

**OKLAHOMA SCHOOL of  
SCIENCE and MATHEMATICS**

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**Chemistry - Summer Assignment**

You will find very soon that chemistry is a fascinating language that is both verbal and pictorial. To learn a new language one must start with the alphabet to make words and sentences. Similarly, in chemistry one needs to begin to learn the symbols (alphabet) of the elements to make molecular formulae (words) and chemical equations (sentences). We have learned through the years that it is easier for the students to learn chemical concepts if they come to class with a background in chemical symbols, valence and nomenclature. You will be taking chemistry either in your first or second semester at OSSM. Plan on spending sometime this summer studying the following information before your arrival. This advance preparation will prove very beneficial to you.

- 1) Study the *Periodic Table of the Elements* (Handout #1). Learn and memorize the name and symbol of each element in groups 1 through 18.
  - Group 1 is called *alkali metals*: H (hydrogen), Li (Lithium), Na (Sodium), K (Potassium), Rb (Rubidium), Cs (Cesium), and Fr (Francium).
  - Group 2 is called *alkaline earth metals*: Be (Beryllium), Mg (Magnesium), Ca (Calcium), Sr (Strontium), Ba (Barium), and Ra (Radium).
  - Group 3–12 are called *transition metal elements* (these are optional for you to memorize). Skip elements with atomic numbers (57–71), Lanthanide series, and (89–103), Actinide series.
  - Group 13: B (Boron), Al (Aluminum), Ga (Gallium), In (Indium), Tl (Thallium)
  - Group 14: C (Carbon), Si (Silicon), Ge (Germanium), Sn (Tin), Pb (Lead)
  - Group 15: N (Nitrogen), P (Phosphorous), As (Arsenic), Sb (Antimony), Bi (Bismuth)
  - Group 16: O (Oxygen), S (Sulfur), Se (Selenium), Te (Tellurium), Po (Polonium)
  - Group 17: F (Fluorine), Cl (Chlorine), Br (Bromine), I (Iodine), At (Astatine)
  - Group 18: He (Helium), Ne (Neon), Ar (Argon), Kr (Krypton), Xe (Xenon), Rn (Radon)
- 2) Learn the list of symbols and charges for monatomic and polyatomic ions (Handout #2).
- 3) Learn the name and formula of 100 compounds (Handout #3 and #4 in Orientation booklet and also a loose-leaf copy). **The loose-leaf Handout #3 and #4 will be completed by you and returned to OSSM along with other required paperwork. The set that is included in this Orientation booklet is for you to record your answers since you will need these handouts throughout the course.**
- 4) Chemistry Summer Preparation Assignment – 1000 word essay, see handout #5
- 5) For web help and study please go to 1) <http://www.webelements.com/> or 2) <http://dbhs.wvusd.k12.ca.us/webdocs/Nomenclature/Acid-Nomenclature.html>
- 6) For additional questions or help, email Dr. Rahman (Fazlur.Rahman@ossm.edu), Dr. Ruibo Li (Ruibo.Li@ossm.edu), or Dr. Hossain (delwar.hossain@ossm.edu)

# PERIODIC TABLE

## Atomic Properties of the Elements

### FREQUENTLY USED FUNDAMENTAL PHYSICAL CONSTANTS<sup>1</sup>

<sup>1</sup> second = 9 192 631 770 periods of radiation corresponding to the transition between the two hyperfine levels of the ground state of <sup>133</sup>Cs

$c$	299 792 458 m s <sup>-1</sup>	(exact)
$h$	6.626 070 x 10 <sup>-34</sup> J s	
$e$	1.602 177 x 10 <sup>-19</sup> C	
electron mass	9.109 384 x 10 <sup>-31</sup> kg	
$m_p c^2$	0.510 999 MeV	
$m_n c^2$	1.672 622 x 10 <sup>-27</sup> kg	
$\alpha$	1/137.035 999	
$R_\infty$	10 973 731.569 m <sup>-1</sup>	
$R_\infty c$	3.289 841 960 x 10 <sup>15</sup> Hz	
$R_\infty hc$	13 605 693 eV	
$eV$	1.602 177 x 10 <sup>-19</sup> J	
$k$	1.380 65 x 10 <sup>-23</sup> J K <sup>-1</sup>	
$R$	8.314 5 J mol <sup>-1</sup> K <sup>-1</sup>	

electron volt  
Boltzmann constant  
molar gas constant

<sup>2</sup> For the most accurate values of these and other constants, visit [physics.nist.gov/constants](http://physics.nist.gov/constants).

- Solids
- Liquids
- Gases
- Artificially Prepared

**NIST** National Institute of Standards and Technology  
U.S. Department of Commerce  
Physical Measurement Laboratory [www.nist.gov/pml](http://www.nist.gov/pml)  
Standard Reference Data [www.nist.gov/srd](http://www.nist.gov/srd)

Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18																										
IA	IIA		IIIB			IVB			VB			VIB			VIB			VIIIB			VIII			IB			IIB			IIIA			IVA			VA			VIA			VIIA		
Period																																												
1	<b>Li</b> 3 Li 6.94 1s <sup>2</sup> 2s <sup>1</sup>	<b>Be</b> 4 Be 9.0122 1s <sup>2</sup> 2s <sup>2</sup>																																										
2	<b>Na</b> 11 Na 22.990 [Ne]3s <sup>1</sup>	<b>Mg</b> 12 Mg 24.305 [Ne]3s <sup>2</sup>																																										
3	<b>K</b> 19 K 39.098 [Ar]4s <sup>1</sup>	<b>Ca</b> 20 Ca 40.078 [Ar]4s <sup>2</sup>	<b>Sc</b> 21 Sc 44.956 [Ar]3d <sup>1</sup> 4s <sup>2</sup>	<b>Ti</b> 22 Ti 47.867 [Ar]3d <sup>2</sup> 4s <sup>2</sup>	<b>V</b> 23 V 50.942 [Ar]3d <sup>3</sup> 4s <sup>2</sup>	<b>Cr</b> 24 Cr 51.996 [Ar]3d <sup>5</sup> 4s <sup>1</sup>	<b>Mn</b> 25 Mn 54.938 [Ar]3d <sup>5</sup> 4s <sup>2</sup>	<b>Fe</b> 26 Fe 55.845 [Ar]3d <sup>6</sup> 4s <sup>2</sup>	<b>Co</b> 27 Co 58.933 [Ar]3d <sup>7</sup> 4s <sup>2</sup>	<b>Ni</b> 28 Ni 58.693 [Ar]3d <sup>8</sup> 4s <sup>2</sup>	<b>Cu</b> 29 Cu 63.546 [Ar]3d <sup>10</sup> 4s <sup>1</sup>	<b>Zn</b> 30 Zn 65.38 [Ar]3d <sup>10</sup> 4s <sup>2</sup>	<b>Al</b> 13 Al 26.982 [Ne]3s <sup>2</sup> 3p <sup>1</sup>	<b>Si</b> 14 Si 28.085 [Ne]3s <sup>2</sup> 3p <sup>2</sup>	<b>P</b> 15 P 30.974 [Ne]3s <sup>2</sup> 3p <sup>3</sup>	<b>S</b> 16 S 32.06 [Ne]3s <sup>2</sup> 3p <sup>4</sup>	<b>Cl</b> 17 Cl 35.453 [Ne]3s <sup>2</sup> 3p <sup>5</sup>	<b>Ar</b> 18 Ar 39.948 [Ne]3s <sup>2</sup> 3p <sup>6</sup>																										
4	<b>Rb</b> 37 Rb 85.468 [Kr]5s <sup>1</sup>	<b>Sr</b> 38 Sr 87.62 [Kr]5s <sup>2</sup>	<b>Y</b> 39 Y 88.906 [Kr]4d <sup>1</sup> 5s <sup>2</sup>	<b>Zr</b> 40 Zr 91.224 [Kr]4d <sup>2</sup> 5s <sup>2</sup>	<b>Nb</b> 41 Nb 92.906 [Kr]4d <sup>4</sup> 5s <sup>1</sup>	<b>Mo</b> 42 Mo 95.96 [Kr]4d <sup>5</sup> 5s <sup>1</sup>	<b>Ru</b> 44 Ru 101.07 [Kr]4d <sup>7</sup> 5s <sup>1</sup>	<b>Rh</b> 45 Rh 102.91 [Kr]4d <sup>8</sup> 5s <sup>1</sup>	<b>Pd</b> 46 Pd 106.42 [Kr]4d <sup>10</sup>	<b>Ag</b> 47 Ag 107.87 [Kr]4d <sup>10</sup> 5s <sup>1</sup>	<b>Cd</b> 48 Cd 112.41 [Kr]4d <sup>10</sup> 5s <sup>2</sup>	<b>In</b> 49 In 114.82 [Kr]4d <sup>10</sup> 5s <sup>2</sup> 6p <sup>1</sup>	<b>Sn</b> 50 Sn 118.71 [Kr]4d <sup>10</sup> 5s <sup>2</sup> 6p <sup>2</sup>	<b>Sb</b> 51 Sb 121.76 [Kr]4d <sup>10</sup> 5s <sup>2</sup> 6p <sup>3</sup>	<b>Te</b> 52 Te 127.60 [Kr]4d <sup>10</sup> 5s <sup>2</sup> 6p <sup>4</sup>	<b>I</b> 53 I 126.90 [Kr]4d <sup>10</sup> 5s <sup>2</sup> 6p <sup>5</sup>	<b>Xe</b> 54 Xe 131.29 [Kr]4d <sup>10</sup> 5s <sup>2</sup> 6p <sup>6</sup>																											
5	<b>Cs</b> 55 Cs 132.91 [Xe]6s <sup>1</sup>	<b>Ba</b> 56 Ba 137.33 [Xe]6s <sup>2</sup>	<b>La</b> 57 La 138.91 [Xe]5d <sup>1</sup> 6s <sup>2</sup>	<b>Ce</b> 58 Ce 140.116 [Xe]4f <sup>1</sup> 6s <sup>2</sup>	<b>Pr</b> 59 Pr 140.91 [Xe]4f <sup>3</sup> 6s <sup>2</sup>	<b>Nd</b> 60 Nd 144.24 [Xe]4f <sup>4</sup> 6s <sup>2</sup>	<b>Pm</b> 61 Pm [Xe]4f <sup>5</sup> 6s <sup>2</sup>	<b>Sm</b> 62 Sm 150.36 [Xe]4f <sup>6</sup> 6s <sup>2</sup>	<b>Eu</b> 63 Eu 151.96 [Xe]4f <sup>7</sup> 6s <sup>2</sup>	<b>Gd</b> 64 Gd 157.25 [Xe]4f <sup>7</sup> 6s <sup>2</sup>	<b>Tb</b> 65 Tb 158.93 [Xe]4f <sup>9</sup> 6s <sup>2</sup>	<b>Dy</b> 66 Dy 162.50 [Xe]4f <sup>10</sup> 6s <sup>2</sup>	<b>Ho</b> 67 Ho 164.93 [Xe]4f <sup>11</sup> 6s <sup>2</sup>	<b>Er</b> 68 Er 167.26 [Xe]4f <sup>12</sup> 6s <sup>2</sup>	<b>Tm</b> 69 Tm 168.93 [Xe]4f <sup>13</sup> 6s <sup>2</sup>	<b>Yb</b> 70 Yb 173.05 [Xe]4f <sup>14</sup> 6s <sup>2</sup>	<b>Lu</b> 71 Lu 174.97 [Xe]4f <sup>14</sup> 6s <sup>2</sup>																											
6	<b>Fr</b> 87 Fr [Fr] [Fr]	<b>Ra</b> 88 Ra [Ra] [Ra]	<b>Ac</b> 89 Ac [Ac] [Ac]																																									
7																																												

<sup>3</sup> Based upon <sup>12</sup>C. ( ) indicates the mass number of the longest-lived isotope.

<sup>4</sup> For the most precise values and uncertainties, visit [physics.nist.gov/constants](http://physics.nist.gov/constants) and [physics.nist.gov/units](http://physics.nist.gov/units).

Symbols and Charges for Monatomic Ions						
Symbol	Name		Symbol	Name		
H <sup>+</sup>	hydrogen ion		H <sup>-</sup>	hydride		Note that the letters in an ion's name before the -ide ending is the stem. For example, the stem for bromide is brom-.
Li <sup>+</sup>	lithium ion		F <sup>-</sup>	fluoride		
Na <sup>+</sup>	sodium ion		Cl <sup>-</sup>	chloride		
K <sup>+</sup>	potassium ion		Br <sup>-</sup>	bromide		
Rb <sup>+</sup>	rubidium ion		I <sup>-</sup>	iodide		
Cs <sup>+</sup>	cesium ion		O <sup>2-</sup>	oxide		
Be <sup>2+</sup>	beryllium ion		S <sup>2-</sup>	sulfide		
Mg <sup>2+</sup>	magnesium ion		Se <sup>2-</sup>	selenide		
Ca <sup>2+</sup>	calcium ion		Te <sup>2-</sup>	telluride		
Sr <sup>2+</sup>	strontium ion					
Ba <sup>2+</sup>	barium ion		Ag <sup>+</sup>	silver ion	N <sup>3-</sup>	nitride
Ra <sup>2+</sup>	radium ion		Ni <sup>2+</sup>	nickel ion	P <sup>3-</sup>	phosphide
Zn <sup>2+</sup>	zinc ion		Al <sup>3+</sup>	aluminum ion	As <sup>3-</sup>	arsenide

Symbol	Systematic name (Stock system)	Common name	Symbol	Systematic name (Stock system)	Common name
Cu <sup>+</sup>	copper(I)	cuprous	Hg <sub>2</sub> <sup>2+</sup>	mercury(I)	mercurous
Cu <sup>2+</sup>	copper(II)	cupric	Hg <sup>2+</sup>	mercury(II)	mercuric
Fe <sup>2+</sup>	iron(II)	ferrous	Pb <sup>2+</sup>	lead(II)	plumbous
Fe <sup>3+</sup>	iron(III)	ferric	Pb <sup>4+</sup>	lead(IV)	plumbic
Sn <sup>2+</sup>	tin(II)	stannous	Co <sup>2+</sup>	cobalt(II)	cobaltous
Sn <sup>4+</sup>	tin(IV)	stannic	Co <sup>3+</sup>	cobalt(III)	cobaltic
Cr <sup>2+</sup>	chromium(II)	chromous	Au <sup>+</sup>	gold(I)	aurous
Cr <sup>3+</sup>	chromium(III)	chromic	Au <sup>3+</sup>	gold(III)	auric
Mn <sup>2+</sup>	manganese(II)	manganous			
Mn <sup>3+</sup>	manganese(III)	manganic			

Symbols and Charges for Polyatomic Ions			
Formula	Name	Formula	Name
NO <sub>3</sub> <sup>-</sup>	nitrate	ClO <sub>4</sub> <sup>-</sup>	perchlorate
NO <sub>2</sub> <sup>-</sup>	nitrite	ClO <sub>3</sub> <sup>-</sup>	chlorate
CrO <sub>4</sub> <sup>2-</sup>	chromate	ClO <sub>2</sub> <sup>-</sup>	chlorite
Cr <sub>2</sub> O <sub>7</sub> <sup>2-</sup>	dichromate	ClO <sup>-</sup>	hypochlorite
CN <sup>-</sup>	cyanide	IO <sub>4</sub> <sup>-</sup>	periodate
MnO <sub>4</sub> <sup>-</sup>	permanganate	IO <sub>3</sub> <sup>-</sup>	iodate
OH <sup>-</sup>	hydroxide	IO <sup>-</sup>	hypoiodite
O <sub>2</sub> <sup>2-</sup>	peroxide	BrO <sub>3</sub> <sup>-</sup>	bromate
NH <sub>2</sub> <sup>-</sup>	amide	BrO <sup>-</sup>	hypobromite
CO <sub>3</sub> <sup>2-</sup>	carbonate	HCO <sub>3</sub> <sup>-</sup>	hydrogen carbonate (bicarbonate)
SO <sub>4</sub> <sup>2-</sup>	sulfate	HSO <sub>4</sub> <sup>-</sup>	hydrogen sulfate (bisulfate)
SO <sub>3</sub> <sup>2-</sup>	sulfite	HSO <sub>3</sub> <sup>-</sup>	hydrogen sulfite (bisulfite)
C <sub>2</sub> O <sub>4</sub> <sup>2-</sup>	oxalate	HC <sub>2</sub> O <sub>4</sub> <sup>-</sup>	hydrogen oxalate (binoxalate)
PO <sub>4</sub> <sup>3-</sup>	phosphate	HPO <sub>4</sub> <sup>2-</sup>	hydrogen phosphate
PO <sub>3</sub> <sup>3-</sup>	phosphite	H <sub>2</sub> PO <sub>4</sub> <sup>-</sup>	dihydrogen phosphate

Student's Name (Please Print)

Name	Formula		Name	Formula
1. ammonium sulfide			26. nickel(II) iodide	
2. sodium nitrate			27. mercurous oxide	
3. cupric bromide			28. lead(II) chlorite	
4. aluminum sulfate			29. stannic iodide	
5. potassium nitrate			30. iron(II) bisulfite	
6. ferrous carbonate			31. magnesium nitrate	
7. lead(II) phosphate			32. iron(III) chromate	
8. sodium phosphide			33. iron(II) chromate	
9. cupric hydroxide			34. copper(II) hydroxide	
10. calcium fluoride			35. cuprous carbonate	
11. nickel(II) nitrate			36. chromic acetate	
12. silver cyanide			37. calcium chlorate	
13. ammonium sulfite			38. cobaltous telluride	
14. zinc sulfate			39. mercurous perchlorate	
15. tin(II) chloride			40. zinc bicarbonate	
16. antimony(III) chloride			41. sodium phosphate	
17. silver sulfide			42. silver hypochlorite	
18. magnesium hydroxide			43. ammonium phosphate	
19. ammonium carbonate			44. ferrous chlorite	
20. nickel(II) acetate			45. potassium sulfide	
21. sodium chromate			46. tin(IV) bromide	
22. chromic bisulfate			47. lithium chromate	
23. potassium permanganate			48. magnesium bisulfate	
24. silver perchlorate			49. ferrous phosphate	
25. potassium phosphate			50. calcium sulfate dihydrate	

Student's Name (Please Print)

Formula	Name	Formula	Name
51. FeCl <sub>3</sub>		76. NH <sub>4</sub> F	
52. PbF <sub>2</sub>		77. HgF <sub>2</sub>	
53. PbSO <sub>4</sub>		78. K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	
54. KF		79. NH <sub>4</sub> OH	
55. NaCl		80. (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	
56. V <sub>2</sub> O <sub>5</sub>		81. Na <sub>2</sub> O	
57. AlBr <sub>3</sub>		82. SnCrO <sub>4</sub>	
58. Ba(ClO <sub>4</sub> ) <sub>2</sub>		83. Al <sub>2</sub> O <sub>3</sub>	
59. Ba <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub>		84. CuCO <sub>3</sub>	
60. CdO		85. RbClO <sub>2</sub>	
61. FePO <sub>4</sub>		86. CuS	
62. Hg <sub>2</sub> SO <sub>4</sub>		87. MgI <sub>2</sub>	
63. KH		88. CoCl <sub>3</sub>	
64. Co <sub>2</sub> (SO <sub>3</sub> ) <sub>3</sub>		89. NaCN	
65. Al <sub>2</sub> Se <sub>3</sub>		90. Hg <sub>3</sub> N <sub>2</sub>	
66. Ca <sub>3</sub> P <sub>2</sub>		91. NaBrO <sub>3</sub>	
67. Fe(NO <sub>2</sub> ) <sub>3</sub>		92. MnF <sub>4</sub>	
68. Sn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub>		93. Sb <sub>2</sub> O <sub>5</sub>	
69. PbO <sub>2</sub>		94. LiH	
70. Be(OH) <sub>2</sub>		95. VF <sub>5</sub>	
71. Sr(HCO <sub>3</sub> ) <sub>2</sub>		96. SnI <sub>4</sub>	
72. Sr(OH) <sub>2</sub>		97. KOH	
73. RaS		98. K <sub>2</sub> O	
74. Hg <sub>2</sub> O <sub>2</sub>		99. Rb <sub>2</sub> SO <sub>4</sub>	
75. Hg <sub>2</sub> (OH) <sub>2</sub>		100. Li <sub>2</sub> O	

# OKLAHOMA SCHOOL of SCIENCE and MATHEMATICS

## Chemistry Summer Preparation Assignment

In addition to the Chemistry assignments the incoming students are asked to write a 500-1000 word essay (2-5 pages) on one of the following prompts.

- Greatest three Nobel Prizes in chemistry
- Best three elements in the periodic table
- Best three compounds that changed our lives for better
- Three elements that has detrimental effects on health
- Three molecules that are harmful to the environment
- Clean water and clean air and our citizens rights
- What are we made of? The story of amino acid, RNA and DNA molecules
- Carbohydrates: The food we eat
- Chemistry of cosmetics
- Chemistry of new materials

### Your essay must include the following:

- A summary - An introduction (why it is important)
- What do we know?
- Statistical data, are there any applications?
- Benefit to society.
- A conclusion.

### The essay must also have the following information:

- Title, author's name, date of submission
- Must include references and/or citations, (preferred MLA citations).
- The essay must be written in 12 font Times New Roman.
- The student may use any sources.