NH_4^{+1}~ammonium
CO_3^{-2}~carbonate
ClO_3^{-1}~chlorate
CN^{-1}~cynaide
OH^{-1}~hydoxide
NO_3^{-1}~nitrate
PO_4^{-3}~phosphate
SO_4^{-2}~sulfate

POLY ATOMICS
H,O,Br,F,I,N,Cl (2)
P (4) S (8)

CONVERSIONS
1mL=1cm3
1L=1dm3
kilo=1000
hecto=100
deca=10
norm=1
deci=1/10
centi=1/100
milli=1/1000

P T V

REACTIONS
Single-replacement~ AB+C.AC+B(act.ser)
Double-replacement~ AB+CD>AD+CB
Combustion(hydroC)~ $CH+O_2>CO_2+H_2O$

DRIVING FORCE: (double-replacement) water, gas, precipitate(solid)

ACTIVATION ENERGY: amount of energy that must be overcome to produce a product

BALANCING
2 Sb + 3 Cl_2 > 2 $SbCl_3$ product=6(criss-cross)
2 Rb + 1 Cl_2 > 2 RbCl
2 Fe + 3 H_2O > 1 Fe_2O_3 + 3 H_2

ISLAND DIAGRAM

LIMITING REACTANT: substance that limits max. amount product produced
~smaller # is limiting reactant

ACTUAL YIELD: experimentally found
THEORETICAL YIELD: calculated
PERCENT YIELD: actual compared to theoretical
% yield = actual / theoretical

COMPOSITION OF ATMOSPHERE
Nitrogen=80%
Oxygen=20%
Carbon dioxide=.033%
Argon=1%

IDEAL GAS LAW (USE W/ STOICHIOMETRY)
PV=nRT
P=pressure V=volume n=moles
R=constant T=temperature (kalvin)
R=0.0821 L*atm/mol*k R=8.314kPa*L/mol*k
PV/T=nR n=PV/RT R=PV/nT

KINETIC ENERGY
$KE=1/2mv^2$ m=mass v=velocity

K/C/KPA/ATM/MM HG CONVERSIONS
K=Kelvin C+273=K
760 mm Hg=101.3 kPa=1 atm

MANOMETER
Big = small + height

COMBINED GAS LAW
Temp. in Kelvin

DENSITY OF GASES
Assume mass=1g

GRAHAM'S LAW
M=mass(amu) v= velocity

DALTON'S LAW PARTIAL PRESSURE
$P_1V_1=P_2V_2$ total pressure=sum of partial

SOLUTION: solute dissolved in solvent (homogenous)

SUSPENSION: how ions are in solution, settle over time

ALLOY: homogenous mixture of 2 or more metals
AMALGAM: solvent is Hg (dental crown)
TINCTURE: solvent is alcohol (Iodine(cuts))
AQUEOUS SOLUTION: solvent is water (universal solvent)
ORGANIC SOLUTION: solvent has Carbon (gas, benzene)

MOLARITY: relates moles of solute to liters of solution

MOLALITY: relates moles of solutes to kg of solvent

EMULSIFYING AGENTS/EMULSION
- Emulsion: polar and non-polar "mix"
- Agents: soap, detergent, lecithin, eggs

SOAP
~works: polar head (Na) and non-polar tail
~why need: body oil and dirt mix, water and oil no mix, soap has oil that attracts body oil, has polar head to attract water to rinse off

VITAMINS AND SOLUBILITY
Water- C
Fat- A,D (stored in fat)

DILUTIONS OF SOLUTIONS (USE W/ TITRATION)
$M_1V_1=M_2V_2$ concentrated=dilute

COLLIGATIVE PROP: changing freezing/boiling point
Constant=C/molal
~freezing point: Tf= $constant_{(f)}$*molal
~boiling point: change temp=$constant_{(b)}$*molal
~molar mass: grams/moles

ACID DISSOCIATION CONSTANT:
K_a = products/reactants strong acid = larger #/breaks easy
Coeffients- use as exponent weak acid= breaks little

LECHATELIER'S PRINCIPLE: any reaction at equilibrium when stressed by change in conc, temp, pressure will shift to relieve stress
- ~ pressure, shift
- ~ temp, shift
- ~add catalyst, no shift

PROP ACID/BASE
Acid: pH=<7,sour, litmus=red, gives protons
~monoprotic=give 1 proton(HCl), di=2(H_2NO_3),poly=more than 1(H_3PO_4)
Base: pH=>7, bitter, litmus=blue, accepts protons

COMMON ACID/BASE
~strong: hydrochloric(HCl)-stomach, clean metal
sulfuric(H_2SO_4)-battery, top selling
phosphoric(H_3PO_4)-food flavor
nitric(HNO_3)-fertilizer, explosives
~weak: acetic(CH_3COOH)-vinegar
hydrofluoric(HF)-etch glass
~base: calcium hydroxide($Ca(OH)_2$)
sodium hydroxide(NaOH)
ammonium hydroxide(NH_4OH)

ACID/BASE CALCULATIONS
~pH + pOH = 14
~pH = $-\log(H^+)$ or $10^{-pH} = H^+$
~pOH = $-\log(OH^-)$ or $10^{-pOH} = OH^-$
~$(H^+)(OH^-) = 1*10^{-14}$
~water dissociation constant= $1*10^{-14}$

NORMALITY
H_2SO_4 2 H^+ +SO_4^- 6M b/c there are 2 ions
3M 6M 3M of H (that's normality)

BUFFERS: chem's that resist change in pH
~many in blood

INDICATORS: chem's that change color in acid or base
~litmus paper- acid=red, base=blue
~phenolphthalein- acid=clear, base=pink

MEASURING pH
- Litmus/phenolphthalein-tell acid or base
- pH paper- measures pH 0-14
- universal indicator- measures pH 4-10
  R O Y G B I V
- pH meter- measures small voltages in solution and is calibrated to convert voltages to pH, precise

PARTS NUCLEAR REACTOR
~CONTROL RODS- absorbs neutrons to regulate power level
~CONTAINMENT SHELL- concrete shell helps hold in radiation if leak in plant
~MODERATOR- substance used to help slow down neutrons

DECAY
ALPHA: Ra Rn + He (a)
BETA: C N + B
NEUTRON: H + H He + n

MOLARITY/pH/STOICHOMETRY
~LiOH (0.956 L, $5.8*10^{-5}$ M) added to H_2SO_4 (0.0023g, 7.38L). find the pH.
1. LiOH Li + OH H_2SO_4 2 H + SO_4
0.956 L 0.0023g
$5.8*10^{-5}$ M 7.38 L
2. 0.0023g( )=$2.3*10^{-5}$ mol H_2SO_4
3. $5.8*10^{-5}$ M=X mol/0.956 L=$5.5*10^{-5}$mol LiOH
4. $5.5*10^{-5}$mol - $2.3*10^{-5}$ mol=$3.1979*10^{-5}$mol
5. 0.956 L + 7.38 L=8.336 L
6. X M=$3.1979*10^{-5}$mol/8.336 L= $3.836*10^{-6}$M OH
7. $1*10^{-14}$ /$3.836*10^{-6}$M=$2.6067*10^{-9}$M H^+
8. pH= -log($2.6067*10^{-9}$M) pH=8.58

ALPHA PARTICLE: stopped by piece paper, positive charge
BETA PARTICLE:stopped by heavy clothes/wood, neg. charge
GAMMA RAYS: stopped by concrete, no charge
NEUTRON:

MASS DEFECT: amount that mass of nucleus is less than sum of particle masses
~proton- 1.007276 multiply #'s by p,n,e – add all
~neutron- 1.008665 together- subtract from mass
~electron- 0.0005486 of nucleus (amu)
BINDING ENERGY: energy required to decompose a nucleus into component nucleons
~mass defect $(1.6605*10^{-27}kg)(3*10^8m/s)^2$ answer in J
MASS DEFECT PER NUCLEON
~binding energy/mass of sum of nucleons
~answer in J/nucleon
HALF LIFE: time required for # of nuclides in radioactive sample to reach ½ original #
~original # = remaining/ # of ½ lives

FUNCTIONAL GROUPS
- alcohol (-ol)
- aldehyde (-al)
- ketone (-one)
- ether (R-oxy-R)
- carboxyl (-ic acid)
- ester (-oate)
- amide (-amide)
- amine (-amine)

1- meth
2- eth
3- prop
4- but
5- pent
6- hex
7- hept
8- oct
9- non 10-dec

FORMULAS
~alkane= CnH(2n+2)
~alkene= CnH(2n)
~alkyne= CnH(2n-2)
~alkadiene= CnH(2n-2)