

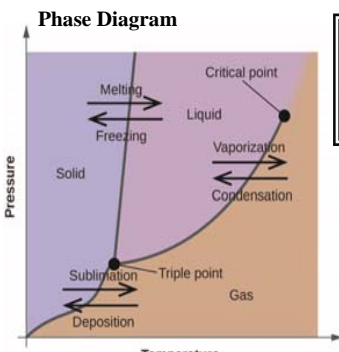
Common Polyatomic Ions	
ammonium	NH ₄ ⁺
acetate	CH ₃ COO ⁻
carbonate	CO ₃ ²⁻
hydrogen carbonate (bicarbonate)	HCO ₃ ⁻
hydroxide	OH ⁻
nitrite	NO ₂ ⁻
nitrate	NO ₃ ⁻
chromate	CrO ₄ ²⁻
dichromate	Cr ₂ O ₇ ²⁻
phosphate	PO ₄ ³⁻
hydrogen phosphate	HPO ₄ ²⁻
dihydrogen phosphate	H ₂ PO ₄ ⁻
hypochlorite	ClO ⁻
chlorite	ClO ₂ ⁻
chlorate	ClO ₃ ⁻
perchlorate	ClO ₄ ⁻
permanganate	MnO ₄ ⁻
sulfite	SO ₃ ²⁻
sulfate	SO ₄ ²⁻
hydrogen sulfite (bisulfite)	HSO ₃ ⁻
hydrogen sulfate (bisulfate)	HSO ₄ ⁻
cyanide	CN ⁻
peroxide	O ₂ ²⁻
borate	BO ₃ ³⁻
iodate	IO ₃ ⁻

Prefix	Symbol	Multiplier	Conversions
tera	T	10 ¹²	1 pound = 453.6 grams
giga	G	10 ⁹	1 inch = 2.54 cm
mega	M	10 ⁶	1 foot = 12 inches
kilo	k	10 ³	1 mile = 5280 feet
deci	d	10 ⁻¹	1 mile = 1.609 km
centi	c	10 ⁻²	1 mL = 1 cm ³ = 1 cc
milli	m	10 ⁻³	1 gallon = 4 quarts
micro	μ	10 ⁻⁶	1 liter = 1.06 quarts
nano	n	10 ⁻⁹	1 atm = 760 mmHg = 760 torr
pico	p	10 ⁻¹²	molar volume of gas = 22.4 L/mol at STP
femto	f	10 ⁻¹⁵	

Know abbreviations and names of shaded elements.

1	2																	18
1A	2A																	8A
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
H	He	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl	Ar	K	Ca	
1.008	4.003	10.81	12.01	14.01	16.00	19.00	20.18	22.99	24.31	26.98	28.09	30.97	32.07	35.45	39.95	39.10	40.08	
Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl	Ar	K	Ca	
6.941	9.012	10.81	12.01	14.01	16.00	19.00	20.18	22.99	24.31	26.98	28.09	30.97	32.07	35.45	39.95	39.10	40.08	
Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	Rb	Sr	
44.96	47.88	50.94	52.00	54.94	55.85	58.93	58.69	63.55	65.39	69.72	72.64	74.92	78.96	79.90	83.80	85.47	87.62	
Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	Ba	La	
88.91	91.22	92.91	95.94	(98)	101.1	102.9	106.4	107.9	112.4	114.8	118.7	121.8	127.6	126.9	131.3	137.3	138.91	
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	W	Re	
140.1	140.9	144.2	(147)	150.4	152.0	157.3	158.9	162.5	164.9	167.3	168.9	173.0	175.0	180.9	183.8	186.2	187.0	
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr	Rf	Db	Sg	Bh	
232.0	(231)	238.0	(237)	(242)	(243)	(247)	(247)	(249)	(254)	(253)	(258)	(254)	(257)	(261)	(263)	(263)	(262)	
Lanthanide series		58	59	60	61	62	63	64	65	66	67	68	69	70	71			
		Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu			
		140.1	140.9	144.2	(147)	150.4	152.0	157.3	158.9	162.5	164.9	167.3	168.9	173.0	175.0			
Actinide series		88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	
		Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr			
		232.0	(231)	238.0	(237)	(242)	(243)	(247)	(247)	(249)	(254)	(253)	(258)	(254)	(257)			

Soluble compounds contain	Except when paired with
Group I metal cations or NH ₄ ⁺	None
CH ₃ COO ⁻ , HCO ₃ ⁻ , NO ₃ ⁻ , or ClO ₃ ⁻	None
Cl ⁻ , Br ⁻ , or I ⁻	Ag ⁺ , Hg ₂ ²⁺ , Pb ²⁺
SO ₄ ²⁻	Ag ⁺ , Hg ₂ ²⁺ , Pb ²⁺ , Ca ²⁺ , Sr ²⁺ , Ba ²⁺
Insoluble compounds contain	Except when paired with
CO ₃ ²⁻ , CrO ₃ ²⁻ , PO ₄ ³⁻ , or S ²⁻	Group I cations or NH ₄ ⁺
OH ⁻	Group I cations or NH ₄ ⁺ , or Ba ²⁺



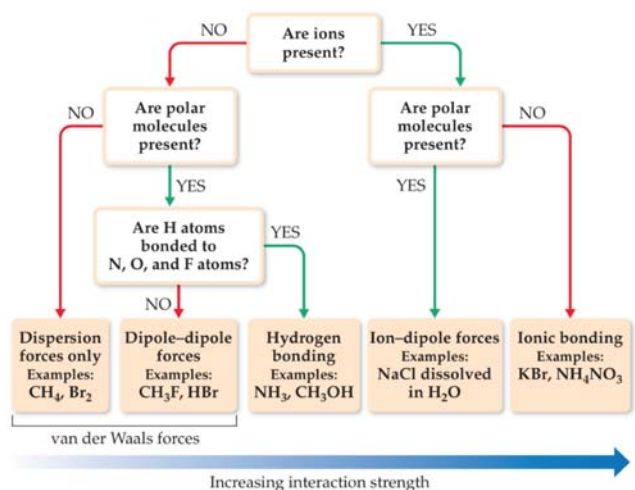
105, 109, 110, 107

Electron geometry	Hybridization
linear	sp
trigonal planar	sp ²
tetrahedral	sp ³

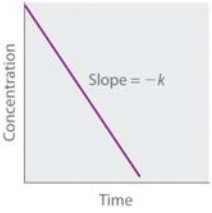

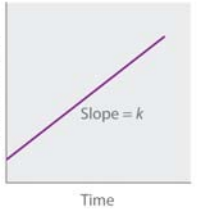
Strong Acids	Strong Bases
HCl, HBr, HI, HNO ₃ , HClO ₄ , H ₂ SO ₄	Group I & II metal hydroxides

Concentration Unit	Definition
molarity (M)	$\frac{\text{mol solute}}{\text{L solution}}$
molality (m) (used in 107)	$\frac{\text{mol solute}}{\text{kg solvent}}$
mole fraction (c)	$\frac{\text{moles of solute}}{\text{moles of solute} + \text{solvent}}$
percent by mass (%)	$\frac{\text{mass of solute}}{\text{mass of solution}} \times 100$
parts per million (ppm)	$\frac{\text{mass of solute}}{\text{mass of solution}} \times 10^6$
parts per billion (ppb)	$\frac{\text{mass of solute}}{\text{mass of solution}} \times 10^9$

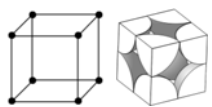
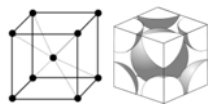
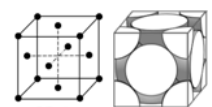
Intermolecular Forces



Number of electron pairs	Electron pair geometries: 0 lone pair	1 lone pair	2 lone pairs	3 lone pairs	4 lone pairs
2	Linear (180°)				
3	Trigonal planar (120°)	Bent or angular (<120°)			
4	Tetrahedral (109°)	Trigonal pyramid (<109°)	Bent or angular (<<109°)		
5	Trigonal bipyramid (120°/90°)	Sawhorse or seesaw (<120°/90°)	T-shape (<90°)	Linear (180°)	
6	Octahedral (90°)	Square pyramid (<90°)	Square planar (90°)	T-shape (<90°)	Linear (180°)

	Zeroth Order	First Order	Second Order
Differential rate law	Rate = $-\frac{\Delta[A]}{\Delta t} = k$	Rate = $-\frac{\Delta[A]}{\Delta t} = k[A]$	Rate = $-\frac{\Delta[A]}{\Delta t} = k[A]^2$
Integrated rate law	$[A] = [A]_0 - kt$	$[A] = [A]_0 e^{-kt}$ or $\ln[A] = \ln[A]_0 - kt$	$\frac{1}{[A]} = \frac{1}{[A]_0} + kt$
Straight-line plot to determine rate constant			
Half-life	$t_{1/2} = \frac{[A]_0}{2k}$	$t_{1/2} = \frac{0.693}{k}$	$t_{1/2} = \frac{1}{k[A]_0}$
Units of k, rate constant	M/s	1/s	$M^{-1} \cdot s^{-1}$

Simple Cubic Unit Cells

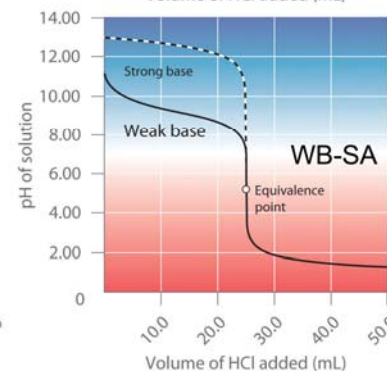
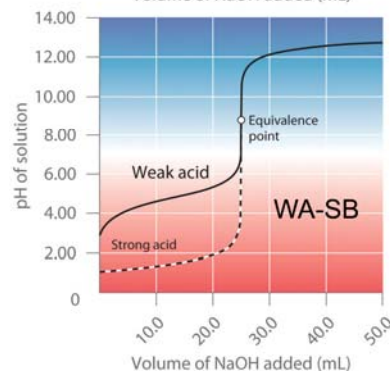
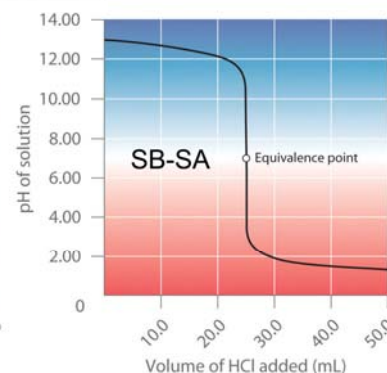
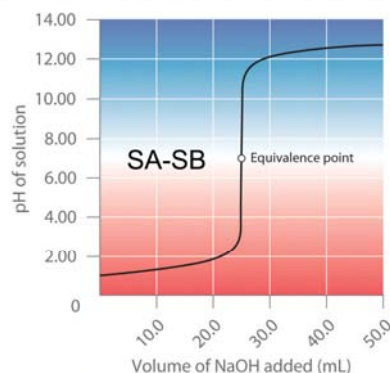
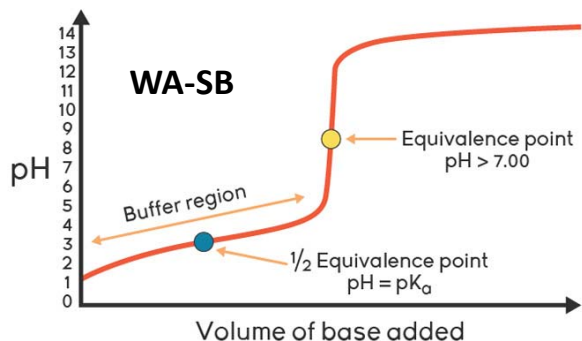
Name	Atoms per cell	Structure	Sharing of atoms	Coordination number	Packing efficiency
Simple cubic	1		8 corner atoms	6	low
Body-centered cubic	2		8 corner atoms, 1 body atom	8	medium
Face-centered cubic	4		8 corner atoms, 6 face atoms	12	high

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Unit cell fractions

Atom Location	Fraction in unit cell
Body	1
Face	1/2
Edge	1/4
Corner	1/8

Titration Curves



Nuclear Decay Reactions

Type of radiation	Symbol	Mass number	charge
Alpha particle	α or ${}^4_2\text{He}$	4	2+
Beta particle	β or ${}^0_{-1}e$	0	1-
Gamma ray	γ or ${}^0_0\gamma$	0	0
Neutron	1_0n	1	0
Positron	β^+ or 0_1e	0	1+

Electrochemical Cell

