,	m)L (milli)Lit g Gram(s) nm Nanomer atm Atmosph	ter(s) (k)J	mm of Mercur (kilo)Joule(s) Volt(s) Mole(s)	у		_						_						
	Fara Atomic N Molar		F = 96485.33 C $1 amu = 1.6605$ $R = 8.3144$ J m	$0.000^{-1} \ \mathrm{Mol}^{-1} \ \mathrm{Mol}^{-1} \ \mathrm{kg}^{-1} \ \mathrm{kg}^{-1} \ \mathrm{K}^{-1}$	P	erio	odio	CT	abl	e o	f E	lem	en	ts				
	Speed of Lig Boltzr Charge on a Pr	mb's Constant ght (Vacuum) mann Consant roton/Electron nck's Constant	$c = 2.998 \times 10^6$ $k_b = 1.3807 \times 1$ $e = 1.602 \times 10^-$	$< 10^{9} \mbox{N m}^{2} \mbox{ C}^{-2} \mbox{m s}^{-1} \mbox{0}^{-23} \mbox{ J K}^{-1} \mbox{C}^{-19} \mbox{ C}$	$0^9 \text{N m}^2 \text{C}^{-2}$ Kinetics $ [A]_t - [A]_0 = -kt \text{ (first order)} $ $1 \text{C}^{-23} \text{J K}^{-1}$ $\ln[A]_t - \ln[A]_0 = -k \text{ (second order)} $ $1 \text{C} \frac{1}{[A]_t} - \frac{1}{[A]_0} = kt \text{ (third order)} $													
		cap. of $H_2O_{(I)}$	$c=4.18~{ m kJ~kg}^-$ Equilibriu	·¹°C ⁻¹ um	, ,													18 VIIIA
1	1 2.20 H ₂ Hydrogen 1.01	2 IIA	$K_{c} = \frac{ \mathbf{C} }{ \mathbf{A} ^{2}}$ $K_{p} = \frac{(P_{c})}{(P_{c})}$ $K_{a} = \frac{ \mathbf{H}^{+} }{ \mathbf{I} }$ $K_{b} = \frac{ \mathbf{O}\mathbf{H}^{-} }{ \mathbf{C}\mathbf{A}^{-} }$	⁺ [A [−]] HA]	$\begin{aligned} \textbf{Gasse} \\ PV &= \\ P_A &= \\ P_{total} : \end{aligned}$	s/Solutions	$X_A = \frac{\text{moles } A}{\text{total moles}}$	Thermo/Electr $q=mc\triangle T$ $\triangle S^{\circ}=\sum_{\mathrm{product}}$ Same for $\triangle H^{\circ}$:	$S^{\circ} - \sum_{reactants}$	S°			13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	He Helium 4.00
2	3 0.98 Li Lithium 6.94	4 1.57 Be Beryllium 9.01	$= 1.0 \times 1$ $pH = -10$ $pH + pOI$ $pH = pK$	$H = 14.$ $C_a + \log \frac{[A^-]}{[HA]}$	M = -1 $M = -1$ atm $M = -1$ At ST Standa	$M = \frac{\text{moles solute}}{\text{Liters solution}}, \ m = \frac{\text{moles solute}}{\text{kg solvent}} \qquad \qquad \triangle G^\circ = \triangle H^\circ - T\triangle S^\circ \\ = -RT \ln K = -nFE^\circ \\ \text{g[OH$^-$TP$} = 273.15 \text{ K and } 1.0 \text{ atm} \qquad \qquad I = \frac{q}{t} \\ \text{At STP, ideal gas } 22.4 \text{L mol}^{-1}. \qquad \qquad E_{\text{cell}} = E_{\text{cell}}^\circ - \frac{RT}{nF} \ln Q. \\ \text{Standard conditions are } 25^\circ \text{ C and } 1 \text{ atm}.$								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	10 Ne Neon 20.18
3	11 0.93 Na Sodium 22.99	12 1.31 Mg Magnesium 24.31	$pK_a = -\log K_a, pK_b = -\log K_b.$ $\begin{array}{cccccccccccccccccccccccccccccccccccc$											Cl ₂ Chlorine	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	Te Tellurium 127.60	2 2.86 lodine 126.90	Xe Xenon 131.29
6	Cs Caesium 132.91	Ba Barium 137.33	57-71 La-Lu Lanthanide	72 1.3 Hf Hafnium 178.49	73 1.5 Ta Tantalum 180.95	74 2.36 W Tungsten 183.84	75 1.9 Re Rhenium 186.21	76 2.2 Os Osmium 190.23	77 2.20 Ir 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	104 Rf Rutherfordium (267)	105 Db Dubnium (268)	106 Sg Seaborgium (269)	107 Bh Bohrium (270)	108 Hs Hassium (277)	109 Mt Meitnerium (278)	110 Ds Darmstadtium (281)	Roentgenium (282)	112 Cn Copernicium (285)	113 Nh Nihonium (286)	114 Fl Flerovium (289)	115 Mc Moscovium (290)	116 Lv Livermorium (293)	Ts Tennessine (294)	118 Og Ogannesson (294)
	NO ₂ HBr CO HCI CO ₂ HNO ₃ CH ₄ H ₂ SO ₄	Alkali Metal Alkaline-Earth Metal Metalloid Non-metal	Z E.N. Sym Name mass	57 1.1 La Lanthanum 138.91	58 1.12 Ce Cerium 140.12	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	Gd 1.2 Gadolinium 157.25	7 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
	C ₂ H ₆ HClO ₃ C ₃ H ₈ HClO ₄ C ₄ H ₁₀ N ₂ O NH ₃	Halogen Noble Gas Lanthanide/Active Synthetic Aufbau Exception EN, IE, EA, & \mathbb{Z}_e Radius & Metall	$\frac{1}{ff}$ increase $\rightarrow \uparrow$	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)

	Polyatomic	mic lons	
	1+		2-
$(\mathrm{NH_4})^{+1}$	ammonium	$(CrO_4)^{-2}$	chromate
	1-	$(Cr_2O_7)^{-2}$	dichromate
$(NO_3)^{-1}$	nitrate	$(CO_3)^{-2}$	carbonate
$(NO_2)^{-1}$	nitrite	$(HPO_4)^{-2}$	dibasic phosphate or
(OH) ⁻¹	hydroxide		<u>hydrogen phosphate</u>
$(HCO_3)^{-1}$	bicarbonate or	i i	
•	hydrogen carbonate	$(MnO_4)^{-2}$	manganate
$(C_2H_3O_2)^{-1}$	acetate	$(O_2)^{-2}$	peroxide thiosulfate
$(ClO_4)^{-1}$	perchlorate	$(SO_4)^{-2}$	sulfate
$(ClO_3)^{-1}$	chlorate	$(SO_3)^{-2}$	sulfite
$(ClO_2)^{-1}$	chlorite	$(C_2O_4)^{-2}$	oxalate
	;		3-
(CN)-1	cyanide	$(AsO_4)^{-3}$	arsenate
(SCN)	thiocyanate	$(AsO_3)^{-3}$	arsenite
$(\text{MsO}_4)^{-1}$ $(\text{MnO}_4)^{-1}$	bisulfate or hydrogen sulfate permanganate	(BO ₃) ⁻³	borate
$(H_2PO_4)^{-1}$	dihydrogen phosphate	$(C_6H_5Q_7)^{-3}$	citrate
OD 1-1	poriodata	(PO ₄)-3	phosphate or tribasic phosphate
(104)	periodate	(FO_3)	phospinic
$(10_3)^{\frac{1}{2}}$	iodate		4-
(IO) ⁻¹	hypoiodite	$(SiO_4)^{-4}$	silicate (ortho)
$(NH_2)^{-1}$	amide		
$(CHO_2)^{-1}$	formate		

Al ⁺³ Fe ⁺³ Ni ⁺³ Pb ⁺⁴ Si ⁺⁴ Sn ⁺⁴ Sn ⁺⁴ Mn ⁺⁴		$\frac{N_1}{Mn^{+2}}$ Sn^{+2}	Pb^{+2}	$\operatorname{Hg}_{2}^{+2}$	Cd^{+2} Hg^{+2}	Zn^{+2}	Ca^{+2} Ba^{+2}	Mg_{2}^{+2}		Cu ⁺¹	$\Lambda_{\alpha^{+1}}^{T}$	Na ⁺¹	Li^{+1}		
Aluminum Iron (III) Nickel (III) +4 Lead (IV) Silicon (IV) Tin (IV) Manganese (IV)	+3	Nickel (II) Manganese (II) Tin (II)	Lead (II) Iron (II)	Mercury (I) Copper (II)	Cadmium (II) Mercury (II)	Zinc	Calcium Barium	Magnesium	+2	Copper (I)	Potassium Silvar	Sodium	Lithium	+1	Aton
P-3							S-2	•		T. (G!-1	F-1			Atomic lons
Nitride Phosphide	-3						Oxide Sulfide		-2	iodide	Bromide	Fluoride		-1	