

Stuff I Should Know (Page 2)

Complex Ions & Common Ligands

Ligands	polar molecules & anions	NH ₃ , H ₂ O, OH ⁻ , CN ⁻ , Cl ⁻	Odd example: Fe ³⁺ + SCN ⁻ ⇌ FeSCN ²⁺
Central Ions	transition metals and Al ³⁺	Ag ⁺ , Cu ²⁺ , Ni ²⁺ , Zn ²⁺ , etc. & Al ³⁺	
Examples	usually twice the number of ligands as the charge on the central ion. Key Words: "excess, concentrated"	Ag(CN) ₂ ⁻ , Cu(NH ₃) ₄ ²⁺ , Ni(OH) ₄ ²⁻ , Zn(NH ₃) ₄ ²⁺ , Al(OH) ₆ ³⁻	Reaction with Acid: Cu(NH ₃) ₄ ²⁺ + H ⁺ → Cu ²⁺ + NH ₄ ⁺

Organic Chemistry & Functional Groups

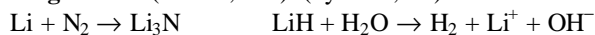
alkanes C _n H _{2n+2}	alkenes C _n H _{2n}	alkynes C _n H _{2n-2}	aromatics (benzene) C ₆ H ₆
alcohol R—OH	aldehyde R—C(=O)—H	ketone R—C(=O)—R	ether R—O—R
carboxylic acid R—C(=O)—OH	ester R—C(=O)—O—R	amine R—NH ₂	amide R—C(=O)—NH ₂
Substituted benzene:	ortho = 1,2	meta = 1,3	para = 1,4

nuclear chem	DH DS Spont.?
alpha ⁴ He ₂	- + at all temps + + high temps - - low temps + - no temps Note: DS in J DG & DH in kJ
beta/electron ⁰ e ₋₁	
neutron ¹ n ₀	K _{sp} & Solubility, s
positron ⁰ e ₊₁	1:1 K _{sp} = s ² 1:2 K _{sp} = 4s ³ 1:3 K _{sp} = 27s ⁴ 2:3 K _{sp} = 108s ⁵

Lewis Acids & Bases

BF₃ + NH₃ → BF₃NH₃
 acid anhydrides (oxides of nonmetals, CO₂)
 basic anhydrides (oxides of metals, MgO)
 MgO + CO₂ → MgCO₃
 decomposition reactions: MgCO₃ → MgO + CO₂
 Strange Examples: P₄O₁₀ + H₂O → H₃PO₄

Strange Ions: (nitride, N³⁻) (hydride, H⁻)



Flame Test Colors

Barium – green
Sodium – yellow
Copper – blue (w/ green)
Potassium – lavender
Strontium – red
Lithium – red
Calcium – orange

Quantum Numbers

n	1, 2, 3, ...
l	0 ... (n-1)
m _l	-l ... +l
m _s	+1/2, -1/2
l	0 = s, 1 = p, 2 = d, 3 = f

Writing Lewis Structures

hint: use one valence electron to connect F's or Cl's then determine lone pairs (Ex: XeF₄)

Product-Favored (Spontaneous) Reactions

$$\Delta G < 0 \quad E^\circ > 0 \quad K_{eq} > 1$$

Properties Indicate Strength of Intermolecular Forces (IMF's)

IMF	BP	FP	H _{vap}	H _{fus}	VP
IMF	BP	FP	H _{vap}	H _{fus}	VP

Orders of Reactions & Graphs That Give Straight Lines

0 Order	1 st Order	2 nd Order
[R] vs. Time	ln[R] vs. Time	1/[R] vs. Time
slope = -k	slope = -k	slope = k

Electrochemical Cells

anode	cathode
oxidation	reduction
- side	+ side
lower E°	higher E°
e ⁻ leave	e ⁻ enter

Bond Orders

bond	B.O.	
single	1	σ
double	2	σ+π
triple	3	σ+π+π

SN & hybridization & shape

Steric Number	hybridization	basic shape
1	s	—
2	sp	linear
3	sp ²	Δ planar
4	sp ³	tetrahedral
5	sp ³ d	Δ bipyramidal
6	sp ³ d ²	octahedral

IMF's

London	nonpolar molecules, ex: CH ₄ , He
dipole-dipole	polar molecules, ex: H ₂ S, SO ₂
hydrogen bonding	H-F, H-O-, H-N-, NH ₃ , H ₂ O amines and alcohols
metallic	metals, Ag, Pb
ionic	salts, NaCl, CaCO ₃ (Note: "ates" contain covalent bonds)
covalent network	C(graphite), C(diamond), SiO ₂ , WC, Si, SiC (Note: graphite = London, too)

Activity of Metals (Four Groups)

Metals	React with...
Groups I & II	H ₂ O ex: Li + H ₂ O → Li ⁺ + OH ⁻ + H ₂
all others	Non-oxidizing Acid, ex: HCl Zn + 2HCl → H ₂ + ZnCl ₂
Cu, Ag, Hg	Oxidizing Acid, HNO ₃ or H ₂ SO ₄ (conc.) Cu + HNO ₃ → NO ₂ + H ₂ O + Cu ²⁺
Au, Pt, Ir	Aqua Regia (HNO ₃ + HCl)