

$$R_{\text{gas-law}} = 0.0821 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}} = 62.4 \frac{\text{L} \cdot \text{mmHg}}{\text{mol} \cdot \text{K}} = 8.314 \frac{\text{L} \cdot \text{kPa} \vee \text{J}}{\text{mol} \cdot \text{K}}$$

$$\frac{453.6 \text{ g}}{1 \text{ lb}} = \frac{2.54 \text{ cm}}{1 \text{ in}} = \frac{0.946 \text{ L}}{1 \text{ qt}} = \frac{6.022 \times 10^{23} \text{ units}}{\text{mol}} = \frac{22.4 \text{ L}}{\text{mol}}$$

$$\frac{1 \text{ g}_{\text{water}}}{1 \text{ mL}_{\text{water}}} = \frac{P_{\text{sea}}}{101325 \text{ Pa}} = \frac{1 \text{ atm}}{760 \text{ mmHg}} = \frac{1 \text{ atm}}{14.7 \text{ psi}} = \frac{1 \text{ kcal}}{4.184 \text{ kJ}}$$

$$^{\circ}\text{C} = \frac{5}{9}(^{\circ}\text{F} - 32) \text{ and } ^{\circ}\text{F} = \frac{9}{5}^{\circ}\text{C} + 32$$

$$h = 6.626 \times 10^{-34} \text{ Js} \vee \text{kgm}^2\text{s}^{-1} \text{ and } c = 3.00 \times 10^8 \text{ ms}^{-1}$$

Periodic Table of Elements

$[J] = \text{kg m}^2 \text{s}^{-2}$ ,  $[N] = \text{kg m s}^{-1}$ ,  
 $[Pa] = \text{N m}^{-2} = \text{kg (ms)}^{-1}$

Ion	Soluble with	Precipitates with
$\text{NO}_3^-$ Nitrate	Most cations	No common cations

$PV = nRT \text{ and } \left[ P + \frac{an^2}{V^2} \right] [V - nb] = nRT$ $PV \propto 1 \text{ and } VT \propto 1 \text{ (Boyle and Charle).}$ $M = \frac{\text{moles solute}}{\text{L solution}} \text{ and } m = \frac{\text{moles solute}}{\text{kg solvent}}$ $X_{\text{mol fraction}} = \frac{\text{mol component}}{\text{mol total}}.$	$k = Ae^{-\frac{E_a}{RT}}$ $[A]_t = [A]_0 - kt$ $[A]_t = [A]_0 e^{-kt}$ $[A]_t = \frac{1}{kt + \frac{1}{[A]_0}}$
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Ion	Soluble with	Precipitates with
$\text{NO}_3^-$ Nitrate	Most cations	No common cations
$\text{ClO}_4^-$	Most cations	No common cations
$\text{ClO}_3^-$	Most cations	No common cations
$\text{C}_2\text{H}_3\text{O}_2^-$	Most cations	$\text{Ag}^+, \text{Hg}_2^{2+}$
$\text{F}^-$	Most cations	$\text{Cr}^{3+}$
$\text{Cl}^-$	Most cations	$(\text{Ag}, \text{Ti})^+, \text{Pb}^{2+,4+}, \text{Hg}_2^{2+}$
$\text{Br}^-$	Most cations	$(\text{Ag}, \text{Ti})^+, \text{Pb}^{2+,4+}, \text{Hg}_2^{2+}$
$\text{I}^-$	Most cations	$(\text{Ag}, \text{Ti})^+, \text{Pb}^{2+,4+}, \text{Hg}_2^{2+}$
$\text{SO}_4^{2-}$	Most cations	$\text{Ag}^+, \text{Ba}^{2+}, \text{Sr}^{2+}, \text{Pb}^{2+,4+}, \text{Ca}^{2+}, \text{Hg}_2^{2+}$
$\text{CrO}_4^{2-}$	Most cations	$\text{Ba}^{2+}, \text{Sr}^{2+}, \text{Pb}^{2+,4+}, \text{Ca}^{2+}, \text{Hg}_2^{2+}$
$\text{S}^{2-}$	$\text{Na}^+, \text{K}^+, \text{NH}_4^+, \text{Li}^+, \text{Sr}^{2+}$	Most other cations
$\text{OH}^-$	$\text{Na}^+, \text{K}^+, \text{NH}_4^+, \text{Li}^+, \text{Sr}^{2+}, \text{Ba}^{2+}, \text{Ca}^{2+}$	Most other cations
$\text{CO}_3^{2-}$	$(\text{Na}, \text{K}, \text{NH}_4, \text{Li})^+$	Most other cations
$\text{PO}_4^{3-}$	$\text{Na}^+, \text{K}^+, \text{NH}_4^+$	Most other cations
$\text{O}^{2-}$	No <sub>common</sub> cations	Most cations
$(\text{Na}, \text{K}, \text{NH}_4)^+$	Most Anions	$(\text{NH}_4)_2\text{C}_2\text{O}_4$
$\text{Bi}^{3+}$	Nothing	Most anions
$\text{As}^{3+}$	$\text{I}^-$	Most anions
$\text{Sb}^{3+}$	$\text{Cl}^-$	Most anions

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2.20

**H<sub>2</sub>**

Hydrogen

1.01

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3

0.98

**Li**

Lithium

6.94

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1.57

**Be**

Beryllium

9.01

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0.93

**Na**

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