

PERIODIC TABLES:

I. Directory, II. Traditional, III. Vertical, IV. Toxicity (LD₅₀ values), V. Native (elemental form)

Site developed by Steve Murov, Professor Emeritus of Chemistry, Modesto Junior College, <http://murov.info/>
Other Murov sites:

Chemistry Directory: <http://murov.info/webercises.htm>

Organic Chemistry Directory: <http://murov.info/orgchem.htm>

Organic Solvent Properties and Property Directory: <http://murov.info/orgsolvents.htm>

Reaction-Map of Organic Chemistry: <http://murov.info/rxnmaponline.pdf>

I. Directory of Periodic Tables

A. Properties, Graphing and/or Ranking Capability

WebElements - <http://www.webelements.com/>

<http://www.rsc.org/Education/Teachers/Resources/ptdata/welcome.htm>

<http://acswebcontent.acs.org/games/pt.html>

<http://www.periodictable.com/Properties/A/AbsoluteBoilingPoint.html>

<http://environmentalchemistry.com/yogi/periodic/>

B. Properties

<http://www.rsc.org/periodic-table/>

<http://www.chemicool.com/>

<http://public.wsu.edu/~wherland/>

<http://www.ch.cam.ac.uk/content/periodic-table>

<http://www.chemicalelements.com/>

<http://www.lenntech.com/periodic/periodic-chart.htm>

<http://hyperphysics.phy-astr.gsu.edu/Hbase/pertab/pertab.html>

<http://www.webqc.org/periodictable-Carbon-C.html>

<http://www.chemnetbase.com/PeriodicTable/index.jsf>

<http://www.chemglobe.org/ptoe/index.php>

<http://education.jlab.org/itselemental/>

<http://www.visualentities.com/periodictable.htm>

<http://www.americanelements.com/>

<http://pubs.acs.org/cen/80th/elements.html>

<http://www.speclab.com/elements/>

<http://www.elementsdatabase.com/>

Interactive and/or Animated Periodic Table

<http://animatedsoftware.com/elearning/Periodic%20Table/AnimatedPeriodicTable.swf>

<http://profmokeur.ca/chemistry/>

<http://www.ptable.com/>

<http://www.rsc.org/periodic-table/>

<http://www.syngentaperiodictable.co.uk/>

<http://www.humantouchofchemistry.com/sites/all/themes/zen/chem/pages/periodictable.html>

http://www.knovel.com/web/portal/periodic_table

Images of Elements

<http://periodictable.com/>

<http://chemistry.about.com/library/blperiodictable.htm>

<http://www.theodoregray.com/PeriodicTable/>

<http://www.chemtopics.com/elements.htm>

<http://www.lenntech.com/periodic/periodic-chart.htm>

<http://www.chemeddl.org/resources/pt/>

http://www.popsoci.com/files/periodic_popup.html

About the Periodic Table

<http://www.open.edu/openlearn/science-maths-technology/science/chemistry/elements-the-periodic-table>

C. Mendeleev and the History of the Periodic Table

<http://www.aip.org/history/curie/periodic.htm>
<http://web.lemoyne.edu/~giunta/EA/MENDELEEVann.HTML>
http://en.wikipedia.org/wiki/History_of_the_periodic_table
http://en.wikipedia.org/wiki/Periodic_table
<http://www.hobart.k12.in.us/ksms/PeriodicTable/index.htm>
<http://www.rsc.org/Education/Teachers/Resources/periodictable/pre16/develop/mendeleev.htm>

D. Emission Spectra of Elements and Electron Structure

<http://jersey.uoregon.edu/vlab/elements/Elements.html>
<http://www.colorado.edu/physics/2000/applets/a2.html>
http://chemlinks.beloit.edu/BlueLight/moviepages/em_el.htm
<http://chemistry.bd.psu.edu/jircitano/periodic4.html>

E. Isotopes

<http://ie.lbl.gov/education/isotopes.htm>
[http://encyclopedia.thefreedictionary.com/Isotope%20table%20\(complete\)](http://encyclopedia.thefreedictionary.com/Isotope%20table%20(complete))
[http://encyclopedia.thefreedictionary.com/Isotope%20table%20\(divided\)](http://encyclopedia.thefreedictionary.com/Isotope%20table%20(divided))
http://www.meta-synthesis.com/webbook/33_segre/segre.html
<http://atom.kaeri.re.kr/>
http://www.ciaaw.org/pubs/Periodic_Table_Isotopes.pdf
<http://www.sisweb.com/mstools.htm>
<http://www.ptable.com/>

F. Chemogenesis (chemical reactivity from the periodic table)

<http://www.meta-synthesis.com/webbook.html>

G. Tabular Compilation of Elemental Properties and Abundances

http://www.kayelaby.npl.co.uk/chemistry/3_1/3_1_2.html
http://www.kayelaby.npl.co.uk/chemistry/3_1/3_1_3.html

H. Elemental Toxicities

<http://www.danasview.net/metals.htm>
<http://corrosion-doctors.org/Elements-Toxic/Elements.htm>
<http://www.vitaletherapeutics.org/vtlmntox.htm>

I. Sources, Uses, Functions and Mineralogy of Elements

<http://www.corrosionsource.com/FreeContent/1/Periodic%20Table>
<http://www.speclab.com/elements/>
<http://www.mii.org/periodic/miiperiodicchart.htm>

Native Elements

<http://www.britannica.com/EBchecked/topic/405982/native-element>
<http://www.galleries.com/Elements>
<http://ruby.colorado.edu/~smyth/G3010/14Natives.pdf>

J. Periodic Table Videos

<http://periodicvideos.com/>

K. Extended Periodic Table

<http://jeries.rihani.com/>
http://en.wikipedia.org/wiki/Extension_of_the_periodic_table_beyond_the_seventh_period

L. Vertical Periodic Table

extended - [http://en.wikipedia.org/wiki/Periodic_table_\(vertical\)](http://en.wikipedia.org/wiki/Periodic_table_(vertical))
[http://english.turkcebilgi.com/Periodic+table+\(vertical\)](http://english.turkcebilgi.com/Periodic+table+(vertical))

M. Periodic Table Printmaking Projects

<http://periodictableprints.com/table/>
<http://uwaterloo.ca/chemistry/international-year-chemistry/periodic-table-project>

N. Periodic Table of Comic Books - <http://www.uky.edu/Projects/Chemcomics/>

O. The Element Song by Tom Lehrer

<http://www.youtube.com/watch?v=SmwlzwGMMwc&feature=related>

<http://www.privatehand.com/flash/elements.html>

<http://www.youtube.com/watch?v=GFIvXVMbII0>

<http://www.youtube.com/watch?v=zGM-wSKFBpo>

<http://www.youtube.com/watch?v=DYW50F42ss8>

<http://www.edu-cyberpg.com/iec/elementsong.html>

P. Periodic Table Templates

<http://www.vertex42.com/ExcelTemplates/periodic-table-of-elements.html>

<http://science.widener.edu/~svanbram/ptable.html>

Q. Directories of Periodic Tables

http://www.meta-synthesis.com/webbook/35_pt/pt_database.php

http://www.martindalecenter.com/Reference_3_PerTables.html

<http://www.thecatalyst.org/m03ptabl.html>

<http://www.liv.ac.uk/Chemistry/Links/refperiodic.html>

<http://www.anachem.umu.se/cgi-bin/pointer.exe?PeriodicTables>

http://chemistry.about.com/od/periodictableelements/Periodic_Table_The_Elements.htm

<http://www.chemtopics.com/elements.htm>

Questions about the periodic Tables

1. Suggest reasons for the predominance of the horizontal periodic table model over the vertical model but also suggest some advantages of the vertical model.
2. Which elements are sometimes referred to as the noble metals and why are they called noble metals? Is there any relationship of this terminology to the use of these metals in jewelry?
3. Of the elements with LD₅₀ values for rodents reported, list the five most toxic. Does there appear to be any periodicity to toxicity? Explain your answer. (Note: a possibly relevant reference is: <http://www.vitaletherapeutics.org/vtlmntox.htm>)
4. Which of the native elements occur in nature in uncombined form (not as diatomics or bonded to themselves)? Is there a difference between the definition of an element and an elementary substance? (Note: a possibly relevant reference is Myers, R.J. *J. Chem. Educ.*, **2012**, 89, pp. 832-833.)

II. Traditional PERIODIC TABLE OF THE ELEMENTS

s		d										p					18
1																	8A
1A																	8A
1	2											13	14	15	16	17	2
<i>H</i> 1.008	2A											3A	4A	5A	6A	7A	<i>He</i> 4.0026
3 Li 6.97	4 Be 9.012											5 B 10.82	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 <i>Ne</i> 20.180
11 Na 22.990	12 Mg 24.305	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9 8B	10 8B	11 1B	12 2B	13 Al 26.982	14 Si 28.085	15 P 30.974	16 S 32.07	17 <i>Cl</i> 35.45	18 <i>Ar</i> 39.948
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.867	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.847	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.39	31 Ga 69.723	32 Ge 72.63	33 As 74.922	34 Se 78.96	35 <i>Br</i> 79.904	36 <i>Kr</i> 83.798
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 <i>Xe</i> 131.29
55 Cs 132.91	56 Ba 137.33	57 La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 <i>Rn</i> (222)
87 Fr (223)	88 Ra 226.03	89 Ac 227.03	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 Ds (269)	111 Rg (272)	112 Cn (277)	113 2003 (284)	114 Fr (289)	115 2003 (288)	116 Lv (292)	117 2010 (294)	118 2006 (294)
f																	
		58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97		
		90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np 237.05	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)		

key: bold or normal italics - gas, shadow - liquid, bold or normal - solid, normal print - all known isotopes are radioactive

III. Vertical PERIODIC TABLE OF THE ELEMENTS

1	<i>H</i> 1.008	3	Li 6.97	11	Na 22.990	19	K 39.098	37	Rb 85.468	55	Cs 132.91	87	Fr (223)
1 IA		2	Be 9.012	12	Mg 25.305	20	Ca 40.078	38	Sr 87.62	56	Ba 137.33	88	Ra 226.03
S	2 2A			3	3B	21	Sc 44.956	39	Y 88.906	57	La 138.91	89	Ac 227.03
				4	4B	22	Ti 47.867	40	Zr 91.224	72	Hf 178.49	104	Rf (261)
				5	5B	23	V 50.942	41	Nb 92.906	73	Ta 180.95	105	Db (262)
				6	6B	24	Cr 51.996	42	Mo 95.94	74	W 183.85	106	Sg (263)
				7	7B	25	Mn 54.938	43	Tc (98)	75	Re 186.21	107	Bh (262)
d				8	8B	26	Fe 55.847	44	Ru 101.07	76	Os 190.23	108	Hs (265)
				9	8B	27	Co 58.933	45	Rh 102.93	77	Ir 180.95	109	Mt (266)
				10	8B	28	Ni 58.693	46	Pd 106.42	78	Pt 195.08	110	Ds (269)
				11	1B	29	Cu 63.546	47	Ag 107.87	79	Au 196.97	111	Rg (272)
				12	2B	30	Zn 65.39	48	Cd 112.41	80	Hg 200.59	112	Cn (277)
				13	3A	5	B 10.82	13	Al 26.982	31	Ga 69.723	49	In 114.82
				14	4A	6	C 12.011	14	Si 28.085	32	Ge 72.63	50	Sn 118.71
				15	5A	7	N 14.007	15	P 30.974	33	As 74.922	51	Sb 121.76
				16	6A	8	O 15.999	16	S 32.07	34	Se 78.96	52	Te 127.60
				17	7A	9	F 18.998	17	Cl 35.45	35	Br 79.904	53	I 126.90
				18	8A	2	He 4.0026	10	Ne 20.180	18	Ar 39.948	36	Kr 83.798
								36	Kr 83.798	54	Xe 131.29	86	Rn (222)
								54	Xe 131.29	86	Rn (222)	118	2006 (294)
								81	Tl 204.38	81	Tl 204.38	113	2003 (284)
								82	Pb 207.2	82	Pb 207.2	114	Fr (289)
								83	Bi 208.98	83	Bi 208.98	115	2003 (288)
								84	Po (209)	84	Po (209)	116	Lv (292)
								85	At (210)	85	At (210)	117	2010 (294)
								86	Rn (222)	86	Rn (222)	118	2006 (294)
								58	Ce 140.12	58	Ce 140.12	90	Th 232.04
								59	Pr 140.91	59	Pr 140.91	91	Pa 231.04
								60	Nd 144.24	60	Nd 144.24	92	U 232.04
								61	Pm (145)	61	Pm (145)	93	Np 237.05
								62	Sm 150.36	62	Sm 150.36	94	Pu (244)
								63	Eu 151.96	63	Eu 151.96	95	Am (243)
								64	Gd 157.25	64	Gd 157.25	96	Cm (257)
								65	Tb 158.93	65	Tb 158.93	97	Bk (247)
								66	Dy 162.50	66	Dy 162.50	98	Cf (257)
								67	Ho 164.93	67	Ho 164.93	99	Es (252)
								68	Er 167.26	68	Er 167.26	100	Fm (257)
								69	Tm 168.93	69	Tm 168.93	101	Md (258)
								70	Yb 173.04	70	Yb 173.04	102	No (259)
								71	Lu 174.97	71	Lu 174.97	103	Lr (260)

key: bold or normal italics - gas, shadow - liquid, bold or normal - solid, normal print - all known isotopes are radioactive

V. PERIODIC TABLE OF ELEMENTS FOUND IN ELEMENTAL FORM

1 H																	2 He 😊
3 Li	4 Be											5 B	6 C 😊	7 N 😊	8 O 😊	9 F	10 Ne 😊
11 Na	12 Mg											13 Al	14 Si	15 P	16 S 😊	17 Cl	18 Ar 😊
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu 😊	30 Zn	31 Ga	32 Ge	33 As 😊	34 Se 😊	35 Br	36 Kr 😊
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru 😊	45 Rh 😊	46 Pd 😊	47 Ag 😊	48 Cd	49 In	50 Sn	51 Sb 😊	52 Te 😊	53 I 😊	54 Xe 😊
55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os 😊	77 Ir 😊	78 Pt 😊	79 Au 😊	80 Hg rarely 😊	81 Tl	82 Pb 😊	83 Bi ? 😊	84 Po	85 At	86 Rn 😊 ☠️
87 Fr	88 Ra	89 Ac	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 2003	114 Fl	115 2003	116 Lv	117 2010	118 2006
			58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	
			90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr	