NH4 +1~ammonium POLY ATOMICS

CO3 -2~carbonate H,O,Br,F,I,N,Cl (2)

ClO3 -1~chlorate P (4) S (8)

CN -1~cynaide

OH -1~hydoxide

NO3 -1~nitrate

PO4 -3~phosphate

SO4 -2~sulfate

CONVERSIONS

1mL=1cm3

1L=1dm3

kilo=1000

hecto=100 P T V

deca=10

norm=1

deci=1/10

centi=1/100

milli=1/1000

REACTIONS

Single-replacement~ AB+C.AC+B(act.ser)

Double-replacement~ AB+CD>AD+CB

Combustion(hydroC)~ CH+O2>CO2+H2O

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 Cl2 > 2 SbCl3 product=6(criss-cross)

2 Rb + 1 Cl2 > 2 RbCl

2 Fe + 3 H2O > 1 Fe2O3 + 3 H2

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=1/2mv2 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

P1V1=P2V2 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)

M1V1=M2V2 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:

Ka = 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(H2NO3),poly=more than 1(H3PO4)

Base: pH=>7, bitter, litmus=blue, accepts protons

COMMON ACID/BASE

~strong: hydrochloric(HCl)-stomach, clean metal

sulfuric(H2SO4)-battery, top selling

phosphoric(H3PO4)-food flavor

nitric(HNO3)-fertilizer, explosives

~weak: acetic(CH3COOH)-vinegar

hydrofluoric(HF)-etch glass

~base: calcium hydroxide(Ca(OH)2)

sodium hydroxide(NaOH)

ammonium hydroxide(NH4OH)

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

H2SO4 2 H+ +SO4- 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 H2SO4 (0.0023g, 7.38L). find the pH.

1. LiOH Li + OH H2SO4  2 H + SO4

0.956 L 0.0023g

5.8\*10-5 M 7.38 L

2. 0.0023g( )=2.3\*10-5 mol H2SO4

3. 5.8\*10-5 M=X mol/0.956 L=5.5\*10-5mol LiOH

4. 5.5\*10-5mol - 2.3\*10-5 mol=3.1979\*10-5mol

5. 0.956 L + 7.38 L=8.336 L

6. X M=3.1979\*10-5mol/8.336 L= 3.836\*10-6M OH

7. 1\*10-14 /3.836\*10-6M=2.6067\*10-9M H+

8. pH= -log(2.6067\*10-9M) 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\*10-27kg)(3\*108m/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 1- meth

* alcohol (-ol) 2- eth
* aldehyde (-al) 3- prop
* ketone (-one) 4- but
* ether (R-oxy-R) 5- pent
* carboxyl (-ic acid) 6- hex
* ester (-oate) 7- hept
* amide (-amide) 8- oct
* amine (-amine) 9- non 10-dec

FORMULAS

~alkane= CnH(2n+2)

~alkene= CnH(2n)

~alkyne= CnH(2n-2)

~alkadiene= CnH(2n-2)