# CP Chemistry Reference Sheet
## Legacy High School

### *Equations*

$D = M/V$

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

$PV = nRT$

Molarity (M) = mol/L

$K_w = [H_3O^+][OH^{-1}] = 1.0 \times 10^{-14}$

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$pH + pOH = 14.000$

$q = mC\Delta T$

### *Constants*

Avogadro's Number 1 mole = $6.022 \times 10^{23}$

R = 0.0821 L•atm/mol•K

Specific Heat of Water: 4.184 J/g °C

STP: 1 atm, 0 °C

### *Unit Conversions*

1 mL = 1 $cm^3$ K = °C + 273.15 1 cal = 4.184 J

1 atm = 760 mm Hg = 760 torr = 101.3 kPa = 14.69 psi

### *Common Polyatomic Ions*

| 1- | | 2- | | 3- | |
|---|---|---|---|---|---|
| $C_2H_3O_2^{1-}$ | acetate | $CO_3^{2-}$ | carbonate | $PO_4^{3-}$ | phosphate |
| $ClO_3^{1-}$ | chlorate | $CrO_4^{2-}$ | chromate | $PO_3^{3-}$ | phosphite |
| $ClO_2^{1-}$ | chlorite | $Cr_2O_7^{2-}$ | dichromate | | |
| $CN^{1-}$ | cyanide | $HPO_4^{2-}$ | hydrogen phosphate | | |
| $H_2PO_4^{1-}$ | dihydrogen phosphate | $SO_4^{2-}$ | sulfate | | |
| $HCO_3^{1-}$ | hydrogen carbonate (bicarbonate) | $SO_3^{2-}$ | sulfite | | |
| $HSO_4^{1-}$ | hydrogen sulfate (bisulfate) | $S_2O_3^{2-}$ | thiosulfate | | |
| $OH^{1-}$ | hydroxide | $O_2^{2-}$ | peroxide | | |
| $ClO^{1-}$ | hypochlorite | | | | |
| $NO_3^{1-}$ | nitrate | | | | |
| $NO_2^{1-}$ | nitrite | | | 1+ | |
| $ClO_4^{1-}$ | perchlorate | | | $H_3O^+$ | hydronium |
| $MnO_4^{1-}$ | permanganate | | | $NH_4^+$ | ammonium |
| $SCN^{1-}$ | thiocyanate | | | | |

**Metric prefixes:**

**Kilo** (k): 1 kilo = 1000

Examples: 1 kilogram (kg) = 1000 grams (g)
1 kilometer (km) = 1000 meters (m)
1 kiloliter (kL) = 1000 liters (L)

**Hecto** (h): 1 hecto = 100

Examples: 1 hectogram (hg) = 100 g
1 hectometer (hm) = 100 m
1 hectoliter (hL) = 100 L

**Deka** (da): 1 deka = 10

Examples: 1 dekagram (dag) = 10 g
1 dekameter (dam) = 10 m
1 dekaliter (daL) = 10 L

**BASE UNIT**

**Deci** (d): 10 deci = 1

Examples: 10 decigrams (dg) = 1 g
10 decimeter (dm) = 1 m
10 deciliter (dL) = 1 L

**Centi** (c): 100 centi = 1

Examples: 100 centigrams (cg) = 1 g
100 centimeter (cm) = 1 m
100 centiliter (cL) = 1 L

**Milli** (m): 1000 milli = 1

Example: 1000 milligrams (mg) = 1 g
1000 millimeters (mm) = 1 m
1000 milliliters (mL) = 1 L

**Micro** (μ): 1 x$10^6$ micro = 1

Example: 1 x$10^6$ micrometers (μm) = 1 m

**Nano** (n): 1 x $10^9$ nano = 1

Example: 1 x $10^9$ nanometers (nm) = 1 m

**Pico** (p): 1 x $10^{12}$ pico = 1

Ex:1 x $10^{12}$ picometers = 1 m

**Other Conversion Factors:**

1 inch = 2.54 cm
1 pound (lb) = 0.454 kg
1 quart (qt) = 946 mL
1 mL = 1 $cm^3$
1 meter (m) = 1.094 yds

1 pound (lb) = 16 oz.
1 yard = 36 inches (in)
1 mile = 5280 feet (ft)
1 mile = 1.609 km
1 gallon = 4 quarts (qt)
1 qt = 2 pints (pt)
8 fl. oz = 1 cup
16 fl. oz = 1 pint
32 fl oz = 1 qt.
1 ton = 2000 lbs
1 oz = 28.345 grams
1 cal = 4.184 joules (J)

# VSEPR Shapes

| |
|---|
| **Linear** |
| **Trigonal Planar,** Bent |
| **Tetrahedral,** Trigonal Pyramidal, Bent |
| **Trigonal Bipyramidal,** See-saw, T-shaped , Linear |
| **Octahedral,** Square pyramidal, Square planar |

**Solubility Rules Table**

The solubility classification of ionic substances according to their solubility in water is difficult. Nothing is completely "insoluble" in water. The degree of solubility varies from one "soluble" substance to another. Nevertheless, a solubility classification scheme is useful even though it must be regarded as an approximate guideline.

| | |
|---|---|
| **MAINLY WATER SOLUBLE** | |
| $NO_3^-$ | All nitrates are soluble. |
| $CH_3COO^-$ **or** $C_2H_3O_2^-$ | All acetates are soluble except $AgCH_3COO$. |
| $ClO_3^-$ | All chlorates are soluble. |
| $Cl^-$ | All chlorides are soluble except $AgCl, Hg_2Cl_2, PbCl_2$. |
| $Br^-$ | All bromides are soluble except $AgBr, PbBr_2, Hg_2Br_2$, **and** $HgBr_2$. |
| $I^-$ | All iodides are soluble except $AgI, Hg_2I_2, HgI_2$, **and** $PbI_2$. |
| $SO_4^{2-}$ | All sulfates are soluble except $BaSO_4, PbSO_4, Hg_2SO_4, CaSO_4$, $Ag_2SO_4$, **and** $SrSO_4$. |
| Alkali metal cations (Group IA) and $NH_4^+$ | All are soluble |
| $H^+$ | All common inorganic acids and low molecular mass organic acids are soluble. |
| **MAINLY WATER INSOLUBLE** | |
| $CO_3^{2-}$ | All carbonates are insoluble except those of the IA elements and $NH_4^+$. |
| $CrO_4^{2-}$ | All chromates are insoluble except those of the IA elements, $NH_4^+$, $CaCrO_4$, **and** $SrCrO_4$. |
| $OH^-$ | All hydroxides are insoluble except those of the IA elements, $NH_4^+$, $Ba(OH)_2, Sr(OH)_2$, **and** $Ca(OH)_2$. |
| $PO_4^{3-}$ | All phosphates are insoluble except those of the IA elements and $NH_4^+$. |
| $SO_3^{2-}$ | All sulfites are insoluble except those of the IA elements and $NH_4^+$. |
| $S^{2-}$ | All sulfides are insoluble except those of the IA and IIA elements and $NH_4^+$. |