbers can be specified in any order and the gradient can start or end in any group. In this example, the smallest group number is 3 and the greatest is 16, so the gradient is built from group 3 to group 16 and the colors from group 1 to 3 are equal to group 3's color, just like the colors from group 16 to 18 are equal to group 16's color.

```
⇒ \pgfPTPeriodColors[default period color]{name of the new color scheme}{list of
colors,options}
```

This command **creates a Color Scheme** with the name **name of the new color scheme**. **Period colors** can be configured in three different ways:

- ✓ **setting the colors one by one**, using the *key=value* mechanism in the list of colors. For example:

```
\pgfPTPeriodColors{name of the new color scheme}%
{P1=red,P2=red!50,<...>,P7=blue,options}
```

This will set the specified color for each period. If no color is specified for a period,

default period color will be used.

NOTE: default period color is initially set to white.

- ✓ **defining a gradient** using the keys `top color=<color>`, `middle color=<color>` and `bottom color=<color>` as the *list of colors*. Note that all the keys are optional, but at least one of them is required. This produces a gradient starting from period 1, with *top color*, to period 7, with *bottom color*. If the *middle color* key is used then the gradient starts at period 1 with *top color*, goes to the middle position of the periods (period 4) with *middle color* and ends at period 7 with *bottom color*. For example:

```
\pgfPTPeriodColors{name of the new color scheme}%
{top color=red,middle color=yellow,bottom color=blue,options}
```

defines a gradient from red (period 1) to yellow (period 4) and from yellow (period 4) to blue (period 7).

- ✓ **defining a custom gradient** as the *list of colors* by using the *key=value* mechanism inside the `gradient` key. For example:

```
\pgfPTPeriodColors{name of the new color scheme}%
{gradient={P1=red,P3=red!50,P7=blue},options}
```

defines a gradient from red (period 1) to red!50 (period 3) and to blue (period 7).

The *options* available to this command are:

- ✓ `H=<color>`, sets the color of the *hydrogen* cell. If not set, period 1's color will be used. If set, the color of the *hydrogen* cell won't be affected by group blending.
- ✓ `La=<color>`, sets the color of the *lanthanum* cell. If not set, period 6's color will be used.
- ✓ `Lanta=<color>`, sets the color of the *lanthanoids* cells. If not set, *lanthanum's* color will be used.
- ✓ `Ac=<color>`, sets the color of the *actinium* cell. If not set, period 7's color will be used.
- ✓ `Actin=<color>`, sets the color of the *actinoids* cells. If not set, *actinium's* color will be used.
- ✓ `group blending={color=<color>, percentage=<positive or negative integer>, mode=<add|sub|linear>}`, performs a *mode* blend over the groups up to the specified percentage with the provided color.

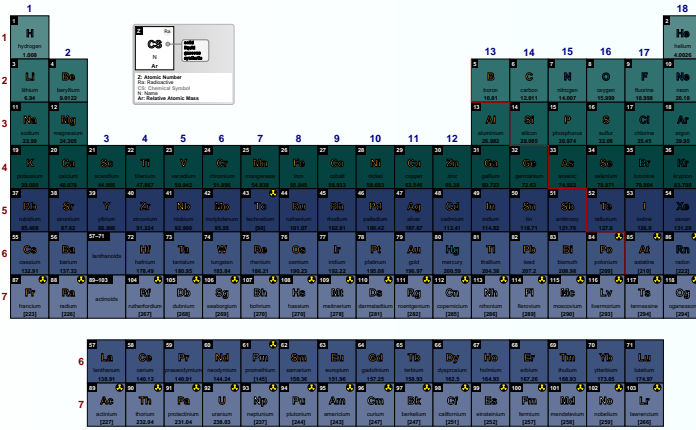
NOTES:

- ✓ *percentage* refers to how much of the color, in total, was mixed over the 18 groups. For example 68% adds 4% to each period: G1▶0% ↔ G2▶4% ↔ G3▶8% ↔ ... ↔ G18▶68%. If the percentage is positive, the mixing is done from left to right (from G1 to G18); if the percentage is negative, the mixing is done from right to left (from G18 to G1).
- ✓ The *mode's* values are *add* for *additive* blending, *sub* for *subtractive* blending and *linear* for *linear* blending (as in the `xcolor` package).
- ✓ **If group blending is used without further options** all the default values are used, so *group blending* is equivalent to `group blending={color=white,percentage=68,mode=linear}`.
- ✓ None of the keys *color*, *percentage* and *mode* are mandatory. If omitted the default value is used.

```

\pgfPTPeriodColors{example}{P1=*[RGB:86;139;137],P2=*[RGB:49;114;112],
P3=*[RGB:23;91;88],P4=*[RGB:5;67;64],P5=*[RGB:35;54;100],
P6=*[RGB:62;82;126],P7=*[RGB:101;117;153]}
\pgfPT[back color scheme=example,show title=false]

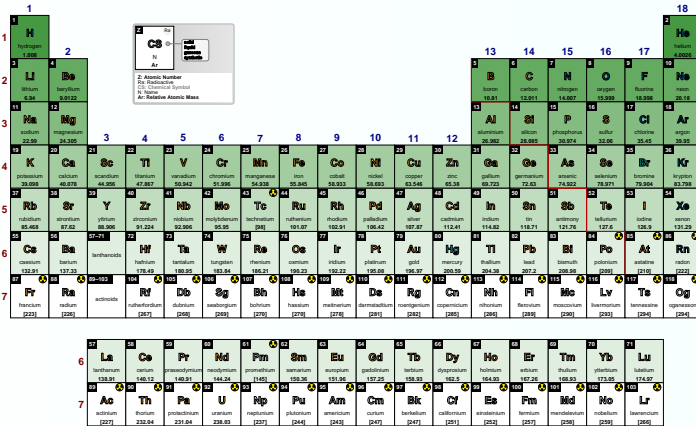
```



```

\pgfPTPeriodColors{example}{top color=*[Hsb:117;.57;.6]}
\pgfPT[back color scheme=example,show title=false]

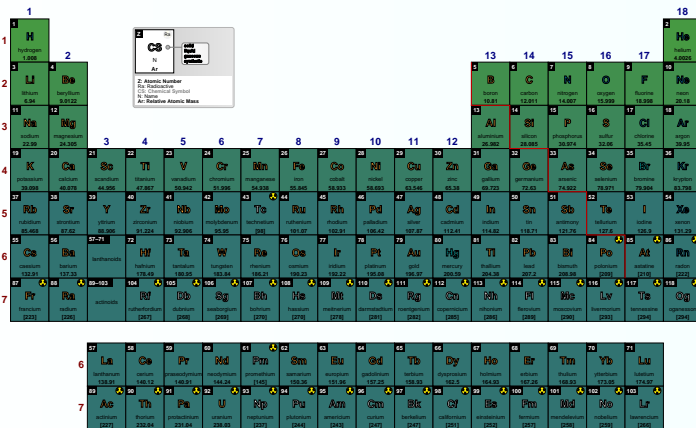
```



```

\pgfPTPeriodColors{example}{gradient={P1=*[Hsb:117;.57;.6],
P5=*[Hsb:178;.57;.45]}
\pgfPT[back color scheme=example,show title=false]

```



```
\pgfPTCScombine[prop1:prop2,mode]{name of color scheme one,name of color scheme two,name of the new color scheme}
```

This command **combines two named Color Schemes** and merges the result in a new Color Scheme with *name of the new color scheme*.

For example `\pgfPTCScombine{myCSA,myCSB,myCSC}` adds the color scheme *myCSA* to the color scheme *myCSB* and their sum will be available as the color scheme *myCSC*.

NOTE: if the Color Schemes have different sizes (*i.e.*, different number of colors), the last color from the color scheme that ends first will be used until the other color scheme also ends.

The optional parameters [*prop1:prop2,mode*] are for controlling how the two Color Schemes are combined:

- ✓ The first parameter – *prop1:prop2* – controls the proportions used to mix the color schemes: *prop1* parts of *name of color scheme one* and *prop2* parts of *name of color scheme two*. Both *prop1* and *prop2* must be integer values between 1 and 999.

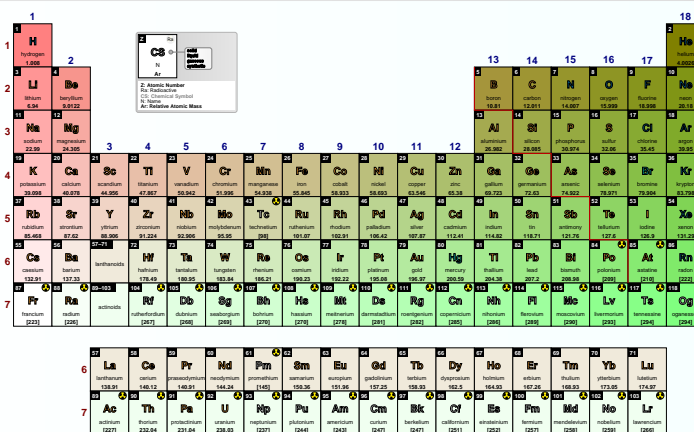
NOTE: default proportion is 1:1.

For example, *1:4* will mix each color in the ratio of 1 to 4, *i.e.*, the *n*th-color from the first color scheme is used as 1/5 of the mixed color and the *n*th-color from the second color scheme is used as 4/5 of the mixed color.

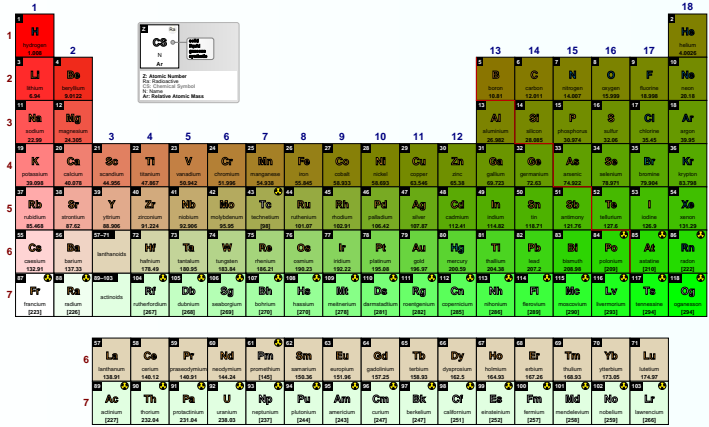
- ✓ The *mode* refers to how the colors are mixed: use *add* for *additive* mixing, *sub* for *subtractive* mixing and *linear* for *linear* mixing (as in the *xcolor* package).

NOTE: default mode is *linear*.

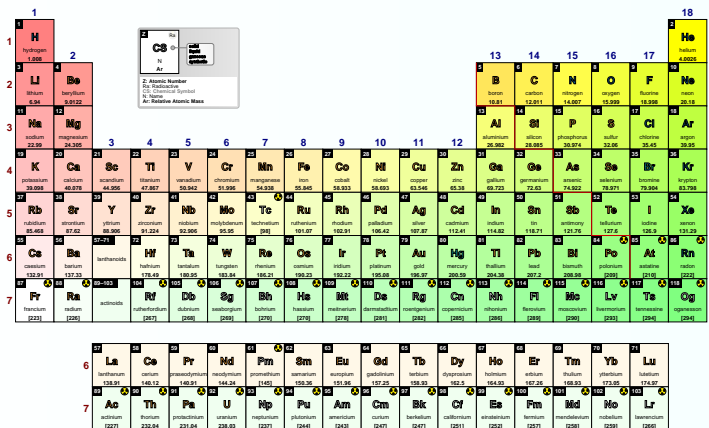
```
\pgfPTPeriodColors{period}{top color=red}
\pgfPTGroupColors{group}{right color=green}
\pgfPTCScombine{period,group,mix}
\pgfPT[back color scheme=mix,show title=false]
```



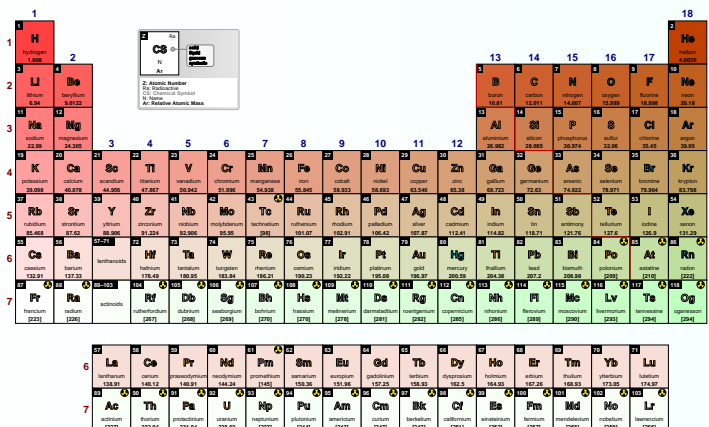

```
\pgfPTCScombine[sub]{period,group,mix}
\pgfPT[back color scheme=mix,show title=false]
```



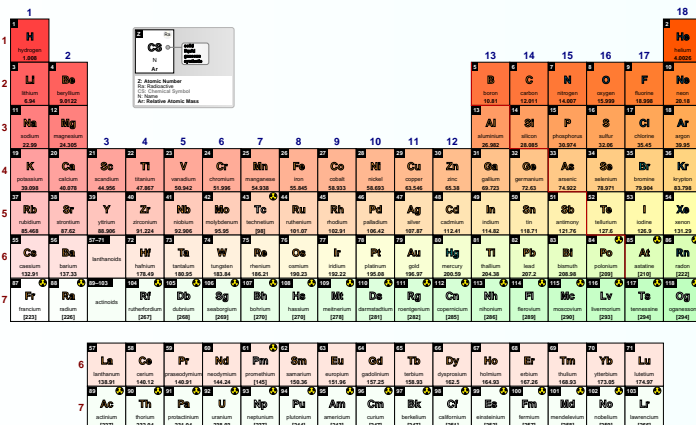
```
\pgfPTCScombine[add]{period,group,mix}
\pgfPT[back color scheme=mix,show title=false]
```



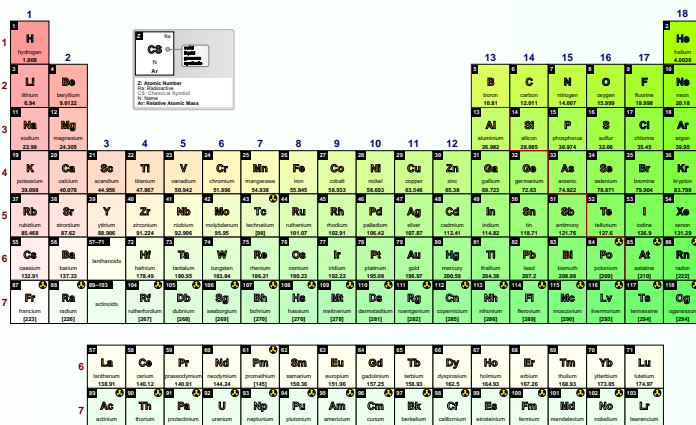
```
\pgfPTCScombine[3:1]{period,group,mix}
\pgfPT[back color scheme=mix,show title=false]
```



```
\pgfPCTSCombine[3:1,add]{period,group,mix}
\pgfPT[back color scheme=mix,show title=false]
```

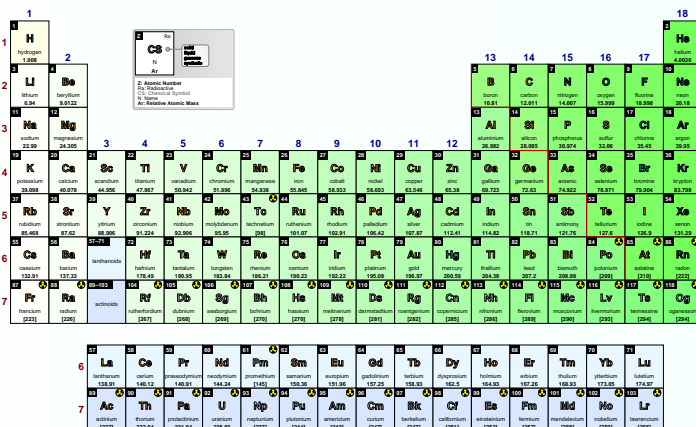


```
\pgfPCTSCombine[add,2:3]{period,group,mix}
\pgfPT[back color scheme=mix,show title=false]
```

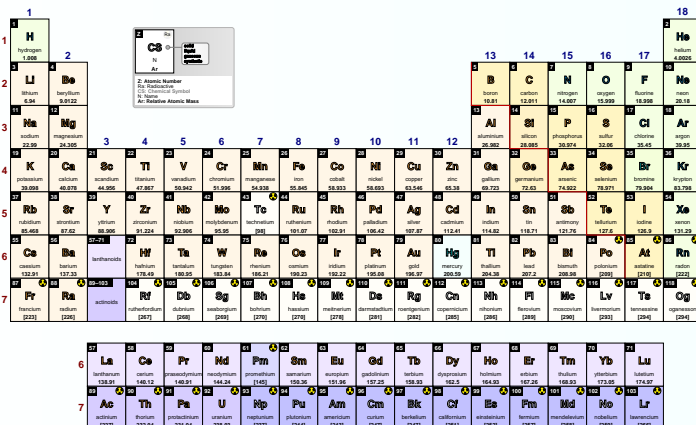


Built-in color schemes can also be mixed:

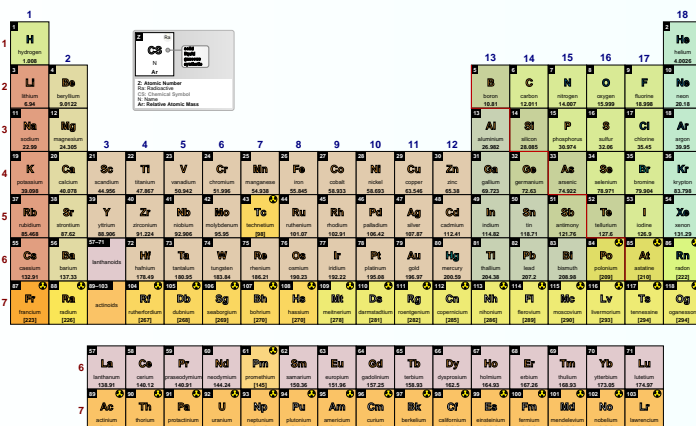
```
\pgfPCTSCombine[add]{Soft,group,mix}
\pgfPT[back color scheme=mix,show title=false]
```



```
\pgfPTCScombine[add,3:1]{Soft,PS,mix}
\pgfPT[back color scheme=mix,show title=false]
```



```
\pgfPTCScombine[add]{Radio,Wikipedia,mix}
\pgfPT[back color scheme=mix,show title=false]
```



```
\pgfPTCSwrite[filename]{list of color schemes names}
```

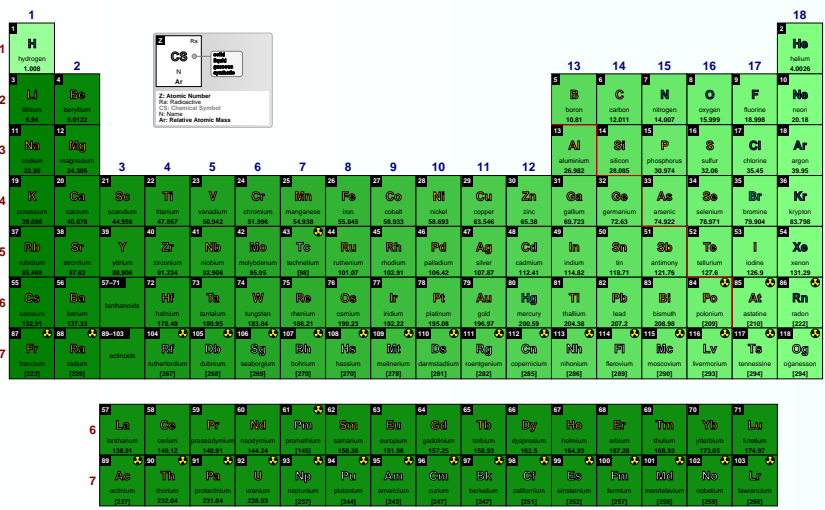
This command **writes the provided Color Schemes to a file** for later use without loading this library. It has a mandatory argument, the **list of the color schemes names** to be written and an optional argument, the **filename**. If no **filename** is provided the first name on the **list of the color schemes names** is used. For example, `\pgfPTCSwrite[myGroupColors]{myGroupGradGreenToRed,myGroupGreens,myGroupGradYellowToRed}`, will create (or overwrite), in the current working directory, a file with name `myGroupColors.tex` with the following contents:

```
\pgfPTnew ColorScheme{my GroupGradGreenToRed}{0/1/0,...}
\pgfPTnew ColorScheme{my GroupGreens}{0/1/.1,...}
\pgfPTnew ColorScheme{my GroupGradYellowToRed}{1/1/0,...}
```

After that, it's possible to use `\input{myGroupColors.tex}`, anywhere in any document (in the same working directory). The named color schemes defined in the loaded file are now available for use as usual:

```
\pgfPTPeriodColors{myGroupGradGreenToRed}{gradient={G1=green!50!black,
G18=red!30!black},H=green!40!white}
\pgfPTPeriodColors{myGroupGreens}{gradient={G1=green!50!black,
G18=green!50!white},H=green!40!white}
\pgfPTPeriodColors{myGroupGradYellowToRed}{gradient={G1=yellow!50!white,
G18=red!30!black},H=yellow!40!white}
\pgfPTCSwrite[myGroupColors]{myGroupGradGreenToRed,myGroupGreens, myGroup-
GradYellowToRed}
```

```
%\usepgfPTlibrary{color schemes}
\input{myGroupColors.tex}%
\pgfPT[back color scheme=myGroupGreens,show title=false]
```

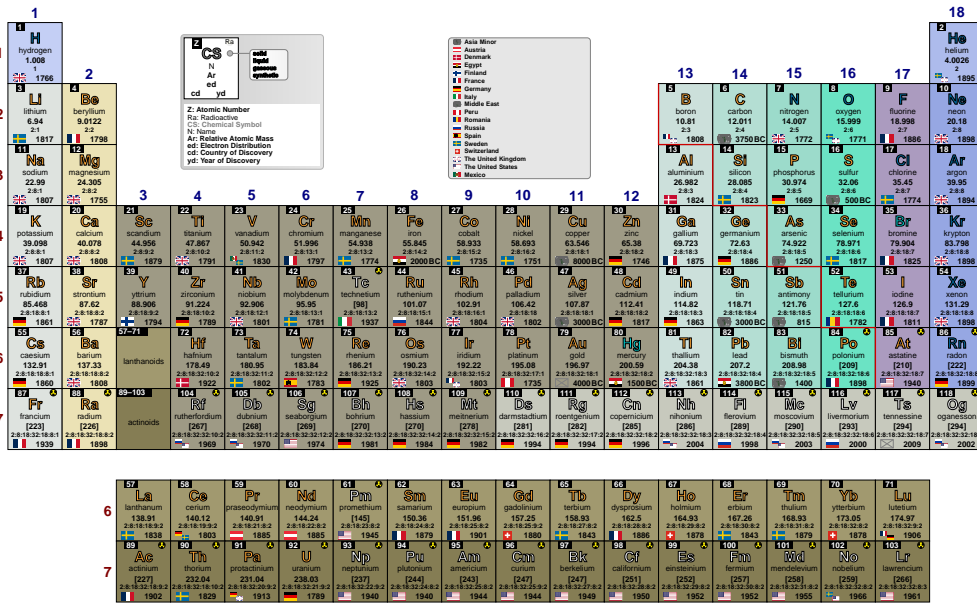


A few more examples

The following examples could be used for students or for any other purposes.

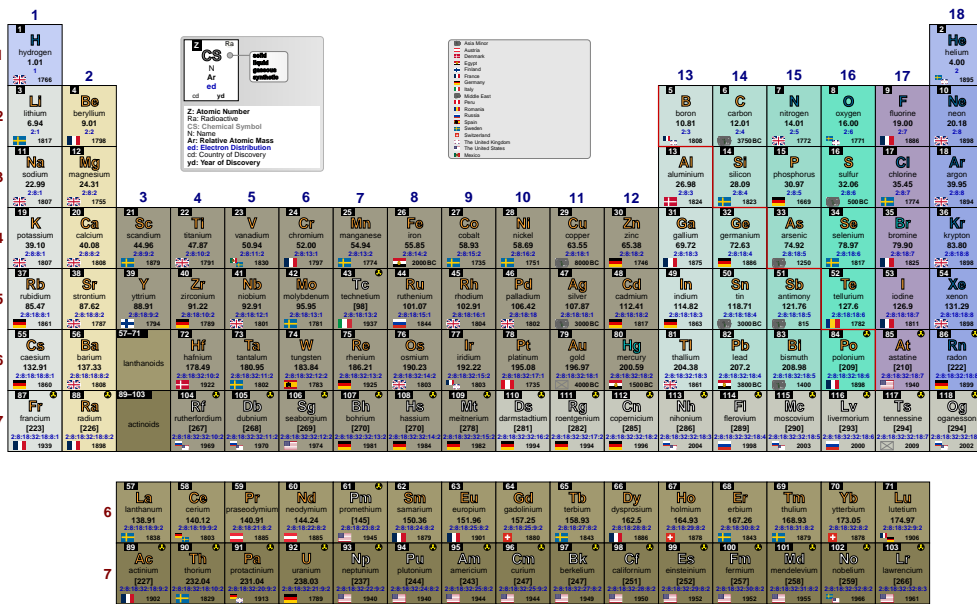
```
\pgfPTbuildcell(8,3)% 8 rows by 3 columns
[(1;1.4-2.8;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4.2;1-3;name),
(5.4;1-3;Ar),(6.5;1-3;eDist),(7.55-8.95;1-2.25;DiscC),(7.55-8.95;2.25-3.8;DiscY)]
\pgfPT
```

Periodic Table of Elements

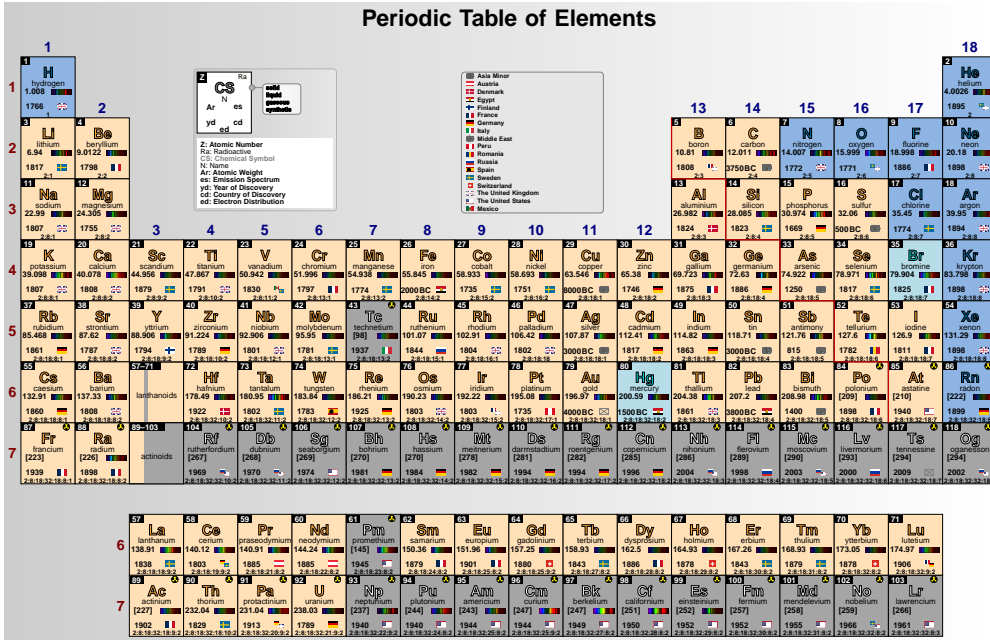


```
\pgfPT[eDist color=blue!70!black,Ar precision=2,DiscC
font=\fontsize{4}{4}\selectfont,DiscY font=\fontsize{4}{4}\selectfont\bfseries]
```

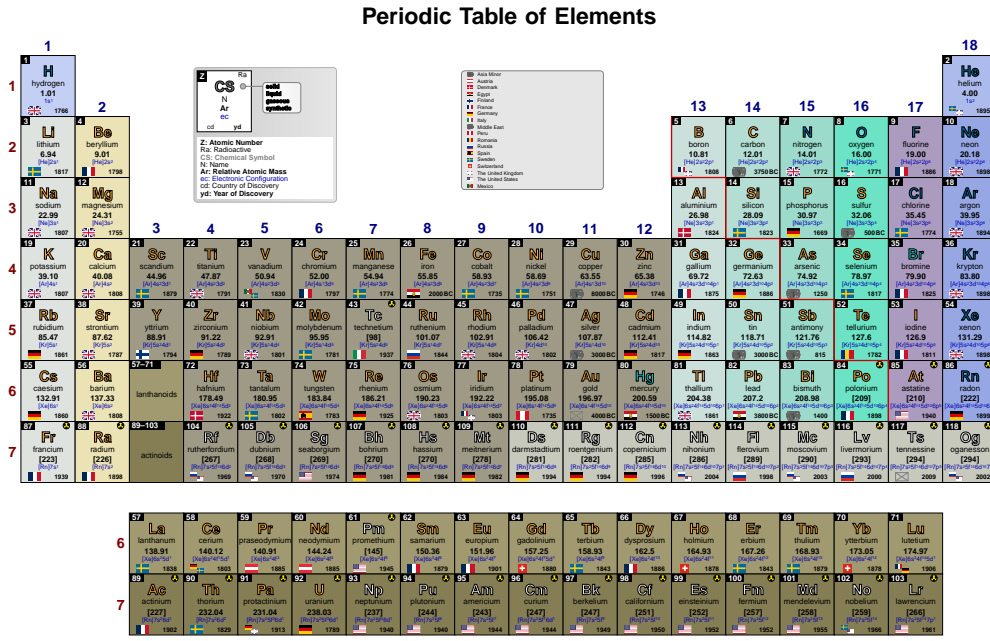
Periodic Table of Elements



```
\pgfPTbuildcell(8,3)% 8 rows by 3 columns
[(1;1-2;Z),(1;3;radio),(2-3;1-3;CS),(4;1-3;name),(5;1-2.5;Ar),(5;2.5-3;spectra),
(7;1-2.5;DiscY),(7;2.5-3;DiscC),(8;1-3;eDist)]
\pgfPT[csPS,Ar label=w,background={left color=black!20}]
```



```
\pgfPTbuildcell(8,3)% 8 rows by 3 columns
[(1;1-3;Z),(1;3;radio),(2-3;1.5-3.5;CS),(4.2;1-3;name),(5.4;1-3;Ar),
(6.5;1-3;eConfigl),(7.55-8.95;1-2.45;DiscC),(7.55-8.95;2.45-3;DiscY)]
\pgfPT[eConfigl color=blue!70!black,Ar precision=2,DiscC
font=\fontsize{4}{4}\selectfont,DiscY font=\fontsize{4}{4}\selectfont\bfseries]
```



```
\usepgfPTlibrary{colorschemes}
\pgfPTPeriodColors{period}{P5=red!20}
\pgfPTGroupColors{group}{G14=green!20}
\pgfPTCScombine{period,group,mix}
\pgfPT[back color scheme=mix,show title=false]
```

1																	18		
1	H																	He	
2	Li	Be											B	C	N	O	F	Ne	
3	Na	Mg											Al	Si	P	S	Cl	Ar	
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
6	Cs	Ba	lanthanoids		Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
7	Fr	Ra	actinoids		Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
6	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu				
7	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr				

In the Periodic Table, a row is called a **period** and a column is called a **group**.

Representative elements: element families 

For the **representative elements** (groups **1**, **2** and **13** to **18**) it is common to speak of families that reflect their common characteristics. So we have **the families**:



1	Li
2	Na
3	K
4	Rb
5	Cs
6	Fr

GROUP 1: Alkali metals

► *lithium, sodium, potassium, rubidium, cesium and francium.*

The atoms of these elements **have only one valence electron.**

- ✓ They react violently with water to form hydroxides.
- ✓ They have a silver-gray color, with the exception of cesium, which has a golden hue.



2	Be
3	Mg
4	Ca
5	Sr
6	Ba
7	Ra

GROUP 2: Alkaline earth metals

► *beryllium, magnesium, calcium, strontium, barium and radium.*

The atoms of these elements **have two valence electrons.**

- ✓ Their oxides remain solid at high temperatures and form alkaline solutions.
- ✓ They react violently with water to form hydroxides.
- ✓ When they burn, they have reddish flames, excluding barium, which presents a greenish flame.



13	B
13	Al
13	Ga
13	In
13	Tl
13	Nh

GROUP 13: Boron group

► *boron, aluminium, gallium, indium, thallium and nihonium.*

The atoms of these elements **have three valence electrons.**

- ✓ Boron is a metalloid and the other are metals.
- ✓ Boron, aluminium, gallium, indium and thallium are often used as p-type silicon dopants.
- ✓ Aluminium is the third most abundant element in the Earth's crust (7.4%)



14	C
14	Si
14	Ge
14	Sn
14	Pb
14	Fl

GROUP 14: Carbon group

► *carbon, silicon, germanium, tin, lead and flerovium.*

The atoms of these elements **have four valence electrons.**

- ✓ Carbon is a non-metal, silicon and germanium are metalloids, and tin and lead are metals.
- ✓ Silicon and germanium are used in semiconductors.

GROUP 15: Pnictogens

► *nitrogen, phosphorus, arsenic, antimony, bismuth and moscovium.*

The atoms of these elements **have five valence electrons**.

- ✓ Nitrogen and phosphorus are non-metals, arsenic and antimony are metalloids and bismuth is a metal.
- ✓ Phosphorus, arsenic, antimony and bismuth are often used as n-type silicon dopants.
- ✓ Diatomic nitrogen is the main constituent of the Earth's atmosphere (78%).

GROUP 16: Chalcogens

► *oxygen, sulfur, selenium, tellurium, polonium and livermorium.*

The atoms of these elements **have six valence electrons**.

- ✓ Oxygen, sulfur and selenium are non-metals, tellurium is a metalloid and polonium is a metal.
- ✓ Diatomic oxygen is the second constituent of the Earth's atmosphere (21%).

GROUP 17: Halogens

► *fluorine, chlorine, bromine, iodine, astatine and tennessine.*

The atoms of these elements **have seven valence electrons**.

- ✓ They are extremely reactive elements, as they are very electronegative.
- ✓ Fluorine is able to *attack* inert substances, including the heavier noble gas atoms.

GROUP 18: Noble gases

► *helium, neon, argon, krypton, xenon, radon and oganesson.*

The atoms of these elements have the valence shell fully filled, which corresponds to **eight valence electrons**, with the exception Helium, which has only one shell and, consequently, has **two valence electrons**.

- ✓ They are extremely inert elements, that is, they do not react with other elements, as they are the most stable elements in Nature.

EXERCISE:

In the following scheme of the Periodic Table, the positions of some chemical elements are represented by letters:

THE LETTERS DO NOT CORRESPOND TO THE CHEMICAL SYMBOLS OF THE ELEMENTS.

A																B
C	D															E
	F														G	H
I	J					K	L					M	N	O		
												P				Q
						R										S
T																

Using the letters shown:

1. identify group 2 elements of the Periodic Table.
2. identify the elements of the 2nd period of the Periodic Table.
3. identify group 17 elements of the Periodic Table.
4. identify the elements of s-block.
5. identify the elements of p-block.
6. identify the elements of d-block.
7. identify the metallic elements.
8. identify the non-metallic elements.
9. identify the transition metals.
10. identify the alkaline earth metals.
11. identify the noble gases.
12. tell which element belongs, simultaneously, to the 4th period and to group 14.
13. identify the representative elements that tend to generate positive ions.
14. indicate an element that forms bivalent ions.
15. indicate the halogen whose mononegative ion has the largest radius.
16. write the chemical formula of the compound formed by the elements **F** and **O**.
17. identify, justifying, the element with the largest atomic radius.
18. identify, justifying, the element with the lowest 1st ionization energy.

For the source of this example please see the file pgf-PeriodicTableManual_Examples.tex

EXERCISE:

Using the following notation,



for the elements in the gaseous state (NTP),



for the elements in the liquid state (NTP) and



for the synthetic elements,

fill in the following Periodic Table:

For the source of this example please see the file `pgf-PeriodicTableManual_Examples.tex`

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