Formations:

1. Acid + Metal = Salt + Hydrogen Gas

Ex. $2HCl_{(aq)} + Zn_{(s)} \rightarrow ZnCl_{2(aq)} + H_{2(g)}$

2. Acid + Base = Salt + Water

Ex. $HCl_{(aq)} + NaOH_{(aq)} \rightarrow NaCl_{(aq)} + H_2O$

3. Acid + Metal Carbonate = CO_2 + H_2O + Salt

Ex. $CaCO_{3(s)} + HCl_{(aq)} \rightarrow H_2O + CO_{2(g)} + CaCl_{2(aq)}$

4. Metal Oxide + Acid → Salt + Water

Ex. $MgO_{(s)} + HCl_{(aq)} \rightarrow MgCl_{2(aq)} + H_2O$

Polyatomic Ions:

Acetate	CH_3COO^- or $C_2H_3O_2^-$	*Hydronium*	H_3O^+
Aluminate	AlO_2^-, $Al_2O_4^{2-}$	*Hydroxide*	OH^-
Amide	NH_2^-	*Hypobromite*	BrO^-
Ammonium	NH_4^+	*Hypochlorite*	ClO^-
Antimonate	SbO_4^{3-}	*Hypoiodite*	IO^-
Antimonite	SbO_3^{3-}	*Hypophosphite*	PO_2^{3-}
Arsenate	AsO_4^{3-}	*Hyposulfite*	SO_2^{2-}
Arsenite	AsO_3^{3-}	*Iodate*	IO_3^-
Bicarbonate (hydrogen carbonate)	HCO_3^-	*Iodite*	IO_2^-
Bromate	BrO_3^-	*Manganate*	MnO_4^{2-}
Bromite	BrO_2^-	*Nitrate*	NO_3^-
Carbide	C_2^{2-}	*Nitrite*	NO_2^-
Carbonate	CO_3^{2-}	*Ozonide*	O_3^-
Chlorate	ClO_3^-	*Perbromate*	BrO_4^-
Chlorite	ClO_2^-	*Perchlorate*	ClO_4^-
Chromate	CrO_4^{2-}	*Periodate*	IO_4^-
Chromite	CrO_2^-	*Permanganate*	MnO_4^-
Cyanate	OCN^-	*Peroxide*	O_2^{2-}
Cyanide	CN^-	*Phosphate*	PO_4^{3-}
Dichromate	$Cr_2O_7^{2-}$	*Phosphite*	PO_3^{3-}
Dihydrogen arsenate	$H_2AsO_4^-$	*Plumbate*	PbO_3^{2-}
Dihydrogen phosphate	$H_2PO_4^-$	*Plumbite*	PbO_2^{2-}
Dihydrogen phosphite	$H_2PO_3^-$	*Stannate*	SnO_3^{2-}
Disulfide	S_2^{2-}	*Stannite*	SnO_2^{2-}
Ferrate	FeO_4^{2-}	*Sulfate*	SO_4^{2-}
Hydrogen carbonate (bicarbonate)	HCO_3^-	*Sulfite*	SO_3^{2-}
Hydrogen arsenate	$HAsO_4^{2-}$	*Superoxide*	O_2^-
Hydrogen phosphate	HPO_4^{2-}	*Tartrate*	$(CH(OH)COO)_2^{2-}$
Hydrogen phosphite	HPO_3^{2-}	*Tellurite*	TeO_3^{2-}
Hydrogen sulfate	HSO_4^-	*Thiocyanate*	SCN^-
Hydrogen sulfite	HSO_3^-	*Thiosulfate*	$S_2O_3^{2-}$

THE EQUATION SHEET

Constants:

Avagadro's Number (***N_A***)	6.02×10^{23}
Universal Gas Constant (***R***)	8.314 J/mol·K
Planck's constant (***h***)	6.626×10^{-34} J·s
Rydberg Constant	2.18×10^{-18} J
Speed of Light (***c***)	3.00×10^{8} m/s
Charge of an Electron (***q***)	1.602×10^{-19}
Boltzmann Constant (***k_B***)	1.381×10^{-23} J/K
Molar Volume (***V_{mol}***)	22.4 L/mol
Compton Wavelength of the Electron (λ_c)	2.42631×10^{-12} m
Specific Heat Capacity of Water (**C**)	4.18J/g·mol
Faraday's Constant (***F***)	9.64846×10^{4} C/mol

Conversion factors:

1A = 1C/s
1C = 1 J/V·mol
1L atm = 101.3J
1nm = 10^{-9}m
1atm = 760 torr = 760mm Hg
0°C = 273 K

Basic Equations:

$$n = \frac{m}{M_R} \qquad n = cV$$

$$n_{gas} = \frac{V}{22.4 mol/L} \qquad c_1V_1 = c_2V_2$$

The Equations:

Acid-Base Chemistry:

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

$$\left[H_3O^+\right] = 10^{-pH}$$

$$K_w = K_a \times K_b$$

$$pK_a + pK_b = pK_w$$

$$pK_a = -\log K_a$$

$$pK_b = -\log K_b$$

$$pK_b = 14 - pK_a$$

$$pH + pOH = 14$$

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

$$\left[OH^-\right] = 10^{-pOH}$$

Thermodynamics:

$$\Delta H_{rxn} = H_P - H_R$$

$q = \Delta H$ at constant pressure

$$\Delta H^o = \frac{-Q}{\#\, mol}$$

$$M_{Enthalpy} = \sum (E_k + E_p)$$

$$E_k = \frac{1}{2}v^2$$

$$C = \frac{Q}{\Delta T}$$

$$Q = mc\Delta T$$

$$\Delta H^o_{rxn} = \sum \left[\Delta H^o_{f(P)}\right] - \sum \left[\Delta H^o_{F(R)}\right]$$

$$\Delta H^o_{rxn} = \sum D(broken) - \sum D(formed)$$

$$\Delta S = k \ln W = \frac{q}{T} = \frac{\Delta H}{T} = S_{System} + S_{Surrounding}$$

$$\Delta S^o_{rxn} = \sum S^o_{(P)} - \sum S^o_{(R)}$$

$$\Delta G^o = \Delta H^o - T\Delta S^o$$

$$\Delta G^o_{rxn} = \sum \Delta G^o_{(P)} - \sum \Delta G^o_{(R)}$$

Chemical Kinetics:

$$Rate_{\text{Re}action} = \frac{\Delta c}{\Delta t}$$

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

$$Rate_{\text{Re}action} = k\left[A\right]^m\left[B\right]^n$$

$$E_A = -\frac{\ln\left(\frac{k}{A}\right)}{RT}$$

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

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

$$\left[A\right]_t = -kt + \left[A\right]_o$$

$$\frac{1}{\left[A\right]} = kt + \frac{1}{\left[A\right]_o}$$

$$\ln\left[A\right]_t = -kt + \ln\left[A\right]_o$$

Quantum Mechanics:

$$E = \frac{hc}{\lambda}$$

$$c = f\lambda$$

$$\Delta E = R_H\left(\frac{1}{n_i^2} - \frac{1}{n_f^2}\right)$$

$$E = hf$$

Nuclear Chemistry:

$$E = mc^2$$

$${}^{238}_{92}U = {}^{234}_{+0}Th + {}^{4}_{2}He$$

$${}^{1}_{0}n \rightarrow {}^{1}_{1}H + {}^{0}_{-1}e$$

Gas:

$$PV = nRT$$

Redox:

$$Charge = Current \times Time$$

$$E^o_{cell} = E^o_{cathode} - E^o_{Anode}$$