ELEMENTS

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properties of chemical elements

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This package provides means for retrieving properties of chemical elements like atomic number, element symbol, element name, electron distribution or isotope number. Properties are defined for the elements up to the atomic number 112.

This package is a spin-off of the package bohr [Nie15] by the same author.

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1 Licence and Requirements

Permission is granted to copy, distribute and/or modify this software under the terms of the LaTeX Project Public License (LPPL), version 1.3 or later (http://www.latex-project.org/lppl.txt). The software has the status "maintained."

ELEMENTS loads the packages etoolbox [LW15] and translations [Nie13].

2 Element Names

\elementname{⟨*atomic number*⟩|⟨*element symbol*⟩}

Prints the element name of a given element as defined with \setatomname.

\setatomname[⟨alt. name⟩]{⟨atomic number⟩}{⟨element name⟩}
Define or redefine the name of an element. If ⟨element name⟩ contains non-ascii symbols the optional argument ⟨alt. name⟩ must be given. In this case ⟨alt. name⟩ must be used in ELEMENTS' other macros where an element's name can be given as argument.

\DeclareAtomName[⟨alt. name⟩]{⟨atomic number⟩}{⟨element name⟩}
This is the same as \setatomname but used before begin document or in packages/classes.

\saveelementname{⟨cs⟩}{⟨atomic number⟩|⟨element symbol⟩|⟨element name⟩}
Saves the name of the given element as replacement text for the macro ⟨cs⟩.

```
\elementname{Cu} \par
\elementname{11} \par
\saveelementname\foo{28}
\ttfamily\meaning\foo
```

Copper
Sodium
macro:->Nickel

3 Element Symbols

\elementsymbol{⟨atomic number⟩|⟨element name⟩}
Prints the element symbol of a given element as defined with \setatomsymbol.

\setatomsymbol{⟨atomic number⟩}{⟨element symbol⟩}
Define or redefine the symbol of an element.

\DeclareAtomSymbol{⟨atomic number⟩}{⟨element symbol⟩}
This is the same as \setatomsymbol but used before begin document or in packages/classes.

\saveelementsymbol{⟨cs⟩}{⟨atomic number⟩|⟨element symbol⟩|⟨element name⟩}
Saves the symbol of the given element as replacement text for the macro ⟨cs⟩.

```
\elementsymbol{13} \par
\elementsymbol{Sulfur} \par
\saveelementsymbol\foo{83}
\ttfamily\meaning\foo
```

Al
S
macro:->Bi

4 Atomic Numbers

\atomicnumber{⟨element symbol⟩|⟨element name⟩}
Prints the atomic number of a given element.

`\Z{`⟨*element symbol*⟩ | ⟨*element name*⟩`}`
An alias of `\atomicnumber` but only defined at begin document and only if it isn't defined by any other package.

`\saveatomicnumber{`⟨*cs*⟩`}{`⟨*atomic number*⟩ | ⟨*element symbol*⟩ | ⟨*element name*⟩`}`
Saves the atomic number of the given element as replacement text for the macro ⟨*cs*⟩.

```
\atomicnumber{U} \par
\atomicnumber{Chlorine} \par
\saveatomicnumber\foo{Kr}
\ttfamily\meaning\foo
```

```
92
17
macro:->36
```

5 Electron Configuration

`\elconf{`⟨*atomic number*⟩ | ⟨*element symbol*⟩ | ⟨*element name*⟩`}`
Typesets the electron configuration of the given element.

`\writeelconf{`⟨*electron distribution*⟩`}`
Typesets the electron distribution ⟨*electron distribution*⟩. The input is the same as described below for `\setelectrondistribution`.

`\setelectrondistribution{`⟨*atomic number*⟩`}{`⟨*electron distribution*⟩`}`
This set the electron distribution associated with the atom number ⟨*atomic number*⟩. ⟨*electron distribution*⟩ is a comma-separated list of the number of electrons placed on each shell from inner to outer shell. For example `\setelectrondistribution{3}{2,0,1}` would be an excited Lithium. The number of electrons with the same principal quantum number but a different angular quantum number are separated with a + ordered by the angular quantum number, *i. e.*, first *s*, then *p*, then *d*, and then *f* . Copper's distribution would be declared like this: `\setelectrondistribution{29}{2,2+6,2+6+10,1}`.
A declaration with `\setelectrondistribution{29}{2,8,18,1}` would work but then `\elconf{29}` would give the wrong results.

`\DeclareElectronDistribution`
This is the same as `\setelectrondistribution` but used before begin document or in packages/classes.

```
\writeelconf{2,2+6,2+6+7} \par
\elconf{Cl}
```

$1s^2 2s^2 2p^6 3s^2 3p^6 3d^7$
$1s^2 2s^2 2p^6 3s^2 3p^5$

There is currently *no way* to get the electron configuration in the shortened way (*e. g.*: [Ar]$3d^{10}4s^1$).

6 Isotope Lists

`\setatomisotopes{`⟨*atomic number*⟩`}{`⟨*isotope list*⟩`}`
Defines or redefines the isotope list for a given element. ⟨*isotope list*⟩ should be a comma seperated list of integers. One of the integers may be preceded with a `!` to mark the main isotope for the given element: `\setatomisotopes{6}{10,11,!12,13,14,15,16}`

`\DeclareAtomIsotopes{`⟨*atomic number*⟩`}{`⟨*isotope list*⟩`}`
This is the same as `\setatomisotopes` but used before begin document or in packages/classes.

`\saveelementisotopes{`⟨*cs*⟩`}{`⟨*atomic number*⟩`|`⟨*element symbol*⟩`|`⟨*element name*⟩`}`
Saves the isotope list of the given element as replacement text for the macro ⟨*cs*⟩.

`\savemainelementisotope{`⟨*cs*⟩`}{`⟨*atomic number*⟩`|`⟨*element symbol*⟩`|`⟨*element name*⟩`}`
Saves the main isotope of the given element as replacement text for the macro ⟨*cs*⟩. If the isotope list of the element contains no main isotope ⟨*cs*⟩ will be equivalent to `\@empty`.

```
\ttfamily
\saveelementisotopes\foo{C}
\meaning\foo
\savemainelementisotope\foo{C}
\meaning\foo
```

```
macro:->10,11,!12,13,14,15,16
macro:->12
```

Element Properties

On the following pages a table containing the properties known to ELEMENTS is printed. For those interested: the code used to get the table is as follows (using the packages lscape [Caroo], longtable [Caro4] and booktabs [Feao5]).

```
\setlength\LTleft\fill
\setlength\LTright\fill
\newcounter{element}
\setcounter{element}{1}
\begin{landscape}
\begin{longtable}{lllll}
  \toprule
    Number & Symbol & Name & Main Isotope & Electron Configuration \\
  \midrule
  \endhead
  \whileboolexpr{test{\ifnumless{\value{element}}{113}}}
    {
      \theelement &
      \elementsymbol{\arabic{element}} &
      \elementname{\arabic{element}} &
      \savemainelementisotope\foo{\arabic{element}}\foo &
      \elconf{\arabic{element}}
      \stepcounter{element} \\
    }
    {}
\end{longtable}
\end{landscape}
```

Number	Symbol	Name	Main Isotope	Electron Configuration
1	H	Hydrogen	1	$1s^1$
2	He	Helium	4	$1s^2$
3	Li	Lithium	4	$1s^2 2s^1$
4	Be	Beryllium	9	$1s^2 2s^2$
5	B	Boron	11	$1s^2 2s^2 2p^1$
6	C	Carbon	12	$1s^2 2s^2 2p^2$
7	N	Nitrogen	14	$1s^2 2s^2 2p^3$
8	O	Oxygen	16	$1s^2 2s^2 2p^4$
9	F	Fluorine	19	$1s^2 2s^2 2p^5$
10	Ne	Neon	20	$1s^2 2s^2 2p^6$
11	Na	Sodium	23	$1s^2 2s^2 2p^6 3s^1$
12	Mg	Magnesium	24	$1s^2 2s^2 2p^6 3s^2$
13	Al	Aluminium	27	$1s^2 2s^2 2p^6 3s^2 3p^1$
14	Si	Silicon	28	$1s^2 2s^2 2p^6 3s^2 3p^2$
15	P	Phosphorus	31	$1s^2 2s^2 2p^6 3s^2 3p^3$
16	S	Sulfur	32	$1s^2 2s^2 2p^6 3s^2 3p^4$
17	Cl	Chlorine	35	$1s^2 2s^2 2p^6 3s^2 3p^5$
18	Ar	Argon	40	$1s^2 2s^2 2p^6 3s^2 3p^6$
19	K	Potassium	39	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$
20	Ca	Calcium	40	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$
21	Sc	Scandium	45	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^1 4s^2$
22	Ti	Titanium	48	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^2 4s^2$
23	V	Vanadium	51	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^3 4s^2$
24	Cr	Chromium	52	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$
25	Mn	Manganese	55	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^2$
26	Fe	Iron	56	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2$
27	Co	Cobalt	59	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^7 4s^2$
28	Ni	Nickel	58	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$
29	Cu	Copper	63	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$

Number	Symbol	Name	Main Isotope	Electron Configuration
30	Zn	Zinc	64	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2$
31	Ga	Gallium	69	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^1$
32	Ge	Germanium	74	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^2$
33	As	Arsenic	75	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^3$
34	Se	Selenium	80	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^4$
35	Br	Bromine	79	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^5$
36	Kr	Krypton	84	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6$
37	Rb	Rubidium	85	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 5s^1$
38	Sr	Strontium	88	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 5s^2$
39	Y	Yttrium	89	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^1 5s^2$
40	Zr	Zirconium	90	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^2 5s^2$
41	Nb	Niobium	93	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^4 5s^1$
42	Mo	Molybdenum	98	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^5 5s^1$
43	Tc	Technetium	99	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^6 5s^1$
44	Ru	Ruthenium	102	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^7 5s^1$
45	Rh	Rhodium	103	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^8 5s^1$
46	Pd	Palladium	106	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10}$
47	Ag	Silver	107	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^1$
48	Cd	Cadmium	114	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2$
49	In	Indium	115	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^1$
50	Sn	Tin	120	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^2$
51	Sb	Antimony	121	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^3$
52	Te	Tellurium	130	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^4$
53	I	Iodine	127	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^5$
54	Xe	Xenon	132	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^6$
55	Cs	Caesium	133	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^6 6s^1$
56	Ba	Barium	138	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^6 6s^2$
57	La	Lanthanum	139	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^6 5d^1 6s^2$
58	Ce	Cerium	140	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^2 5s^2 5p^6 6s^2$

Number	Symbol	Name	Main Isotope	Electron Configuration
59	Pr	Praseodymium	141	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^3 5s^2 5p^6 6s^2$
60	Nd	Neodymium	142	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^4 5s^2 5p^6 6s^2$
61	Pm	Promethium	147	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^5 5s^2 5p^6 6s^2$
62	Sm	Samarium	152	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^6 5s^2 5p^6 6s^2$
63	Eu	Europium	153	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^7 5s^2 5p^6 6s^2$
64	Gd	Gadolinium	158	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^7 5s^2 5p^6 5d^1 6s^2$
65	Tb	Terbium	159	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^9 5s^2 5p^6 6s^2$
66	Dy	Dysprosium	164	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{10} 5s^2 5p^6 6s^2$
67	Ho	Holmium	165	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{11} 5s^2 5p^6 6s^2$
68	Er	Erbium	167	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{12} 5s^2 5p^6 6s^2$
69	Tm	Thulium	169	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{13} 5s^2 5p^6 6s^2$
70	Yb	Ytterbium	174	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 6s^2$
71	Lu	Lutetium	175	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^1 6s^2$
72	Hf	Hafnium	180	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^2 6s^2$
73	Ta	Tantalium	181	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^3 6s^2$
74	W	Tungsten	184	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^4 6s^2$
75	Re	Rhenium	187	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^5 6s^2$
76	Os	Osmium	192	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^6 6s^2$
77	Ir	Iridium	193	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^7 6s^2$
78	Pt	Platinum	195	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^9 6s^1$
79	Au	Gold	197	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 6s^1$
80	Hg	Mercury	202	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 6s^2$
81	Tl	Thallium	205	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 6s^2 6p^1$
82	Pb	Lead	208	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 6s^2 6p^2$
83	Bi	Bismuth	209	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 6s^2 6p^3$
84	Po	Polonium	210	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 6s^2 6p^4$
85	At	Astatine		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 6s^2 6p^5$
86	Rn	Radon	222	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 6s^2 6p^6$
87	Fr	Francium	223	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 6s^2 6p^6 7s^1$

Number	Symbol	Name	Main Isotope	Electron Configuration
88	Ra	Radium	226	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 6s^2 6p^6 7s^2$
89	Ac	Actinium	227	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 6s^2 6p^6 6d^1 7s^2$
90	Th	Thorium	232	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 6s^2 6p^6 6d^2 7s^2$
91	Pa	Protactinium	231	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^2 6s^2 6p^6 6d^1 7s^2$
92	U	Uranium	238	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^3 6s^2 6p^6 6d^1 7s^2$
93	Np	Neptunium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^4 6s^2 6p^6 6d^1 7s^2$
94	Pu	Plutonium	244	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^6 6s^2 6p^6 7s^2$
95	Am	Americium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^7 6s^2 6p^6 7s^2$
96	Cm	Curium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^7 6s^2 6p^6 6d^1 7s^2$
97	Bk	Berkelium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^9 6s^2 6p^6 7s^2$
98	Cf	Californium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^{10} 6s^2 6p^6 7s^2$
99	Es	Einsteinium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^{11} 6s^2 6p^6 7s^2$
100	Fm	Fermium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^{12} 6s^2 6p^6 7s^2$
101	Md	Mendelevium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^{13} 6s^2 6p^6 7s^2$
102	No	Nobelium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^{14} 6s^2 6p^6 7s^2$
103	Lr	Lawrencium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^{14} 6s^2 6p^6 6d^1 7s^2$
104	Rf	Rutherfordium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^{14} 6s^2 6p^6 6d^2 7s^2$
105	Db	Dubnium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^{14} 6s^2 6p^6 6d^3 7s^2$
106	Sg	Seaborgium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^{14} 6s^2 6p^6 6d^4 7s^2$
107	Bh	Bohrium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^{14} 6s^2 6p^6 6d^5 7s^2$
108	Hs	Hassium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^{14} 6s^2 6p^6 6d^6 7s^2$
109	Mt	Meitnerium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^{14} 6s^2 6p^6 6d^7 7s^2$
110	Ds	Darmstadtium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^{14} 6s^2 6p^6 6d^9 7s^1$
111	Rg	Roentgenium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^{14} 6s^2 6p^6 6d^{10} 7s^1$
112	Cn	Copernicium		$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 5f^{14} 6s^2 6p^6 6d^{10} 7s^2$

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