

Chemistry Reference Sheet

| | | | | | | | | | | | | |
|---|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 1 | 1A | | 2 | 2A | | 13 | 14 | 15 | 16 | 17 | 18 | |
| 1 | 1 | | 2 | | | 5 | 6 | 7 | 8 | 9 | 10 | |
| | H | | Be | | | B | C | N | O | F | Ne | |
| 2 | 3 | 4 | | | | 13 | 14 | 15 | 16 | 17 | 18 | |
| | Li | Be | | | | Al | Si | P | S | Cl | Ar | |
| 3 | 11 | 12 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | Na | Mg | 3B | 4B | 5B | 6B | 7B | 8B | 1B | 2B | 13 | 14 |
| 4 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| | K | Ca | Sc | Ti | V | Cr | Mn | Fe | Co | Ni | Cu | Zn |
| 5 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| | Rb | Sr | Y | Zr | Nb | Mo | Tc | Ru | Rh | Pd | Ag | Cd |
| 6 | 55 | 56 | 57 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| | Cs | Ba | La | Hf | Ta | W | Re | Os | Ir | Pt | Au | Hg |
| 7 | 87 | 88 | 89 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 |
| | Fr | Ra | Ac | Rf | Db | Sg | Bh | Hs | Mt | Ds | Rg | Cn |

Key

| | | |
|-----------|---|----------------------|
| 11 | — | Atomic number |
| Na | — | Element symbol |
| Sodium | — | Element name |
| 22.99 | — | Average atomic mass* |

* If this number is in parentheses, then it refers to the atomic mass of the most stable isotope.

| | | | | | | | | | | | | | |
|-------------------|------------------------|---------------------|---------------------|--------------------|--------------------|----------------------|--------------------|----------------------|----------------------|------------------|----------------------|---------------------|---------------------|
| 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 |
| Ce | Pr | Nd | Pm | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu |
| Cerium 140.12 | Praseodymium 140.91 | Neodymium 144.24 | Promethium (145) | Samarium 150.36 | Europium 151.96 | Gadolinium 157.25 | Terbium 158.93 | Dysprosium 162.50 | Holmium 164.93 | Erbium 167.26 | Thulium 168.93 | Ytterbium 173.04 | Lutetium 174.97 |
| 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 |
| Th | Pa | U | Np | Pu | Am | Cm | Bk | Cf | Es | Fm | Md | No | Lr |
| Thorium 232.04 | Protactinium 231.04 | Uranium 238.03 | Neptunium (237) | Plutonium (244) | Americium (243) | Curium (247) | Berkelium (247) | Californium (251) | Einsteinium (252) | Fermium (257) | Mendelevium (258) | Nobelium (259) | Lawrencium (262) |

DOUGHERTY VALLEY HS CHEMISTRY EQUATIONS AND CONSTANTS

EQUILIBRIUM and ACID BASE

$$K_c = \frac{[C]^C [D]^D}{[A]^A [B]^B} \quad K_p = \frac{(P_C)^C (P_D)^D}{(P_A)^A (P_B)^B}$$

$$K_a = \frac{[H^+][A^-]}{[HA]}; \quad K_b = \frac{[OH^-][HB^+]}{[B]}$$

$$K_w = [H^+][OH^-] \quad K_w = K_a \times K_b$$

$$pH = -\log[H^+], \quad pOH = -\log[OH^-]$$

$$14 = pH + pOH \quad (\text{at } 25^\circ\text{C})$$

Equilibrium Constant:

$$K_w = 1.0 \times 10^{-14} \text{ at } 25^\circ\text{C}$$

THERMOCHEMISTRY

No Phase Change: $q = mc\Delta T$

Phase Change: $q = m \times \Delta H_{fus}$ (or $q = mL_{fus}$)
 $q = m \times \Delta H_{vap}$ (or $q = mL_{vap}$)

Calorimetry: $q_{object\ 1} = -q_{object\ 2}$

Specific Heats:

$$\text{Water} = 4.184 \frac{J}{g^\circ C}$$

$$\text{Steam} = 1.87 \frac{J}{g^\circ C}$$

$$\text{Ice} = 2.09 \frac{J}{g^\circ C}$$

Latent Heats:

$$\text{Fusion} = 334 \frac{J}{g}$$

$$\text{Vaporization} = 2260 \frac{J}{g}$$

Energy Conversion:

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

GASES

Ideal Gas Law: $PV = nRT$

Combined Gas Law: $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$

Dalton's Law: $P_{total} = P_A + P_B + P_C \dots$

Molar Mass: $M = \frac{mRT}{PV}$ $n = \frac{m}{M}$

Gas Density: $D = \frac{MP}{RT}$

Kinetic Energy: $KE = \frac{1}{2}mv^2$

Temperature Conversion: $Kelvin = ^\circ C + 273K$

Volume of Ideal Gas at STP: $22.42 \frac{L}{mol}$

Ideal Gas Constants:

$$= 8.314 \frac{L \cdot kPa}{K \cdot mol}$$

$$= 0.0821 \frac{L \cdot atm}{K \cdot mol}$$

$$= 62.4 \frac{L \cdot mmHg}{K \cdot mol}$$

Pressure Conversions:

$$1 \text{ atm} = 760 \text{ mm Hg}$$

$$= 760 \text{ torr}$$

$$= 101,325 \text{ Pa}$$

$$= 101.3 \text{ kPa}$$

$$= 14.7 \frac{lbs}{in^2}$$

SOLUTIONS

Molarity: $M = \frac{\text{mole solute}}{\text{Liters of solution}}$

Mass Percent: $\% = \frac{\text{mass solute}}{\text{mass solute} + \text{mass solvent}}$

Mole Fraction: $\chi_A = \frac{\text{mol}_A \text{ solute}}{\text{mol}_A \text{ solute} + \text{mol solvent}}$

ENTHALPY

$$\Delta H_{Bonds} = \Sigma Bonds_{Broken} - \Sigma Bonds_{Formed}$$

$$\Delta H_{Rxn} = \Sigma \Delta H_{f \text{ Products}} - \Sigma \Delta H_{f \text{ Reactants}}$$