CONVERSION AND FORMULA SHEETS

Conversions:

$$1\,\text{ppmv} = \frac{1\,\text{x}\,10^{-6}\ \text{mol}}{1\,\text{mol}} = \frac{1\,\mu\text{mol}}{1\,\text{mol}} = \frac{1\,\text{molecule}}{1\,\text{x}\,10^{6}\ \text{molecule}} = \frac{1\,\text{x}\,10^{-6}\ \text{atm}}{1\,\text{atm}} = \frac{1\,\text{x}\,10^{-6}\ \text{Pa}}{1\,\text{Pa}}$$

$n_x = \chi\, n_{air}$

n_{air} (Loschimdt's number) = 2.69 x 10^{19} molecules cm^{-3} (at STP)

Kelvin Temperature = $^{o}C + 273.2$

1.00 atm = 101,300 Pa = 760 torr

1 m^3 = 10^3 L = 10^6 cm^3

1 mol of gas at STP = 22.41 L

pH = - log $a_{H+} \approx$ - log $[H^+]$

Newton (force) N = kg m s^{-2}

Pascal (pressure) Pa = kg m^{-1} s^{-2}

Joule (energy) J = kg m^2 s^{-2}

STP: T = 273 K, P = 1.00 atm

1 Bq = 1 disintegration per second

1 Ci = 3.7 x 10^{10} Bq

1 rad = 10^{-2} J kg^{-1}

1 rem = 1 rad x RBE

General Formulas

$$\text{Residence time (lifetime)} = \frac{\text{amt in resevoir}}{\Sigma \text{ flux rates}} = \frac{1}{\Sigma \text{ k}} \text{ (first or pseudo first order)}$$

$$R_{abs} = I \pi r^2 (1 - A)$$

$$R_{out} = 4 \pi r^2 \sigma T^4$$

$$P_z = P_o \, e^{-\left\{\frac{g \bar{M} z}{R T}\right\}}$$

$$n_z = n_o \, e^{-\left\{\frac{g \bar{M} z}{R T}\right\}}$$

$$E_{photon} \text{ (mole)} = \frac{h c N_A}{\lambda}$$

$$\Delta H^o_{rxn} = \Sigma \Delta H^o_f \text{ (products)} - \Sigma \Delta H^o_f \text{(reactants)}$$

$$K_H = \frac{[X(aq)]}{P_X(g)}$$

$$\ln \frac{[A]_t}{[A]_o} = -kt$$

$$\frac{1}{[A]_t} - \frac{1}{[A]_o} = kt$$

$$t_{1/2} = \frac{0.693}{k}$$

$$t_{1/2} = \frac{1}{k[A]_o}$$

$$k = A \, e^{-\left\{\frac{E_a}{R T}\right\}}$$

$$\ln \frac{k_1}{k_2} = -\frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

$$CCF = \frac{(C_x / C_{Na})_{aerosol}}{(C_x / C_{Na})_{seawater}}$$

$$v_t = \frac{(\rho_p - \rho_a) C g d_p^{\,2}}{18 \eta}$$

$$\frac{-dN}{dt} = 4 \pi D C d_p N^2$$

CHEMISTRY 302: DATA SHEET

Universal Constants

$R = 8.314\ J\ mol^{-1}\ K^{-1} = 0.08206\ L\ atm\ mol^{-1}\ K^{-1}$
$g = 9.81\ m\ s^{-2}$
$h = 6.626 \times 10^{-34}\ J\ s$
$c = 3.00 \times 10^{8}\ m\ s^{-1}$
$N_A = 6.023 \times 10^{23}\ molecule\ mol^{-1}$

Henry's Law Constants

$K_H\ (SO_2) = 1.2 \times 10^{-5}\ mol\ L^{-1}\ Pa^{-1} = 1.2\ mol\ L^{-1}\ atm^{-1}$
$K_H\ (CO_2) = 3.3 \times 10^{-7}\ mol\ L^{-1}\ Pa^{-1} = 3.3 \times 10^{-2}\ mol\ L^{-1}\ atm^{-1}$
$K_H\ (NH_3) = 5.7 \times 10^{-4}\ mol\ L^{-1}\ Pa^{-1} = 58\ mol\ L^{-1}\ atm^{-1}$

Acid Dissociation Constants

H_2CO_3	$K_{a1} = 4.5 \times 10^{-7}$	$K_{a2} = 4.7 \times 10^{-11}$
H_2SO_3	$K_{a1} = 1.72 \times 10^{-2}$	$K_{a2} = 6.43 \times 10^{-8}$

Gas Composition of Dry Atmosphere

N_2	78.01%
O_2	20.95%
Ar	0.93%
CO_2	0.0385%

Planetary constants

Average Molar Mass of Atmosphere (M) = $28.96\ g\ mol^{-1}$
Mass of Atmosphere = $5.3 \times 10^{18}\ kg$
Radius of Earth = 6400 km
Surface Area of Earth = $5.1 \times 10^{14}\ m^2$
Viscosity of air = $1.9 \times 10^{-2}\ g\ m^{-1}\ s^{-1}$
Density of air = $1.2 \times 10^{3}\ g\ m^{-3}$