Useful and Necessary Formulas

http://www2.ucdsb.on.ca/tiss/stretton/Database/formulas_content.html

1. **Electromagnetic Radiation**
   - a) Speed of Light — $c = \lambda * v$
   - b) Wavelength — $\lambda = c / v$
   - c) Frequency — $v = c / \lambda$
   - d) Energy in a photon — $E = h * v$
2. **Concentration and Molar Mass**
   - a) Density (D) — $D = m / V$
   - b) Moles (n) — $n = g / mm$
   - c) Moles (# of particles) — $n =$ number of particles / Avogadro's number
   - d) Moles (solution) — $n =$ concentration • volume
   - e) Moles (gas equation) — $n = PV / RT$
   - f) Molarity (M) — $M = n /$ volume
   - g) Molar mass (mm) — $mm = m / n$
3. **Gases**
   - a) Boyle's Law — $P_1 \bullet V_1 = P_2 \bullet V_2$
   - b) Charles' Law — $V_1 \bullet T_2 = V_2 \bullet T_1$
   - c) Combined Gas Law — $P_1 \bullet V_1 / T_1 = P_2 \bullet V_2 / T_2$
   - d) Ideal Gas Law — $PV = nRT$
   - e) Dalton's Law of Partial Pressures — $P_T = P_1 + P_2 + P_3 + ... + P_n$
4. **Acids and Bases**
   - a) pH — $pH = -\log[H^{+1}]$
   - b) pOH — $pOH = -\log[OH^{-1}]$
   - c) $[H_3O^{+1}]$ — $[H_3O^{+1}] = 10^{-pH}$
   - d) $[OH^{-1}]$ — $[OH^{-1}] = 10^{-pOH}$
5. **Heat**
   - a) Quantity of Heat (Q) — $Q = m \bullet c \bullet \Delta t$
   - b) Quantity of Heat (fusion) — $Q = m \bullet L_f$
   - c) Quantity of Heat (vaporization) — $Q = m \bullet L_v$
   - d) Celsius to Kelvin — $K = {}^oC + 273.15$
   - e) Kelvin to Celcius — ${}^oC = K - 273.15$
6. **Mathematics**
   - a) Quadratic Equation — $x = -b \pm (b^2 - 4ac)^{-2} / 2a$

Common Physical and Chemical Constants

http://www2.ucdsb.on.ca/tiss/stretton/Database/constants.htm

Avogadro's Number	**6.02217×10^{23} things/mole**
Planck's Constant	**$6.6260755 \times 10^{-34}$ Js**
1 atmosphere (atm)	**101,325 Pascals (Pa) = 101.325 kPa = 760 mm of Hg = 760 Torr = 1.01325 bar**
1 mole of any gas at STP	**22.4 L (0^{o}C, 1 atm)**
1 mole of any gas at SATP	**24.8 L (25^{o}C, 1 atm)**
Ideal Gas Law Constant (R)	**0.0821 L atm mol^{-1} K^{-1} = 8.31430 L kPa mol^{-1} K^{-1} = 8.31441 J mol^{-1} K^{-1}**
1 calorie (cal)	**4.184 J**
1 Cal	**1 kcal = 1000 calories**
1 atomic mass unit (amu)	**$1.6605665 \times 10^{-24}$ g**
1 tonne(t)	**1000 kg = 1 Mg**
Speed of light in a vacuum	**299792458 m s^{-1} (3.0×10^{8} m s^{-1})**
Rest mass of an electron (m_e)	**0.000548712 u = $9.1093897 \times 10^{-28}$ g**
Rest mass of a proton (m_p)	**1.00727605 u = $1.67262305 \times 10^{-24}$ g**
Rest mass of a neutron (m_n)	**1.008665 u = 1.674954×10^{-24} g**
1 kiloWattHour(kWh)	**3.6 MJ**
1 Joule (J)	**1 kg m^2 s^{-2} = 1.0×10^{7} erg**
1 Coulomb(C)	**6.24×10^{18} e^-**
Electronic charge on an electron	**$1.60217733 \times 10^{-19}$ C**
1 Ampere(A)	**1 Coulomb/s**
1 Volt(V)	**1 J/C = 96.5 kJ/mole**
1 electron volt (eV)	**1.60219×10^{-19} J**
Faraday's Constant	**96,486.7 C/mole e^-**