

Stuff I Should Know (Page 2)

2nd DRAFT

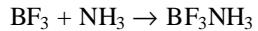
Complex Ions & Common Ligands

Ligands	polar molecules & anions	NH_3 , H_2O , OH^- , CN^- , Cl^-	Odd example: $\text{Fe}^{3+} + \text{SCN}^- \rightleftharpoons \text{FeSCN}^{2+}$
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"	$\text{Ag}(\text{CN})_2^-$, $\text{Cu}(\text{NH}_3)_4^{2+}$, $\text{Ni}(\text{OH})_4^{2-}$, $\text{Zn}(\text{NH}_3)_4^{2+}$, $\text{Al}(\text{OH})_6^{3-}$	Reaction with Acid: $\text{Cu}(\text{NH}_3)_4^{2+} + \text{H}^+ \rightarrow \text{Cu}^{2+} + \text{NH}_4^+$

Organic Chemistry & Functional Groups

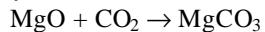
alkanes $\text{C}_n\text{H}_{2n+2}$	alkenes C_nH_{2n}	alkynes $\text{C}_n\text{H}_{2n-2}$	aromatics (benzene) C_6H_6	nuclear chem alpha ${}^4_2\text{He}$
alcohol $\text{R}-\text{OH}$	aldehyde $\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{H} \end{array}$	ketone $\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{R} \end{array}$	ether $\text{R}-\text{O}-\text{R}$	beta/electron ${}^0_{-1}\text{e}$
carboxylic acid $\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{OH} \end{array}$	ester $\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{O}-\text{R} \end{array}$	amine $\text{R}-\text{NH}_2$	amide $\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{NH}_2 \end{array}$	neutron ${}^1_0\text{n}$
Substituted benzene:	ortho = 1,2	meta = 1,3	para = 1,4	positron ${}^0_{+1}\text{e}$

Lewis Acids & Bases



acid anhydrides (oxides of nonmetals, CO_2)

basic anhydrides (oxides of metals, MgO)



decomposition reactions: $\text{MgCO}_3 \rightarrow \text{MgO} + \text{CO}_2$

Strange Examples: $\text{P}_4\text{O}_{10} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{PO}_4$

Strange Ions: (nitride, N^{3-}) (hydride, H^-)



Flame Test Colors

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

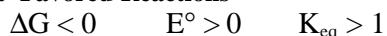
Quantum Numbers

n	1, 2, 3, ...
l	0 ... ($n-1$)
m_l	$-l \dots +l$
m_s	$+\frac{1}{2}, -\frac{1}{2}$
$ $	$0 = s, 1 = p, 2 = d, 3 = f$

Writing Lewis Structures

hint: use one valence electron to connect F's or Cl's then determine lone pairs (Ex: XeF_4)

Product- Favored Reactions



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	$\ln[\text{R}]$ vs. Time	$1/\text{[R]}$ vs. Time
slope = -k	slope = -k	slope = k

nuclear chem alpha ${}^4_2\text{He}$
beta/electron ${}^0_{-1}\text{e}$
neutron ${}^1_0\text{n}$
positron ${}^0_{+1}\text{e}$

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	$\sigma + \pi$
triple	3	$\sigma + \pi + \pi$

SN & hybridization & shape

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

IMF's

London	nonpolar molecules, ex: CH_4, He
dipole-dipole	polar molecules, ex: $\text{H}_2\text{S}, \text{SO}_2$
hydrogen bonding	$\text{H}-\text{F}, \text{H}-\text{O}-, \text{H}-\text{N}-, \text{NH}_3, \text{H}_2\text{O}$ amines and alcohols
metallic	metals, Ag, Pb
ionic	salts, $\text{NaCl}, \text{CaCO}_3$ (Note: "ates" contain covalent bonds)
covalent network	$\text{C}(\text{graphite}), \text{C}(\text{diamond}), \text{SiO}_2, \text{WC}, \text{Si}, \text{SiC}$ (Note: graphite = London, too)

Activity of Metals (Four Groups)

Metals	React with...
Groups I & II	H_2O ex: $\text{Li} + \text{H}_2\text{O} \rightarrow \text{Li}^+ + \text{OH}^- + \text{H}_2$
all others	Non-oxidizing Acid, ex: HCl $\text{Zn} + 2\text{HCl} \rightarrow \text{H}_2 + \text{ZnCl}_2$
$\text{Cu}, \text{Ag}, \text{Hg}$	Oxidizing Acid, HNO_3 or H_2SO_4 (conc.) $\text{Cu} + \text{HNO}_3 \rightarrow \text{NO}_2 + \text{H}_2\text{O} + \text{Cu}^{2+}$
$\text{Au}, \text{Pt}, \text{Ir}$	Aqua Regia ($\text{HNO}_3 + \text{HCl}$)