

Basic stuff

Mass	amount of matter (g,kg,ml)
matter	anything occupies space & has mass
Volume	room space, l, ml, gas, solid, liquid
Density	mass/volume=kg/m ³
pressure	barometer, manometer 760torr=760mmHg=1atm
energy	to work, transfer heat, cal, j,kj, calorimeter heat, light,kinetic, bond
temper- ature	average kinetic energy of molecule,273k=0°C,373k=10-0°C
heat	flow of kinetic energy from body of high temp to low temp
heat capacity	amount of heat abosorbed with 1°C increase
specific heat	heat capacity of 1 gram of substance
q=mc*d- eltaT	heat=mass <i>specific heat</i> delta Temp

Atom: building blocks of matter

element	substance can't be broken down into a simpler substance by chemical reaction;most funder-mental union of matter, can't broken down w/o losing their identity
atom	smallest particle of an element that still retains the chem properties of the element nucleon(proton+neutron)+el-ectron

Atom: building blocks of matter (cont)

ion	atom lose/gain electrons: cation(+) anion(-)
proton	+1,1amu
neuton	0,1amu
eletron	-1,0amu
perodic table	group=column, row=period
atomic number	=proton#, identity
atomic mass	=proton mass + neutron mass
isotope	same proton#,different neutron
atomic weight	= average mass of isotopes occurred on earth

Solution

Measures	Molarity, molality, percent of mass
solubility	solid, gas, solvent, solute, like solve like, pressure, temper-ature
saturation	
electr- olytes	ionic substance, break of ionic bond, neutral overall,conduct electricity
boiling & freezing point	delta T = kmi; k constant of solvent; m molality; i particles solved into; CaCl2 in snow day
precip- itation	ionic solution,double replac-ement reaction
solubility rules	soluble:NO3-,ClO4-,Alkali metal,aNH4+ insoluble:silver,lead,mercu-ry,OH-

Kinetics and equilibrium

Kinetics	reaction rate: collision/re-orien-tation, bond break/making,ac-tivated complex
kinetic factors	concentration(g,l), pressure(g), surface area(s,l),temperature-(10c=double), nature of react-ants(bond strenght),catalyst,
catalyst	not consume, lower Ea activation energy,not change equilibrium
collision freq	concentration, surface area, temp
collision energy	temp, nature of reactant,cat- alyst
chemical equili- brim	dynamic chemical equilibrim, both direction in the same speed, reactant concentration not changed anymore
Keq	>1 favor forward reaction, <1 favor reverse reaction
phase change equilibrim	
Le Chaetlier's principle	Keq never changes with reacted concentra-tion; Keq change with heat stress;reaction shift to relieve the stress
pressure change the equilibrium on gas reactant	
catalyst won't change equilibrium	
Ksp	solubility product constant for precipitation reaction equilibrium

acid and base

autoionoz-
ation $H^+ + OH^- \rightleftharpoons H_2O$

Kw $[H^+][OH^-] = 10^{-14} M^2$ at 25°C

pH=7 $-\log([H^+]) = -\log(10^{-7})$ at 25°C

acid proton/ H^+ donor; electron pair acceptor

base proton(OH^-) acceptor; electron pair donor

amphoteric ion $HCO_3^-(aq)$

strong acid/base complete disassociating and not reversable

Strong acid:0 $HCl, HBr, HI, HNO_3, H_2SO_4, HClO_4$

Strong base:14 $LiOH, NaOH, KOH... Sr(OH)_2, Ba(OH)_2$

calc pH $pH = -\log([H^+]) = 14 - (-\log[OH^-]) = 14 - pOH$

weak base acid partial /reversible dissociation, <10%

calc pH using K_a or K_b to get concentration of H^+ and OH^-

polyprotic acid monoprotic acid

conjugate acid/base pair mol formula same, except ONLY 1 H^+

$HCl-Cl, H_2O-OH^-, H_2SO_4-HSO_4^-, Na^+-NaOH$

Buffer minimize pH change with a conjugated pair of weak acid and based,

acid and base (cont)

titration concentration of unknown; weak or strong acid/base of unknown; pK_a pK_b of unknown

equivalence point titration curve, reflection/end point; $M_1V_1 = M_2V_2$

red-blue indicator $H-Indicator \rightleftharpoons H^+(aq) + indicator(aq)$; color change at 7, buret

oxidation and reduction

LEO lose electron=oxidation

GER Gain electron=reduction

oxidation state adds up to 0; assign oxidation number based on electronegativity

oxidation number total=0; oxygen(-2), alkali(+1), alkali earth(+2), halogens (-1), $OH^+(-1)$

balance redox reaction: total electron balance

oxidant=oxidant agent, reducing agent

activity series

Rustin- $2Fe(s) + 3O_2 \rightarrow Fe_2O_3(s)$
g(O_2)

dissolvin- $Pb(s) + 2H^+ \rightarrow H_2(g) + Pb^{2+}$
g(H^+ , H_2O)

Nitric acid NO_2 is brownish yellow toxic gas produced
disolution

Organic chem and environmental chemistry

Organic chemistry

Carbon, no polar covalent bond

soluble in non polar solution, not in water

no dissociate in solution, no ion in solution, not conductor, not electrolyte

Organic chem and environmental chemistry (cont)

isomer: same composite different geometry and chemical property, ethanol vs dimethyl

Hydrocarbon

alkanes C_nH_{2n+2} , single bonds

Meth- eth- prop-but-pent-hex-

alkenes C_nH_{2n} , ≥ 1 double bond

-ane(all single bonds), -ene(≥ 1 double), -yne (≥ 1 triple)

alkynes C_nH_{2n-2} , ≥ 1 triple bond

Hydrocarbon aromatic hydrocarbons rings

functional groups

-OH, -Cl, -COOH, -NH₂, -COH aldehydes, ketone -C=O, ether -COC-, ester COOC

Organic reactions

Addition: $C=C \rightarrow C-C$

substitution

polymerization: monomer \rightarrow

creaking

combustion: hydrocarbon $\rightarrow CO_2 + H_2O$, $CO_2:44, H_2O:18$

esterification: $COOH + OH \rightarrow COOC + H_2O$

Biomolecular

Lipids; carbohydrate, nucleic acid, protein

Environmental chemistry

atmosphere: N_2 78%, O_2 20%, Ar <1%, H_2O , other <1%; Troposphere, strato, meso, thermo

Ozone, O_3 : $O_2 + \gamma \rightarrow 2O$ (photodissociation), $O + O_2 \rightarrow O_3$ (absorb solar radiation), CFCs consume O_3 (CFCs + light \rightarrow free Cl, then consume O_3 to form ClO)

GreenHouse effect

Acid Rain: $SO_2 \rightarrow SO_3 + H_2O \rightarrow H_2SO_4(aq)$

Carbon monoxide

Lab

Safety

accuracy: how correct a measure is; precision is how exact a measure is, compared to real measurement

Buret washing; hot object weight;

significant figures: least significant after operation, 2500 has 2 significant figures, 2500. has 4, 3 mole = 3.000000 moles

Procedures

filtration -> distillation -> chromatography

titration: $M_a V_a = M_b V_b$, litmus: pink->blue, phenolphthalein: clear->pink

Identifying chemicals

precipitation: AgCl

Conduction: Ion conductivity

Flame test: alkali (earth metal) Li/Sr Red, Ca: orange, Na: yellow, Ba: green, K: Violet

colored solution: Cu^{2+} blue, Ni^{2+} green, Co^{2+} pink, Fe^{3+} yellow, CrO_4^{2-} Yellow, CrO_7^{2-} Orange, MnO_4^- deep purple

gas evolution: manometer, Erlenmeyer tube, splint test

calorimetry: $Q = mc \Delta T$

Equipment

Beaker, buret, burner, crucible tongs, dropper pipette, Erlenmeyer flask, evaporating dish, Florence flask, forceps, funnel, graduated cylinder, volumetric flask, metal spatula, mortar and pestle, pipette bulb, platform balance, ring clamp,



By **Jianmin Feng** (taotao)
cheatography.com/taotao/

Not published yet.
Last updated 30th May, 2019.
Page 3 of 3.

Sponsored by **Readable.com**
Measure your website readability!
<https://readable.com>