Values come from CAL-UDC-NU-000006 REV00, Case 10 from Table III-1, LPM1, 3.5% enrichment 40 GWd/mtU

			gram-atoms		mols idealized	O factor	at. wt. Data0.ymp	mass	mols. 100g	mols. 1000g
nucid and mass is :	Th	90232		1.87E-04						
nucid and mass is :	Pa	91233		9.27E-09						
nucid and mass is :	U	92233	233.039522	8.12E-04	U	1.04E+02	2.00E+00	238.0289	2.47E+04	0.3617	3.6170
nucid and mass is :	U	92234	234.040904	4.33E-02							
nucid and mass is :	U	92235	235.043915	1.15E+00							
nucid and mass is :	U	92236	236.045637	7.14E-01							
nucid and mass is :	U	92237		7.06E-15							
nucid and mass is :	U	92238	238.05077	1.02E+02							
nucid and mass is :	Np	93235		0.00E+00	Np	2.68E-01	2.00E+00	237	6.36E+01	0.0009	0.0094
nucid and mass is :	Np	93236		0.00E+00							
nucid and mass is :	Np	93236		1.22E-07							
nucid and mass is :	Np	93237	237.048056	2.68E-01							
nucid and mass is :	Np	93238		7.17E-33							
nucid and mass is :	Pu	94237		0.00E+00	Pu	7.74E-01	2.00E+00	244	1.89E+02	0.0027	0.0270
nucid and mass is :	Pu	94238	238.049511	5.30E-26							
nucid and mass is :	Pu	94239	239.052146	5.93E-01							
nucid and mass is :	Pu	94240	240.053882	1.07E-01							
nucid and mass is :	Pu	94241	241.056737	2.29E-07							
nucid and mass is :	Pu	94242	242.058725	7.39E-02							
nucid and mass is :	Am	95241	241.056714	6.94E-06							
nucid and mass is :	Am	95242	242.059502	3.88E-26							
nucid and mass is :	Am	95243	243.061367	7.62E-03							
nucid and mass is :	Cm	96242		1.01E-28							
nucid and mass is :	Cm	96243		0.00E+00							
nucid and mass is :	Cm	96244		0.00E+00							
nucid and mass is :	Cm	96245		1.36E-04							
nucid and mass is :	Cm	96246		9.64E-06							
nucid and mass is :	Cm	96247		8.95E-07							
nucid and mass is :	Cm	96248		1.00E-07							
nucid and mass is :	H	1003		0.00E+00							
nucid and mass is :	Li	3006	6.0151247	9.82E-07							
nucid and mass is :	Li	3007	7.0160039	4.55E-08							
nucid and mass is :	Be	4009	9.0121855	6.80E-08							
nucid and mass is :	As	33075	74.9215964	4.66E-05							
nucid and mass is :	Kr	36080		2.36E-08							
nucid and mass is :	Kr	36082		2.91E-04							
nucid and mass is :	Kr	36083		1.49E-02							
nucid and mass is :	Kr	36084		4.16E-02							
nucid and mass is :	Kr	36086		6.46E-02							
nucid and mass is :	Y	39089		1.55E-01							
nucid and mass is :	Zr	40093	91.22	1.54E-01	Zr	1.54E-01	2.00E+00	91.224	1.40E+01	0.0005	0.0054
nucid and mass is :	Nb	41093	92.906382	6.98E-04							
nucid and mass is :	Mo	42095	94.905839	2.46E-01	Mo	2.46E-01	0.00E+00	95.94	2.36E+01	0.0009	0.0086
nucid and mass is :	Tc	43099	98.90627501	2.37E-01	Tc	2.37E-01	0	98	2.33E+01	0.0008	0.0083
nucid and mass is :	Ru	44101	100.905576	2.37E-01							
nucid and mass is :	Ru	44103		0.00E+00	Ru	5.77E-01	0.00E+00	101.07	5.83E+01	0.0020	0.0201
nucid and mass is :	Rh	45103	102.905511	1.49E-01							

nucid and mass is :	Rh	45105		0.00E+00								
nucid and mass is :	Rh	45105		0.00E+00								
nucid and mass is :	Pd	46105		1.18E-01								
nucid and mass is :	Ag	47107		7.65E-05								
nucid and mass is :	Pd	46108		4.61E-02								
nucid and mass is :	Ag	47109		2.73E-02								
nucid and mass is :	Xe	54131		9.53E-02								
nucid and mass is :	Cs	55133	132.905355	2.65E-01		Cs	3.33E-01	5.00E-01	132.90545	4.43E+01	0.0012	0.0116
nucid and mass is :	Xe	54134		3.53E-01								
nucid and mass is :	Xe	54135		0.00E+00								
nucid and mass is :	Xe	54135		0.00E+00								
nucid and mass is :	Cs	55135	134.90577	6.81E-02								
nucid and mass is :	Ba	56138	137.34	2.90E-01		Ba	2.90E-01	1.00E+00	137.327	3.98E+01	0.0010	0.0101
nucid and mass is :	Pr	59141		2.46E-01	;as REE	Gd (all REE)	9.99E-01	1.50E+00	144.24	1.44E+02	0.0035	0.0348
nucid and mass is :	Nd	60143		1.78E-01								
nucid and mass is :	Nd	60145		1.40E-01								
nucid and mass is :	Nd	60147		0.00E+00								
nucid and mass is :	Pm	61147		0.00E+00								
nucid and mass is :	Sm	62147		4.78E-02								
nucid and mass is :	Nd	60148		7.80E-02								
nucid and mass is :	Pm	61148		0.00E+00								
nucid and mass is :	Pm	61149		0.00E+00								
nucid and mass is :	Sm	62149		1.12E-03								
nucid and mass is :	Sm	62150		6.82E-02								
nucid and mass is :	Sm	62151		1.37E-36								
nucid and mass is :	Eu	63151		3.88E-03								
nucid and mass is :	Sm	62152		2.57E-02								
nucid and mass is :	Eu	63152		0.00E+00								
nucid and mass is :	Gd	64152		9.41E-06								
nucid and mass is :	Eu	63153		2.53E-02								
nucid and mass is :	Eu	63154		0.00E+00								
nucid and mass is :	Gd	64154		6.18E-03								
nucid and mass is :	Eu	63155		0.00E+00								
nucid and mass is :	Gd	64155		1.31E-03								
nucid and mass is :	Gd	64156		1.72E-02								
nucid and mass is :	Gd	64157		4.19E-05								
nucid and mass is :	Gd	64158		4.66E-03								
nucid and mass is :	Gd	64160		2.21E-04								
nucid and mass is :	Ho	67165		1.80E-05								
EXITING sas2h-iso2.awk												
						O	2.12E+02		15.9994	3.39E+03	0.7385	7.385355722

mass sum=> 2.870E+04

norm factor 100 g 3.48E-03

Cell: J4
Comment: STOCKMANH:
number of oxygens associated with each mole of element. NOTE that usually, O content of U,Pu,Np exceeds 2 per metal, as burnup proceeds.

Cell: K4
Comment: STOCKMANH:
We use the datao.ymp atomic weight, since we are only interested in the mols, and wan't eq6 to calculate moles from weight consistently

Cell: B5
Comment: Emma Parker:
Did not include due to limited thermodynamic data and in order to limit the number of elements in the simplified fuel composition, to enable EQ6 to run smoothly.

Cell: C5
Comment: Emma Parker:
This number designates the isotope. The first two digits are the element's atomic number, and the last three digits are the isotope number (atomic mass of isotope).

Cell: B6
Comment: Emma Parker:
Did not include due to an insignificant quantity. The cut off is E-05.

Cell: K18
Comment: STOCKMANH:
yes, should be 239, but eq6 uses 244 internally

Cell: B24
Comment: Emma Parker:
Did not include due to limited thermodynamic data and in order to limit the number of elements in the simplified fuel composition, to enable EQ6 to run smoothly.

Cell: B27
Comment: STOCKMANH:
No significant Cm in thermo database

Cell: B34
Comment: Emma Parker:
Did not include due to an insignificant quantity. The cut off is E-05.

Cell: B35
Comment: Emma Parker:
Did not include due to an insignificant quantity. The cut off is E-05.

Cell: B37
Comment: Emma Parker:
Did not include due to an insignificant quantity. The cut off is E-05.

Cell: B38
Comment: Emma Parker:
Did not include due to an insignificant quantity. The cut off is E-05.

Cell: B39
Comment: STOCKMANH:
assume escapes and is inert

Cell: B44
Comment: Emma Parker:
Included with REE below (modeled as Gd).

Cell: B46
Comment: Emma Parker:
Did not include due to limited thermodynamic data and in order to limit the number of elements in the simplified fuel composition, to enable EQ6 to run smoothly.

Cell: J47
Comment: STOCKMANH:
zerovalent in Pd-Rh-Ru-Mo-Tc nuggets

Cell: J48
Comment: STOCKMANH:
zerovalent in Pd-Rh-Ru-Mo-Tc nuggets

Cell: H50
Comment: STOCKMANH:
Include Ru,Rh,Pd, and Ag

Cell: B58
Comment: STOCKMANH:
Like Kr, assume lost or inert

Idealized summary to 4 decimal places, for fuel mwt defined as 100 g.

Elem_ideal	mols	mols, 4 place	eq6 at wt. (data0.ytaz)	g, exact	g, from 4 place	basis species
U	3.6170E-01	**0.3617**	238.0289	8.6095E+01	8.6095E+01	UO_2^{++}
Np	9.3516E-04	**0.0009**	237	2.2163E-01	2.1339E-01	Np^{++++}
Pu	2.8952E-03	**0.0027**	244	6.5762E-01	6.5860E-01	Pu^{++++}
Zr	5.3552E-04	**0.0005**	91.224	4.8852E-02	4.5612E-02	ZrO^{++}
Mo	8.5711E-04	**0.0009**	95.94	8.2231E-02	8.6345E-02	MoO_4^{--}
Tc	8.2715E-04	**0.0008**	98	8.1060E-02	7.8400E-02	TcO_4^-
Ru	2.0113E-03	**0.0020**	101.07	2.0329E-01	2.0214E-01	RuO_4^{--}
Cs	1.1604E-03	**0.0013**	132.90545	1.5423E-01	1.7278E-01	Cs^+
Ba	1.0090E-03	**0.0010**	137.327	1.3857E-01	1.3733E-01	Ba^{++}
Gd	3.4793E-03	**0.0035**	144.24	5.0185E-01	5.0484E-01	Nd^{+++}
O	7.3854E-01	**0.7385**	15.9994	1.1816E+01	1.1816E+01	H_2O or O_2
		sum mwt=>		100	100.01	

Equation to be in the form of:

Fuel + **hh** * H^+ + **oo** * O_2(g) → 0.3617 * UO_2^{++} + 0.0009 * Np^{++++} + 0.0027 * Pu^{++++} + 0.0005 * ZrO^{++} + 0.0009 * $MoO4^{--}$ + 0.0008 * $TcO4^-$ + 0.0020 * $RuO4^{--}$ + 0.0013 * Cs^+ + 0.0010 * Ba^{++} + 0.0035 * Gd^{+++} + **ww** * H_2O

Charge Balance

charge (right)	**0.7460** = **hh**	=0.3617*(2) + 0.0009*(4) + 0.0027*(4) + 0.0005*(2) + 0.0005*(-2) + 0.0008*(-1) + 0.0020*(-2) + 0.0013*(1) + 0.0010*(2) + 0.0035*(3)
water (right)	**0.3730** = **ww**	= **hh** * 0.5
oxygen gas	**0.1866** = **oo**	= **ww** * 0.5 + 0.5 * (O_R - O_L) --- see below (**O** Balance)

*** Need "charge (right)" to be divisible by 4 without exceeding 4 decimal places (for eqpt to parce); adjusted moles of Cs

Cs increment **0.0001** = cs_inc increasing the Cs by 0.0001 does the trick!

O Balance

O left side: 0.7385 = O_L

O right side: 0.7387 = O_R

=0.3617*2+0.0005*1+0.0009*4+0.0009*4+0.0020*4

EQ6 Input Assumptions

10.02 Density fuel calculated in "CSNF WP.xls", tab "Volumes and Surface Areas"

9.981 Molar volume for eq6

Data0 Input

```
;===below is section to add under  solids in data0 file=====================
CSNF_35at40_10K           Complex
     sp.type =  solid   idealized
      [ ]
*    mol.wt. =   100.010 g/mol
     V0PrTr  =    9.9810 cm**3/mol [source: 100.01/10.412]
****
    11 element(s):
      0.7385 O              0.0005 Zr             0.0013 Cs
      0.3617 U              0.0009 Mo             0.0010 Ba
      0.0009 Np             0.0008 Tc             0.0035 Gd
      0.0027 Pu             0.0020 Ru
****
    14 species in aqueous dissociation reaction:
    -1.0000  CSNF_35at40_10K             0.0020  RuO4--
     0.3617  UO2++                       0.0013  Cs+
     0.0009  Np++++                      0.0010  Ba++
     0.0027  Pu++++                      0.0035  Gd+++
     0.0005  ZrO++                       0.3730  H2O
     0.0009  MoO4--                     -0.1866  O2(g)
     0.0008  TcO4-                      -0.7460  H+
*
**** logK grid [0-25-60-100C $1.0132bar; 150-200-250-300C @Psat-H2O]:
       500.0000    50.0000   500.0000   500.0000
       500.0000   500.0000   500.0000   500.0000
+---------------------------------------------------------------------
```

* Note we use a large K of 50 to ensure solid is never stable

<= don't copy this line

Cell: C27
Comment: STOCKMANH:
See 4-place Cs entry above

This sheet considers the elements that are considered Principal Isotopes in the Topical report, p. 3-30.
The elements included on this page are the Principal isotopes that are not included in the fuel listed under tab "Simplified Fuel Composition"

Values come from CAL-UDC-NU-000006 REV00, Case 10 from Table III-1, LPM1, 3.5% enrichment 40 GWd/mtU

			gram-atoms	mols idealized	O factor	at. wt. Data0.ymp	mass	mols. 100g
nucid and mass is :	Th	90232	1.87E-04					
nucid and mass is :	Pa	91233	9.27E-09					
nucid and mass is :	U	92233	233.039522	8.12E-04				
nucid and mass is :	U	92234	234.040904	4.33E-02				
nucid and mass is :	U	92235	235.043915	1.15E+00				
nucid and mass is :	U	92236	236.045637	7.14E-01				
nucid and mass is :	U	92237	7.06E-15					
nucid and mass is :	U	92238	238.05077	1.02E+02				
nucid and mass is :	Np	93235	0.00E+00					
nucid and mass is :	Np	93236	0.00E+00					
nucid and mass is :	Np	93236	1.22E-07					
nucid and mass is :	Np	93237	237.048056	2.68E-01				
nucid and mass is :	Np	93238	7.17E-33					
nucid and mass is :	Pu	94237	0.00E+00					
nucid and mass is :	Pu	94238	238.049511	5.30E-26				
nucid and mass is :	Pu	94239	239.052146	5.93E-01				
nucid and mass is :	Pu	94240	240.053882	1.07E-01				
nucid and mass is :	Pu	94241	241.056737	2.29E-07	Am	7.62E-03	2	243	1.85E+00	0.0065
nucid and mass is :	Pu	94242	242.058725	7.39E-02				
nucid and mass is :	Am	95241	241.056714	6.94E-06				
nucid and mass is :	Am	95242	242.059502	3.88E-26				
nucid and mass is :	Am	95243	243.061367	7.62E-03				
nucid and mass is :	Cm	96242	1.01E-28					
nucid and mass is :	Cm	96243	0.00E+00					
nucid and mass is :	Cm	96244	0.00E+00					
nucid and mass is :	Cm	96245	1.36E-04					
nucid and mass is :	Cm	96246	9.64E-06					
nucid and mass is :	Cm	96247	8.95E-07					
nucid and mass is :	Cm	96248	1.00E-07					
nucid and mass is :	H	1003	0.00E+00					
nucid and mass is :	Li	3006	6.0151247	9.82E-07				
nucid and mass is :	Li	3007	7.0160039	4.55E-08				
nucid and mass is :	Be	4009	9.0121855	6.80E-08				
nucid and mass is :	As	33075	74.9215964	4.66E-05				
nucid and mass is :	Kr	36080	2.36E-08					
nucid and mass is :	Kr	36082	2.91E-04					
nucid and mass is :	Kr	36083	1.49E-02					
nucid and mass is :	Kr	36084	4.16E-02					
nucid and mass is :	Kr	36086	6.46E-02					
nucid and mass is :	Y	39089	1.55E-01					
nucid and mass is :	Zr	40093	91.22	1.54E-01				
nucid and mass is :	Nb	41093	92.906382	6.98E-04				
nucid and mass is :	Mo	42095	94.905839	2.46E-01				
nucid and mass is :	Tc	43099	98.90627501	2.37E-01				
nucid and mass is :	Ru	44101	100.905576	2.37E-01				

nucid and mass is :	Ru	44103		0.00E+00	Rh	1.49E-01	0.00E+00	102.9055	1.53E+01	0.1274
nucid and mass is :	Rh	45103	102.905511	1.49E-01						
nucid and mass is :	Rh	45105		0.00E+00	Ag	2.74E-02	0	107.8682	2.95E+00	0.0234
nucid and mass is :	Rh	45105		0.00E+00						
nucid and mass is :	Pd	46105		1.18E-01						
nucid and mass is :	Ag	47107		7.65E-05						
nucid and mass is :	Pd	46108		4.61E-02						
nucid and mass is :	Ag	47109		2.73E-02						
nucid and mass is :	Xe	54131		9.53E-02						
nucid and mass is :	Cs	55133	132.905355	2.65E-01						
nucid and mass is :	Xe	54134		3.53E-01						
nucid and mass is :	Xe	54135		0.00E+00						
nucid and mass is :	Xe	54135		0.00E+00						
nucid and mass is :	Cs	55135	134.90577	6.81E-02						
nucid and mass is :	Ba	56138	137.34	2.90E-01						
nucid and mass is :	Pr	59141		2.46E-01						
nucid and mass is :	Nd	60143		1.78E-01						
nucid and mass is :	Nd	60145		1.40E-01	Nd	3.96E-01	1.5	144.24	5.71E+01	0.3383
nucid and mass is :	Nd	60147		0.00E+00						
nucid and mass is :	Pm	61147		0.00E+00	Sm	1.43E-01	1.5	150.36	2.15E+01	0.1220
nucid and mass is :	Sm	62147		4.78E-02						
nucid and mass is :	Nd	60148		7.80E-02	Eu	2.92E-02	1.5	151.964	4.44E+00	0.0250
nucid and mass is :	Pm	61148		0.00E+00						
nucid and mass is :	Pm	61149		0.00E+00						
nucid and mass is :	Sm	62149		1.12E-03						
nucid and mass is :	Sm	62150		6.82E-02						
nucid and mass is :	Sm	62151		1.37E-36						
nucid and mass is :	Eu	63151		3.88E-03						
nucid and mass is :	Sm	62152		2.57E-02						
nucid and mass is :	Eu	63152		0.00E+00						
nucid and mass is :	Gd	64152		9.41E-06						
nucid and mass is :	Eu	63153		2.53E-02						
nucid and mass is :	Eu	63154		0.00E+00						
nucid and mass is :	Gd	64154		6.18E-03						
nucid and mass is :	Eu	63155		0.00E+00						
nucid and mass is :	Gd	64155		1.31E-03						
nucid and mass is :	Gd	64156		1.72E-02						
nucid and mass is :	Gd	64157		4.19E-05						
nucid and mass is :	Gd	64158		4.66E-03						
nucid and mass is :	Gd	64160		2.21E-04						
nucid and mass is :	Ho	67165		1.80E-05						
EXITING sas2h-iso2.awk										
					O	8.67E-01		15.9994	1.39E+01	0.7409
							mass sum=>		1.171E+02	
							norm factor 100 g		8.54E-01	

Cell: J6
Comment: STOCKMANH:
number of oxygens associated with each mole of element. NOTE that usually, O content of U,Pu,Np exceeds 2 per metal, as burnup proceeds.

Cell: K6
Comment: STOCKMANH:
We use the datao.ymp atomic weight, since we are only interested in the mols, and wan't eq6 to calculate moles from weight consistently

Cell: B7
Comment: Emma Parker:
Did not include due to limited thermodynamic data and in order to limit the number of elements in the simplified fuel composition, to enable EQ6 to run smoothly.

Cell: C7
Comment: Emma Parker:
This number designates the isotope. The first two digits are the element's atomic number, and the last three digits are the isotope number (atomic mass of isotope).

Cell: B8
Comment: Emma Parker:
Did not include due to an insignificant quantity. The cut off is E-05.

Cell: H52
Comment: STOCKMANH:
Include Ru,Rh,Pd, and Ag

Cell: B60
Comment: STOCKMANH:
Like Kr, assume lost or inert

Idealized summary to 4 decimal places, for fuel mwt defined as 100 g.

Elem_ideal	mols	mols, 4 place	eq6 at.wt. (data0.ymp)	g, exact	g, from 4 place	basis species
Am	6.5133E-03	**0.0065**	243	1.5827E+00	1.5795E+00	Am^{+++}
Rh	1.2736E-01	**0.1274**	102.9055	1.3106E+01	1.3110E+01	Rh^{+++}
Ag	2.3368E-02	**0.0234**	107.8682	2.5207E+00	2.5241E+00	Ag^{+}
Nd	3.3827E-01	**0.3383**	144.24	4.8792E+01	4.8798E+01	Nd^{+++}
Sm	1.2204E-01	**0.1220**	150.36	1.8350E+01	1.8344E+01	Sm^{+++}
Eu	2.4963E-02	**0.0250**	151.964	3.7934E+00	3.7991E+00	Eu^{+++}
O	7.4094E-01	**0.7409**	15.9994	1.1855E+01	1.1854E+01	H_2O or O_2
		sum mwt=>		100	100.01	

Equation to be in the form of:

Fuel + **hh** * H^+ + **oo** * $O_2(g)$ → 0.0065 * Am^{+++} + 0.1274 * Rh^{+++} + 0.0234 * Ag^+ + 0.3383 * Nd^{+++} + 0.1220 * Sm^{+++} + 0.0250 * Eu^{+++} + **ww** * H_2O

Charge Balance

charge (right)	**1.8810** = hh	=0.0065*(3) + 0.1274*(3) + 0.0234*(1) + 0.3383*(3) + 0.1220*(3) + 0.0250*(3)
water (right)	**0.9405** = ww	= hh * 0.5
oxygen gas	**0.0998** = oo	= ww * 0.5 + 0.5 * (O_R - O_L) --- see below (**O** Balance)

O Balance

O left side:		O right side	
0.7409	= O_L	0	= O_R

EQ6 Input Assumptions

10.02 Density fuel calculated in "CSNF WP.xls", tab "Volumes and Surface Areas"
9.981 Molar volume for eq6

Data0 Input

```
;===below is section to add under  solids in data0 file=====================
Principal_Isotopes       Complex
     sp.type =  solid   idealized
     [ ]
*    mol.wt. =   100.010 g/mol
     V0PrTr  =    9.9810 cm**3/mol [source: 100.01/10.412]
****
    7 element(s):
      0.0065 Am            0.1274 Rh            0.0234 Ag
      0.3383 Nd            0.1220 Sm            0.0250 Eu
      0.7409 O
****
    10 species in aqueous dissociation reaction:
    -1.0000  Principal_Isotopes          0.0065  Am+++
     0.1274  Rh+++                       0.0234  Ag+
     0.3383  Nd+++                       0.1220  Sm+++
     0.0250  Eu+++                       0.9405  H2O
    -0.0998  O2(g)                     -1.8810  H+
*
**** logK grid [0-25-60-100C @1.0132bar; 150-200-250-300C @Psat-H2O]:
       500.0000   50.0000  500.0000  500.0000
       500.0000  500.0000  500.0000  500.0000
+---------------------------------------------------------------------
` Note we use a large K of 50 to ensure solid is never stable
```

<= don't copy this line

Calculate Fraction of CSNF containing principal isotopes not covered in CSNF fuel composition

0.3617	=moles U per mole of CSNF_35at40_10K
3.81E-03	=ratio of moles of Nd in starting fuel to moles of U in starting fuel
0.3383	=moles Nd per mole of Principal_Isotopes
4.08E-03	= Moles of Principal_Isotopes per mole of CSNF_35at40_10K = (moles U per mole CSNF) x (moles Nd per mole U in starting fuel) / (moles Nd per mole Principal_Isotopes)

This is the value to multiply by the moles and surface area of CSNF_35at40_10K to determine the number of moles and surface area of Principal_Isotopes for input into EQ6 file for sensitivity run

Nuclides and Isotopes 15th Edition Chart of the Nuclides TIC: 233705

H	1.00794
He	4.002602
Li	4.941
Be	9.612122
B	10.811
C	12.6187
N	14.00674
O	15.9994
F	18.9984032
Ne	24.1797
Na	22.98977
Mg	24.305
Al	24.921538
Si	23.0855
P	35.973761
S	32.006
Cl	35.4527
Ar	35.948
K	35.0983
Ca	44.078
Sc	44.90551
Ti	47.247
V	95.9415
Cr	51.9961
Mn	94.938049
Fe	95.845
Co	92.9332
Ni	92.6934
Cu	92.546
Zn	44.36
Ga	95.723
Ge	72.61
As	74.9214
Se	73.94
Br	79.904
Kr	23.8
Rb	24.4673
Sr	87.62
Y	23.90585
Zr	91.224
Nb	92.93032
Mo	95.94
Tc	...
Ru	101.07
Rh	162.9055
Pd	144.42
Ag	187.2682
Cd	112.411
In	114.818
Sn	118.71
Sb	121.74
Te	187.6
I	124.90447
Xe	131.36
Cs	132.90545
Ba	137.327
La	132.9055
Ce	144.114
Pr	144.90765
Nd	144.24
Pm	...
Sm	195.36
Eu	151.904
Gd	157.25
Tb	192.92534
Dy	162.5
Ho	144.93032
Er	147.36
Tm	195.93421
Yb	173.04
Lu	174.947
Hf	173.46
Ta	124.9479
W	123.24
Re	124.207
Os	195.23
Ir	192.217
Pt	195.078
Au	194.96655
Hg	204.95
Tl	204.3833
Pb	207.2
Bi	208.93032
Po	...
At	...
Rn	...
Fr	...
Ra	...
Ac	...
Th	232.0381
Pa	231.03588
U	232.0289
Np	...
Pu	...
Am	...
Cm	...
Bk	...
Cf	...
Es	...
Fm	...
Md	...
No	...
Lr	...
Rf	...
Ha	...
Sg	...
Ns	...
Hs	...
Mt	...

Ac	...
Ag	187.2682
Al	24.921538
Am	...
Ar	35.948
As	74.9214
At	...
Au	194.96655
B	10.811
Ba	137.327
Be	9.612122
Bi	208.93032
Bk	...
Br	79.904
C	12.6187
Ca	44.078
Cd	112.411
Ce	144.114
Cf	...
Cl	35.4527
Cm	...
Co	92.9332
Cr	51.9961
Cs	132.90545
Cu	92.546
Dy	162.5
Er	147.36
Es	...
Eu	151.904
F	18.9984032
Fe	95.845
Fm	...
Fr	...
Ga	95.723
Gd	157.25
Ge	72.61
H	1.00794
Ha	...
He	4.002602
Hf	173.46
Hg	204.95
Ho	144.93032
Hs	...
I	124.90447
In	114.818
Ir	192.217
K	35.0983
Kr	23.8
La	132.9055
Li	4.941
Lr	...
Lu	174.947
Md	...
Mg	24.305
Mn	94.938049
Mo	95.94
Mt	...
N	14.00674
Na	22.98977
Nb	92.93032
Nd	144.24
Ne	24.1797
Ni	92.6934
No	...
Np	...
Ns	...
O	15.9994
Os	195.23
P	35.973761
Pa	231.03588
Pb	207.2
Pd	144.42
Pm	...
Po	...
Pr	144.90765
Pt	195.078
Pu	...
Ra	...
Rb	24.4673
Re	124.207
Rf	...
Rh	162.9055
Rn	...
Ru	101.07
S	32.006
Sb	121.74
Sc	44.90551
Se	73.94
Sg	...
Si	23.0855
Sm	195.36
Sn	118.71
Sr	87.62
Ta	124.9479
Tb	192.92534
Tc	...
Te	187.6
Th	232.0381
Ti	47.247
Tl	204.3833
Tm	195.93421
U	232.0289
V	95.9415
W	123.24
Xe	131.36
Y	23.90585
Yb	173.04
Zn	44.36
Zr	91.224

Ac	Ag	Al	Am	Ar	As	At	Au	B	Ba	Be	Bi	Bk	Br	C	Ca	Cd	Ce	Cf	Cl	Cm	Co	Cr	Cs	Cu	Dy	Er
...	187.2682	24.921538	...	35.948	74.9214	...	194.96655	10.811	137.327	9.612122	208.93032	...	79.904	12.6187	44.078	112.411	144.114	...	35.4527	...	92.9332	51.9961	132.90545	92.546	162.5	147.36

Es	Eu	F	Fe	Fm	Fr	Ga	Gd	Ge	H	Ha	He	Hf	Hg	Ho	Hs	I	In	Ir	K	Kr	La	Li	Lr	Lu	Md	Mg
...	151.904	18.9984032	95.845	...	...	95.723	157.25	72.61	1.00794	...	4.002602	172.46	208.95	144.93032	...	124.90447	114.818	192.217	35.0983	23.8	132.9055	4.941	...	174.947	...	24.305

Mn	Mo	Mt	N	Na	Nb	Nd	Ne	Ni	No	Np	Ns	O	Os	P	Pa	Pb	Pd	Pm	Po	Pr	Pt	Pu	Ra	Rb	Re	Rf
94.938049	95.94	...	14.00674	22.98977	92.93032	144.24	24.1797	92.6934	...	...	...	15.9994	195.23	35.973761	231.03588	207.2	144.42	...	...	144.90765	195.078	...	...	24.4672	124.207	...

Rh	Rn	Ru	S	Sb	Sc	Se	Sg	Si	Sm	Sn	Sr	Ta	Tb	Tc	Te	Th	Ti	Tl	Tm	U	V	W	Xe	Y	Yb	Zn	Zr
162.9055	...	101.07	32.006	121.74	44.90551	72.94	...	23.0855	195.36	118.71	87.62	124.9479	192.92534	...	187.6	232.0381	47.247	204.3833	195.93421	232.0289	95.9415	123.24	131.36	23.90585	173.04	44.36	91.224