Periodic Table of Elements v4.2

						U															
	Super Se	Gas NO		nversions m = 101.3 J		riodic Trends f increase \rightarrow		Equilib	rium		Quantum			Walent	(Wa)						
	HBr HCl		K = '	$M = 101.3 \text{ J}$ $^{\circ}\text{C} + 273.15$ $= 4.184 \text{ J}$	EN, IE,	EN, IE, & EA increase – Radius & Metallic decrease		When $a{\sf A}+b{\sf B}$ $K_c~=~$		E	$E_{ m photon} = hf = $	$=\frac{hc}{\lambda}$	1 Walent = $0.082 \text{ L(mol K)}^{-1}$								
	HNO ₃ H ₂ SO ₄ HClO ₃ HClO ₄	$\begin{array}{ccc} & & \text{CH}_4 \\ & & \text{C}_2\text{H}_6 \\ & & \text{C}_3\text{H}_8 \end{array}$	(m)L (milli)Liter(s g Gram(s)		m of Mercury iilo)Joule(s)		$K_{p} = \frac{(F)^{-1}}{(F)^{-1}}$ $K_{a} = \frac{[O]^{-1}}{(F)^{-1}}$	$(P_C)^c(P_D)^d$ $(P_A)^a(P_B)^b$ $(P_A)^a(P_B)^b$ $(P_A)^a(P_B)^b$	1	$L_{\rm closer} = 1.097 \times 10^{-10}$ $L_{\rm closer} = R_H \left(\frac{1}{n_i^2} - 2.18 \times 10^{-18} \right)$	$\frac{1}{n_f^2}$	$R=1$ Walentmosphere (Wam) $=1 \ \textit{Walentorr}$ $1 \ m^3 = 8.2 \times 10^{-5} \ Wamokel \ (Wal)$								
	1 IA	C ₄ H ₁₀ N ₂ O NH ₃	N ₂ O NH ₃			olt(s)		$K_w = K_a K_b = [H^+][OH^-]$ $K_w = 1.0 \times 10^{-14} \ (25^{\circ} \ C)$			hermo/Electroc	chem	Ideal Gas at STP: 1.837 Wake (Wk) 18 V								
	1 2.20	SO_3 SO_2			Constants			$H = p K_a + \log rac{[I]}{[I]}$ $p H + p O H$	= 14.	$\wedge S^{\circ} =$	$q = mc\triangle T$ $\sum_{\text{products}} S^{\circ} - \sum_{\text{products}} $			2							
1	H ₂ Hydrogen	H ₂ S HCl	Avogadro Faraday C	's Number	$N_A = 6.02$	$214 imes 10^{23} ext{mol}^{-1}$ $33 ext{ C mol}^{-1}$	1 p	$K_a = -\log K_a$,p	$K_b = -\log K_b.$	Sa	$G^{\circ} = \triangle H^{\circ} - C$	$ \triangle G^{\circ} $									
	1.01	2 IIA		lass Constant s Constant		660538×10^{-27} J (mol K) ⁻¹		Gasses/So $PV =$	nRT		$-RT \ln K = -\frac{q}{t}$ $I = \frac{q}{t}$		13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	Helium 4.00			
2	3 0.98 Li Lithium 6.94	4 1.57 Be Beryllium 9.01	Speed of	s Constant Light (Vacuum) n Constant	R = 62.36 $k_e = 8.987$ c = 2.998 > $k_b = 1.380$	$7 \times 10^{-23} \text{ J K}^{-1}$	C^{-2} M	$P_A = P_{\mathrm{total}} X_A$, where $X_A = \frac{\mathrm{moles}\ A}{\mathrm{total}\ \mathrm{moles}}$ $P_{\mathrm{total}} = P_A + P_B + P_C + \cdots$ $M = \frac{\mathrm{moles}\ \mathrm{solute}}{\mathrm{Liters}\ \mathrm{solution}}$, $m = \frac{\mathrm{moles}\ \mathrm{solute}}{\mathrm{kg}\ \mathrm{solvent}}$ $1\ \mathrm{atm} = 760\ \mathrm{mmHg} = 760\ \mathrm{torr}$ $\mathrm{STP} = 273.15\ \mathrm{K}\ \mathrm{and}\ 1.0\ \mathrm{atm}$ At STP, ideal gas $22.4\mathrm{L}\ \mathrm{mol}^{-1}$.			$E_{ m cell} = E_{ m cell}^{\circ} - rac{RT}{nE}$ Kinetics $E_{ m cell} = -kt \ (1 - kt)$	1 st order)	5 2.04 B Boron 10.81	6 2.55 C Carbon 12.01	7 3.14 N ₂ Nitrogen 14.01	8 3.44 O ₂ Oxygen 16.00	9 3.98 F₂ Fluorine 19.00	Ne Neon 20.18			
3	11 0.93 Na Sodium 22.99	Mg Magnesium 24.31	Planck's (a Proton/Electr Constant eat cap. of H_2O_0	h = 6.626	$< 10^{-34} \; { m Js}$		At STP, Ideal gas tandard condition $v_{rms} = 8 \; {\sf VIIIB}$	is 25° C, 1 atm.	$\frac{1}{[A]_t}$	$-\ln[A]_0 = -k$ ($-\frac{1}{[A]_0} = kt$ (3°) $-\frac{1}{[A]_0} = \frac{0.963}{t}$ (1st)	rd order)	13 1.61 Al Aluminium 26.98	14 1.90 Si Silicon 28.09	15 2.19 P Phosphorus 30.97	2.38 S Sulfur 32.06	17 3.16 Cl ₂ Chlorine 35.45	18 Ar Argon 39.95			
4	19 0.82 K Potassium 39.10	20 1.00 Ca Calcium 40.08	21 1.36 Sc Scandium 44.96	22 1.54 Ti Titanium 47.87	23 1.63 V Vanadium 50.94	24 1.66 Cr★ Chromium 52.00	25 1.55 Mn Manganese 54.94	26 1.83 Fe Iron 55.85	27 1.88 Co Cobalt 58.93	28 1.91 Ni Nickel 58.69	29 1.90 Cu* Copper 63.55	30 1.65 Zn Zinc ⁽²⁺⁾ 65.38	31 1.81 Ga Gallium 69.72	32 2.01 Ge Germanium 72.63	33 2.18 As Arsenic 74.92	34 2.55 Se Selenium 78.97	35 2.96 Br ₂ Bromine 79.90	36 3.00 Kr Krypton 83.80			
5	Rb Rubidium 85.47	38 0.95 Sr Strontium 87.62	39 1.22 Y Yttrium 88.91	Zr Zirconium 91.22	Nb★ Niobium 92.91	Mo ★ Molybdenum 95.95	Tc Technetium (98)	Ru★ Ruthenium 101.07	Rh ★ Rhodium 102.91	Pd★★ Palladium 106.42	Ag ★ Silver ⁽¹⁺⁾ 107.87	48 1.69 Cd Cadmium 112.41	49 1.78 In Indium 114.82	50 1.96 Sn Tin 118.71	51 2.05 Sb Antimony 121.76	52 2.1 Te Tellurium 127.60	53 2.86 2 Iodine 126.90	Xe Xenon 131.29			
6	Cs Caesium 132.91	56 0.89 Ba Barium 137.33	57-71 La-Lu Lanthanide	La-Lu Hf		1.5 74 2.36 75 Ta W Tungsten Rh 30.95 183.84 1		76 2.2 Os Osmium 190.23	77 2.20 lr Iridium 192.22	78 2.28 Pt★ Platinum 195.08	79 2.54 Au★ Gold 196.97	Hg Mercury 200.59	81 1.62 TI Thallium 204.38	Pb Lead 207.2	83 2.02 Bi Bismuth 208.98	Po Polonium (209)	At Astatine (210)	Rn Radon (222)			
7	87 0.7 Fr Francium (223)	Ra Radium (226)	89-103 Ac-Lr Actinide	Ac-Lr Ruther-		106 Sg Seaborgium (269)	107 Bh Bohrium (270)	108 Hs Hassium (277)	109 Mt Meitnerium (278)	Ds Darm- stadtium (281)	111 Reg Roentgenium (282)	112 Cn Copernicium (285)	113 Nh Nihonium (286)	114 Fl Flerovium (289)	115 Mc Moscovium (290)	116 L v Livermorium (293)	Ts Tennessine (294)	118 Og Ogannesson (294)			
	Alkali Metal Alkaline-Earth Metal Metalloid Non-metal		Z E.N. Sym Name mass	E.N. 57 1.1 Sym La Name Lanthanum		Pr Praseodymium 140.91	60 1.14 Nd Neodymium 144.24	61 1.13 Pm Promethium (145)	62 1.17 Sm Samarium 150.36	63 1.2 Eu Europium 151.96	Gadolinium 157.25	Tb Terbium 158.93	Dy Dysprosium 162.50	67 1.23 Ho Holmium 164.93	68 1.24 Er Erbium 167.26	Tm Thulium 168.93	70 1.1 Yb Ytterbium 173.05	71 1.27 Lu Lutetium 174.97			
	1 	Halogen Noble Gas Lanthanide/Actio Synthetic Lufbau Exception		Ac Actinium (227)	90 1.3 Th Thorium 232.04	91 1.5 Pa Protactinium 231.04	92 1.38 U Uranium 238.03	93 1.36 Np Neptunium (237)	94 1.28 Pu Plutonium (244)	95 1.13 Am Americium (243)	96 1.28 Cm Curium (247)	97 1.3 Bk Berkelium (247)	98 1.3 Cf Californium (251)	99 1.3 Es Einsteinium (252)	100 1.3 Fm Fermium (257)	101 1.3 Md Mendelevium (258)	102 1.3 No Nobelium (259)	103 1.3 Lr Lawrencium (266)			

$\begin{array}{cccccccccccccccccccccccccccccccccccc$		Polyato	Polyatomic lons	
ammonium 1- 1- (Cro ₄) ⁻² (Cr ₂ O ₇) ⁻² nitrate hydroxide bicarbonate or hydrogen carbonate chlorate chlorate cyanide hypochlorite bisulfate or hydrogen sulfate dihydrogen phosphate dihydrogen phosphate cyanide cyanide cyanide dihydrogen phosphate dihydrogen phosphate hypoiodite (SiO ₄) ⁻² (Cro ₄) ⁻³ (PO ₄) ⁻³ amide formate		1+		2-
nitrate nitrite hydroxide bicarbonate or hydrogen carbonate chlorate chlorate chlorite hypochlorite cyanide dihydrogen phosphate dihypoiodite hypoiodite formate form	$(\mathrm{NH_4})^{+1}$	ammonium	$(CrO_4)^{-2}$	chromate
nitrate hydroxide bicarbonate or hydrogen carbonate chlorate chlorate cyanide thiocyanate dihydrogen phosphate dihydrogen phosphate dihydroiodite formate form		1-	$(Cr_2O_7)^{-2}$	dichromate
hydroxide bicarbonate or hydrogen carbonate coetate coetate chlorate chlorate chlorate cyanide thiocyanate dihydrogen phosphate dihydrogen phosphate dihypoiodite charte cyanide dihydrogen phosphate dihydrogen phosphate formate for	$(NO_3)^{-1}$	nitrate	$(CO_3)^{-2}$	carbonate
hydroxide bicarbonate or hydrogen carbonate acetate (O ₂) ² (S ₂ O ₃) ² perchlorate chlorate chlorate chorite hypochlorite cyanide thiocyanate dihydrogen phosphate dihydrogen phosphate formate formate formate formate formate formate formate hydrogin differ formate formate	$(NO_2)^{-1}$	nitrite	$(\mathrm{HPO_4})^{-2}$	dibasic phosphate or
bicarbonate or hydrogen carbonate acetate (O ₂) ⁻² (O ₂) ⁻² (So ₃) ⁻² (So ₄) ⁻² chlorate chlorate chlorite hypochlorite cyanide thiocyanate bisulfate or hydrogen sulfate dihydrogen phosphate dihydrogen phosphate chlorate dihydrogen phosphate formate formate formate formate formate formate (NnO ₄) ⁻² (AsO ₄) ⁻³ (AsO ₃) ⁻³ (PO ₄) ⁻³ (PO ₄) ⁻³ (PO ₄) ⁻³ (PO ₄) ⁻³ amide	(OH) ⁻¹	hydroxide		<u>hydrogen phosphate</u>
hydrogen carbonate acetate acetate (O ₂) ⁻² (S ₂ O ₃) ⁻² perchlorate (SO ₄) ⁻² (SO ₄) ⁻² (SO ₄) ⁻² (AsO ₄) ⁻³ thiocyanate hypochlorite cyanide thiocyanate dihydrogen phosphate dihydrogen phosphate (C ₆ H ₅ O ₇) ⁻³ (PO ₄) ⁻³ (PO ₄) ⁻³ periodate hypoiodite (SiO ₄) ⁻³ (SiO ₄) ⁻⁴ amide	$(HCO_3)^{-1}$	<u>bicarbonate</u> or		
acetate $(S_2O_3)^{-2}$ perchlorate $(SO_4)^{-2}$ chlorate $(SO_3)^{-2}$ chlorite hypochlorite $(SO_3)^{-2}$ cyanide thiocyanate bisulfate or hydrogen sulfate dihydrogen phosphate $(C_6H_5O_7)^{-3}$ periodate iodate hypoiodite $(SiO_4)^{-3}$ formate formate		hydrogen carbonate	$(MnO_4)^{-2}$	manganate
perchlorate chlorate chlorate chlorite hypochlorite cyanide thiocyanate dihydrogen phosphate dihydrogen phosphate hypoiodite formate formate formate formate formate formate formate chlorate (SO ₄) ⁻² (AsO ₄) ⁻³ (AsO ₄) ⁻³ (AsO ₃) ⁻³ (BO ₃) ⁻³ (PO ₄) ⁻³ (PO ₄) ⁻³ (PO ₄) ⁻³ amide	$(C_2H_3O_2)^{-1}$	acetate	$(O_2)^{-2}$	peroxide
perchlorate chlorate chlorate chlorite hypochlorite cyanide thiocyanate bisulfate or hydrogen sulfate dihydrogen phosphate cholorite (AsO ₄) ⁻² (AsO ₄) ⁻³ (BO ₃) ⁻³ permanganate dihydrogen phosphate (C ₆ H ₅ O ₇) ⁻³ (PO ₄) ⁻³ periodate iodate hypoiodite (SiO ₄) ⁻⁴ amide			$(S_2O_3)^{-2}$	thiosulfate
chlorate chlorite hypochlorite cyanide thiocyanate bisulfate or hydrogen sulfate dihydrogen phosphate choosing periodate hypoiodite choosing (C ₆ H ₅ O ₇) ⁻³ (PO ₄) ⁻³ amide formate	$(C1O_4)^{-1}$	perchlorate	$(\mathrm{SO_4})^{-2}$	sulfate
chlorite hypochlorite cyanide thiocyanate bisulfate or hydrogen sulfate dihydrogen phosphate cyanide thiocyanate (AsO ₄) ⁻³ (AsO ₄) ⁻³ (BO ₃) ⁻³ permanganate dihydrogen phosphate (C ₆ H ₅ O ₇) ⁻³ (PO ₄) ⁻³ (PO ₄) ⁻³ amide formate	$(C10_3)^{-1}$	chlorate	$(SO_3)^{-2}$	sulfite
cyanide cyanide thiocyanate thiocyanate bisulfate or hydrogen sulfate dihydrogen phosphate dihydrogen phosphate condate hypoiodite formate formate	$(CIO_2)^{-1}$	chlorite	$(C_2O_4)^{-2}$	oxalate
cyanide thiocyanate thiocyanate bisulfate or hydrogen sulfate dihydrogen phosphate dihydrogen phosphate periodate hypoiodite (SiO ₄) ⁻³ (PO ₄) ⁻³ (PO ₄) ⁻³ (PO ₃) ⁻³ (PO ₄) ⁻³ amide	(CIO) ⁻¹	hypochlorite		
cyanide thiocyanate thiocyanate bisulfate or hydrogen sulfate dihydrogen phosphate dihydrogen phosphate $(C_6H_5O_7)^{-3}$ periodate iodate hypoiodite $(SiO_4)^{-4}$ amide formate	,			3-
thiocyanate bisulfate or hydrogen sulfate permanganate dihydrogen phosphate (C ₆ H ₅ O ₇) ⁻³ (PO ₄) ⁻³ periodate iodate hypoiodite (SiO ₄) ⁻⁴ amide	(CN)-1	cyanide	$(AsO_4)^{-3}$	arsenate
bisulfate or hydrogen sulfate permanganate dihydrogen phosphate (C ₆ H ₅ O ₇) ⁻³ (PO ₄) ⁻³ periodate iodate hypoiodite (SiO ₄) ⁻⁴ amide formate	(SCN)-1	thiocyanate	$(AsO_3)^{-3}$	arsenite
permanganate dihydrogen phosphate $(C_6H_5O_7)^{-3}$ $(PO_4)^{-3}$ periodate $(PO_3)^{-3}$ iodate $hypoiodite$ $SiO_4)^{-4}$ amide formate	$(\mathrm{HSO_4})^{-1}$	bisulfate or hydrogen sulfate	$(BO_3)^{-3}$	borate
dihydrogen phosphate $(C_6H_5O_7)^{-3}$ periodate $(PO_4)^{-3}$ iodate $(PO_3)^{-3}$ hypoiodite $(SiO_4)^{-4}$ amide formate	$(MnO_4)^{-1}$	permanganate	,	
periodate $(PO_4)^{-3}$ iodate $(PO_3)^{-3}$ hypoiodite $(SiO_4)^{-4}$ amide formate	$(H_2PO_4)^{-1}$	dihydrogen phosphate	$(C_6H_5O_7)^{-3}$	citrate
periodate $(PO_3)^{-3}$ iodate hypoiodite $(SiO_4)^{-4}$ amide formate			$(PO_4)^{-3}$	phosphate or tribasic phosphate
iodate hypoiodite amide formate	$(10_4)^{-1}$	periodate	$(PO_3)^{-3}$	phosphite
hypoiodite $(SiO_4)^{-4}$ amide formate	$(10_3)^{-1}$	iodate		-4-
	1-(OI)	hypoiodite	$(\mathrm{SiO_4})^{-4}$	silicate (ortho)
	(NH ₅) ⁻¹	amide		
	$(\mathrm{CHO}_2)^{-1}$	formate		

Atomic Ions	-1	F-1 Fluoride	Br-1 Bromide]	-2		Oride Oxide								-3		N ⁻³ Nitride	P-3 Phosphide	,			
Atomi	+1	Li ⁺¹ Lithium Na ⁺¹ Sodium	K ⁺¹ Potassium	Cu^{+1} Copper (I)	+2	Mg ⁺² Magnesium		Ba ⁺² Barium	•			Fe^{+2} Iron (II)	Mn ⁺² Manganese (II)	II) uii I	+3	Aluminum Aluminum	$ \operatorname{Fe}^{+3} $ Iron (III)			Pb ⁺⁴ Lead (IV)		Mn ⁺⁴ Manganese (IV)