CHEM 1013 - QUICK ACCESS FORMULAS: Fall Semester

Chapter 1: Basic Concepts of Chemistry

Temperature in Kelvin = (T °C + 273.15)

Chapter 2: Atoms, Molecules and Ions

$$Force = -k\frac{(n^{+}e)(n^{-}e)}{d^{2}}$$

$$\%\ Compositon = \frac{(atoms\ of\ element)(atomic\ weight)}{(formula\ weight\ of\ compound)}\ \text{x}\ 100$$

$$\%\ Abundance = \frac{\#\ atoms\ of\ individual\ isotope}{\#\ atoms\ of\ all\ isotopes\ of\ that\ element}\ \text{x}\ 100\%$$

$$Atomic\ weight = \frac{(\%\ abundance\ isotope 1)}{100}(mass\ of\ isotope\ 1) + \frac{(\%\ abundance\ isotope\ 2)}{100}(mass\ isotope\ 2) + \cdots$$

Chapter 4: Stoichiometry Quantitative Information about Chemical Reactions

$$\%\ Yield = \frac{Actual\ yield\ (in\ grams\ or\ moles)}{Theoretical\ yield\ (in\ grams\ or\ moles)}\ \text{x}\ 100\%$$

$$M_{initial}V_{initial} = M_{final}V_{final}$$

Chapter 5: Principles of Chemical Reactivity- Energy and Chemical Reactions

$\Delta U = U_{final} - U_{initial}$

$\Delta U = q_{system} + w_{system}$

$q = mc\Delta T$

$q_1 + q_2 + q_3 + \cdots = 0$ (isolated systems)

$w = -P \times \Delta V$

$q_{bomb} = C_{bomb}\Delta T$

$\Delta H_{rxn}° = \Sigma\{(moles\ of\ product \times \Delta_f H°(product)\} - \Sigma\{(moles\ of\ reactant \times \Delta_f H°(reactant)\}$

Chapter 6: The Structure of Atoms

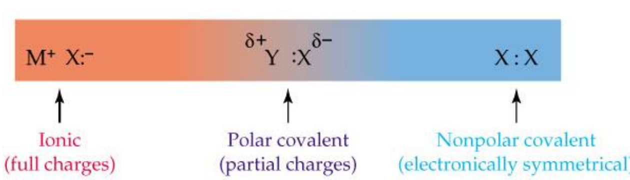
$C = v\lambda$ $\quad E_n = -Rhc/n^2$ $\quad E = hv$ $\quad \lambda = \frac{h}{mv}$

Chapter 7: The Structure of Atoms and Periodic Trends

Z= [Z- (# inner electrons on inner shell)]*

Chapter 8: Bonding and Molecular Structure

$\Delta_r H = \Sigma\Delta H(bonds\ broken) - \Sigma\Delta H(bonds\ formed)$ $\quad Bond\ Order\ \frac{\#\ electron\ pairs\ used\ in\ that\ type\ of\ bond}{total\ \#\ bonds\ of\ that\ type}$



Formal charge: # valence electrons - [# lone pair electrons + ½ bonding electrons]

Disclaimer: This page is meant to be used as a reference, not a comprehensive list of forumlas. For a full list, please see the correspondeing chapter summaries. This page may not be used within an evaluation setting unless your professor's permission is given.

CHEM 1013 - QUICK ACCESS FORMULAS: Winter Semester

Chapter 9: Bonding and Molecular Structure-Orbital Hybridization and Molecular Orbitals

$$Bond\ Order = \frac{\#\ bonding\ electrons - \#\ antibonding\ electrons}{2}$$

Chapter 10: Gases and Their Properties

$P = \frac{F}{A}$

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$P_1V_1 = P_2V_2$

$PV = nRT$

$Density = \frac{P \text{ x } M_{wt}}{RT}$

$(X_a) = \frac{n_a}{n_{total}}$ $(P_a) = X_a P_{total}$

$X_a + X_b + X_{c+\ldots} = 1$

$KE = ½\ mv^2$

$u = \sqrt{\frac{3RT}{M}}$

$\frac{Rate\ of\ effusion\ gas\ 1}{Rate\ of\ effusion\ gas\ 2} = \sqrt{\frac{Molar\ mass\ of\ gas\ 2}{Molar\ mass\ of\ gas\ 1}}$

$(P + a\left[\frac{n}{V}\right]^2)\ (V - bn) = nRT$

Chapter 11: Intermolecular Forces and Liquids

$\ln P = -(\Delta_{vap}\ H^\circ)/(RT) + C$

$\ln(P_2/P_1) = -\frac{\Delta_{vap}H^\circ}{R}[\frac{1}{T_2} - \frac{1}{T_1}]$

Chapter 12: The Solid State

$face\ diagonal = \sqrt{2}$ x edge length

Chapter 13: Solutions and Their Behavior

$molality\ of\ solute = \frac{amount\ of\ solute(mol)}{mass\ of\ solvent[kg]}$

$weight\ \%\ A = \frac{mass\ A}{mass\ A + mass\ B + mass\ C + \cdots} \text{ x } 100\%$

$\Delta_{sol} H = \Delta_{lattice} H + \Delta_{hydration} H$

$S_g = k_H P_g$

$P_{solvent} = X_{solvent} P^\circ_{solvent}$

$\Pi = cRT$

$\Delta T_{bp} = K_{bp}\ m_{solute} i_{solute}$

$\Delta T_{fp} = K_{fp} m_{solute}\ i_{solute}$

Chapter 14: Chemical Kinetics: The Rates of Chemical Reactions

$R = \frac{\Delta[P]}{\Delta t} = -\frac{\Delta[R]}{t}$

$Rate = k[Reactant\ A]^x\ [Reactant\ B]^y$

$ln \frac{[R]_t}{[R]_0} = -kt$

$\frac{1}{[R]_t} - \frac{1}{[R]_0} = kt$

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

$t_{1/2} = 1/k[R]_0$

$k = Ae^{-E_a/RT}$

Chapter 15: Principles of Chemical Reactivity- Equilibria

$K = \frac{[C][B]}{[A]} = \frac{(x)(x)}{[A]_0 - x} = \frac{(x)(x)}{[A]_0}$

$K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$

Chapter 16: The Chemistry of Acids and Bases

$pOH = -\log[OH^-]$

$pH = -\log[H_3O^+]$

$k_w = [H_3O^+]\ [OH^-] = 1.0 \text{ x} 10^{-14}$

$K_a = \frac{[A^-][H_3O^+]}{[HA]}$

$K_b = \frac{[BH^+][OH^-]}{[B]}$

$pH + pOH = 14.00 = pK_w$

$pK_a = -\log(K_a)$

$K_a \text{ x } K_b = K_w$