Chem 111 Cheat Sheet

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Miscellaneous Formulas

Area of a Circle	$3.14r^2$
Volume	area x height
Density	mass/volume
% Composition of Element	[(#of atoms of element)x(atomic weight of element)]/formula weight of substance x 100
% Yield	[(actual yield)/(theoretical yield)] x 100
Molarity	(moles of solute)/(volume of solution in Liters)
Effective Nuclear Charge	(atomic number) - (screening constant)
Dipole Moment	Qr
Bond Order	(# shared electrons) - (# nonbonding electrons))
Pressure	(force) / (area)
Pressure x Volume	nRT
Density of Gas	mass / volume
Density of Gas	(pressure x Molarity) / (R x temp.)
Molarity of Gas	(density x R x Temperature) / pressure
Vapor Pressure	-(change in Hvap) / RT + C1

Activity Series

- Lithium
- Potassium
- Barium
- Calcium
- Sodium
- Magnesium
- Aluminium

Activity Series (cont)

- Manganese
- Zinc
- Chromium
- Iron
- Cobalt
- Nickel
- Tin
- Lead
- Hydrogen
- Copper
- Silver
- Mercury
- Platinum
- Gold

The higher up, the greater the ease of oxidation

Light Formulas

The speed of light (c)	3.00×10^8 ms
c =	(wavelenght) x (velocity)
Planck's Constant (h)	6.626×10^{-34} J-s
E =	hv
Rydberg Constant (Rh)	$1.097 \times 10^7\ m^{-1}$
wavelength =	h / (mv)

Calories in Food

Fat	8.8
Protein	4.1
Carbs	4.1

Intermolecular Forces

Bond	Substance	Melting Point (K)	Boiling Point (K)
Covalent	Diamond	3800	4300
Metallic	Beryllium	1560	2742
Ionic	Lithium Fluoride	1118	1949
Dispersion Force	Nitrogen	63	77
Dipole-Dipole Force	HCl	158	188
Hydrogen	HF	190	293

Metric System

Prefix	Abbreviation	Meaning
Peta	P	10^{15}
Tera	T	10^{12}
Giga	G	10^9
Mega	M	10^6
Kilo	k	10^3
Deci	d	10^{-1}
Centi	c	10^{-2}
Milli	m	10^{-3}
Micro	u	10^{-6}
Nano	n	10^{-9}

Temperature Conversions

Celsius to Kelvin	K = C + 273.15
Kelvin to Celsius	C = K - 273.15
Celsius to Fahrenheit	F = 9/5(C) + 32
Fahrenheit to Celsius	C = 5/9 (F) - 32

Laws

Law of Constant Compet-ition	-French Chemist, Joseph Louis Proust (1800):the elemental composition of a compound is almost always the same

Laws (cont)

Law of Conservation of Mass	The total mass of substances present at the end of a chemical process is the same as the mass of substances present before the process took place

Energy Formulas

Kinetic Energy (Ek)	$1/2mv^2$
Potential Energy (Eel)	(kQ1Q2)/d
Work	force x distance
Work	-Pressure x (change in Volume)
Internal Energy	E(final) - E(initial)
Enthalpy (H)	(internal energy) + (pressure x volume)
Enthalpy of Reaction	H (products) - H (reactants)
Specific Heat	(heat transferred) / (mass x change in temp.)
Change in Enthalpy	m x s x (change in T)
Lattice Energy	K [(Q1Q2) / d]

Exceptions to the Octet Rule

- ions or molecules have an odd number of electrons
- ions or molecules with less than an octet
-ions or molecules with more than 8 valence electrons

Conversions

1 amu	1.66054×10^{-24}g
Grams to Moles	divide by formula weight
Moles to Grams	multiply by formula weight
Moles to Molecules	multiply by 6.022×10^{23}
Molecules to Moles	divide by 6.022×10^{23}

Magnetic Quantum Number

n	l	m1
1	0	0
2	0	0
-	1	1, 0, -1
3	0	0
-	1	1, 0, -1
-	2	2, 1, 0, -1, -2
4	0	0
-	1	1, 0, -1
-	2	2, 1, 0, -1, -2
-	3	3, 2, 1, 0, -1, -2, -3

The Scientific Method

-hypothesis: tentative explanation
-theory: an explanation of the general causes of phenomena
-scientific law: a concise law that summarizes something
-mass: a measurement of the amount of material in an agent

SI Units

Physical Quantity	Name of Unit	Abbreviation
Mass	Kilogram	kg
Length	Meter	m
Time	Second	s or sec
Tempertature	Kelvin	K
Amount of Substance	Mole	mol
Electric Current	Ampere	amp or A
Luminous Intensity	Candela	cd

States of Matter

Liquid	Gas	Solid
assumes shape of the portion of container it occupies	assumes volume and shape of container	retains own shape and volume
does not expand to fill container	expands to fill container	does not expand to fill container
is virtually incompressible	is compressible	is virtually incompressible
flows readily	flows readily	does not flow
diffusion occurs slowly	diffusion occurs rapidly	diffusion occurs extremely slowly

Molecular Shapes

Steric #	Electron-Domain	Bonding / Nonbonding	Molecular Geometry
2	Linear	2 / 0	Linear
3	Trigonal Planar	3 / 0	Trigonal Planar

Molecular Shapes (cont)

		2 / 1	Bent
4	Tetrahedral	4 / 0	Tetrahedral
		3 / 1	Trigonal Pyramid
		2 / 2	Bent
5	Trigonal Bipyramidal	5 / 0	Trigonal Bipyramidal
		4 / 1	Seesaw
		3 / 2	T-shaped
		2 / 3	Linear
6	Octahedral	6 / 0	Octahedral
		5 / 1	Square Pyramidal
		4 / 2	Square Planar

Steric # = (# of bonds) - (nonbonding electron pairs)

Metals vs. Nonmetals

Metals	Nonmetals
shiny luster, various colors, more silvery	no luster, various colors
solids are malleable, ductile	solids are brittle, some hard, some soft
good conductors of heat and electricity	poor conductors of heat and electricity
most oxides are ionic, most solids are basic	most oxides for acidic solutions
tend to form cations in aqueous solutions	tend to form anions or oxyanions in aqeuous solutions

Strong Bases and Acids

Strong Acids	Strong Bases
HCl	LiOH
HBr	NaOH
HI	KOH
$HClO_3$	RbOH
$HClO_4$	CsOH
HNO_3	Sr(OH)
H_2SO_4	$Ba(OH2)$