

CHM 150 & 151 Equation Sheet

Mass of electron = 9.10938×10^{-31} kg

Mass of proton = 1.67262×10^{-27} kg

Mass of neutron = 1.67493×10^{-27} kg

$N_A = 6.02214 \times 10^{23}$ mol⁻¹

$h = 6.626 \times 10^{-34}$ J s

$c = 2.998 \times 10^8$ m/s

$c = \lambda \nu$

$\lambda = h/(m\nu)$

$E = h\nu$

$E_n = -2.18 \times 10^{-18}$ J ($1/n^2$)

$1 \text{ J} = 1 \text{ (kg} \cdot \text{m}^2) / \text{s}^2$

$1 \text{ cal} = 4.184 \text{ J}$

$^{\circ}\text{C} = \frac{100}{180} (^{\circ}\text{F} - 32)$

$q = m (S_h) (\Delta T) = C(\Delta T)$

$C = m (S_h)$

$\Delta H^{\circ}_{\text{rxn}} = \sum n \Delta H^{\circ}_{\text{f (products)}} - \sum n \Delta H^{\circ}_{\text{f (reactants)}}$

$\Delta H^{\circ}_{\text{rxn}} = BE_{\text{(reactants)}} - BE_{\text{(products)}}$

$1 \text{ atm} = 760 \text{ torr} = 760 \text{ mm Hg} = 101.3 \text{ kPa}$

$PV = nRT$

$R = 0.08206 \frac{\text{L atm}}{\text{mol K}} = 8.314 \frac{\text{J}}{\text{mol K}}$

$\chi_A = \frac{\text{mol A}}{\text{total mol}}$

$P_A = \chi_A P_{\text{TOT}}$

$d = \frac{P \times MW}{RT}$

$\Delta T_b = K_b m$

$\Delta T_f = -K_f m$

Activity Series of metals
Li, K, Ba, Sr, Ca and Na metals react rapidly with cool water.
Half-Reaction
$\text{Li}^+_{(\text{aq})} + \text{e}^- \rightarrow \text{Li}_{(\text{s})}$
$\text{K}^+_{(\text{aq})} + \text{e}^- \rightarrow \text{K}_{(\text{s})}$
$\text{Ba}^{2+}_{(\text{aq})} + 2 \text{e}^- \rightarrow \text{Ba}_{(\text{s})}$
$\text{Sr}^{2+}_{(\text{aq})} + 2 \text{e}^- \rightarrow \text{Sr}_{(\text{s})}$
$\text{Ca}^{2+}_{(\text{aq})} + 2 \text{e}^- \rightarrow \text{Ca}_{(\text{s})}$
$\text{Na}^+_{(\text{aq})} + \text{e}^- \rightarrow \text{Na}_{(\text{s})}$
$\text{Mg}^{2+}_{(\text{aq})} + 2 \text{e}^- \rightarrow \text{Mg}_{(\text{s})}$
$\text{Be}^{2+}_{(\text{aq})} + 2 \text{e}^- \rightarrow \text{Be}_{(\text{s})}$
$\text{Al}^{3+}_{(\text{aq})} + 3 \text{e}^- \rightarrow \text{Al}_{(\text{s})}$
$\text{Mn}^{2+}_{(\text{aq})} + 2 \text{e}^- \rightarrow \text{Mn}_{(\text{s})}$
$\text{Zn}^{2+}_{(\text{aq})} + 2 \text{e}^- \rightarrow \text{Zn}_{(\text{s})}$
$\text{Cr}^{3+}_{(\text{aq})} + 3 \text{e}^- \rightarrow \text{Cr}_{(\text{s})}$
$\text{Fe}^{2+}_{(\text{aq})} + 2 \text{e}^- \rightarrow \text{Fe}_{(\text{s})}$
$\text{Cd}^{2+}_{(\text{aq})} + 2 \text{e}^- \rightarrow \text{Cd}_{(\text{s})}$
$\text{Co}^{2+}_{(\text{aq})} + 2 \text{e}^- \rightarrow \text{Co}_{(\text{s})}$
$\text{Ni}^{2+}_{(\text{aq})} + 2 \text{e}^- \rightarrow \text{Ni}_{(\text{s})}$
$\text{Sn}^{2+}_{(\text{aq})} + 2 \text{e}^- \rightarrow \text{Sn}_{(\text{s})}$
$\text{Pb}^{2+}_{(\text{aq})} + 2 \text{e}^- \rightarrow \text{Pb}_{(\text{s})}$
$2 \text{H}^+_{(\text{aq})} + 2 \text{e}^- \rightarrow \text{H}_{2(\text{g})}$
$\text{Cu}^{2+}_{(\text{aq})} + 2 \text{e}^- \rightarrow \text{Cu}_{(\text{s})}$
$\text{Fe}^{3+}_{(\text{aq})} + \text{e}^- \rightarrow \text{Fe}^{2+}_{(\text{aq})}$
$\text{Ag}^+_{(\text{aq})} + \text{e}^- \rightarrow \text{Ag}_{(\text{s})}$
$\text{Hg}_2^{2+}_{(\text{aq})} + 2 \text{e}^- \rightarrow 2 \text{Hg}_{(\text{l})}$
$\text{Au}^{3+}_{(\text{aq})} + 3 \text{e}^- \rightarrow \text{Au}_{(\text{s})}$

Solubility Rules for ionic substances in water. Soluble: >1.00g dissolves in 100 ml H ₂ O @ 25°C.	
Generally soluble salts contain...	Generally insoluble salts contain...
1. Group IA ions and ammonium ions	5. Carbonate, chromate and phosphate ions. Exceptions: Group IA and ammonium salts of these ions are soluble.
2. Acetate, nitrate, chlorate or perchlorate ions	6. Sulfide ions. Exceptions: Group IA, ammonium, Ca ²⁺ , Ba ²⁺ , and Sr ²⁺ salts of sulfide ions are soluble
3. Chloride, bromide or iodide ions. Exceptions: the Ag ⁺ , Hg ₂ ²⁺ , Hg ²⁺ and Pb ²⁺ salts of halides are insoluble	7. Hydroxide ions. Exceptions: Group IA, ammonium, Ca ²⁺ , Ba ²⁺ , and Sr ²⁺ salts of hydroxide ions are soluble
4. Sulfate ions. Exceptions: the Ca ²⁺ , Ba ²⁺ , Sr ²⁺ , Ag ⁺ , Hg ₂ ²⁺ , and Pb ²⁺ salts of sulfate are insoluble	