Important Formulas of Gaseous State PDF

Formulas
Examples
with Units

List of 18
Important Formulas of Gaseous State

1) Concentration of Species in Aqueous Phase by Henry Solubility Formula

Evaluate Formula

Formula

$$c_a = H^{cp} \cdot P_{species}$$

Example with Units

$$0.1\,\text{M} = 10\,\text{mol/(m}^3\text{*Pa)} \cdot 10\,\text{Pa}$$

2) Dimensionless Henry Solubility Formula

Evaluate Formula

Formula

$$H^{cc} = \frac{c_a}{c_g}$$

Example with Units

$$10 = \frac{0.1\,\text{M}}{0.01\,\text{M}}$$

3) Final Number of Moles of Gas by Avogadro's Law Formula

Evaluate Formula

Formula

$$n_2 = \frac{V_f}{\frac{V_i}{n_1}}$$

Example with Units

$$0.9821\,\text{mol} = \frac{5.5\,\text{L}}{\frac{11.2\,\text{L}}{2\,\text{mol}}}$$

4) Final Pressure by Gay Lussac's law Formula

Evaluate Formula

Formula

$$P_{fin} = \frac{P_i \cdot T_{fin}}{T_i}$$

Example with Units

$$12.9513\,\text{Pa} = \frac{21\,\text{Pa} \cdot 247\,\text{K}}{400.5\,\text{K}}$$

5) Final Pressure of Gas by Boyle's Law Formula

Evaluate Formula

Formula

$$P_f = \frac{P_i \cdot V_i}{V_f}$$

Example with Units

$$42.7636\,\text{Pa} = \frac{21\,\text{Pa} \cdot 11.2\,\text{L}}{5.5\,\text{L}}$$

6) Final Temperature by Charles's Law Formula

Evaluate Formula

Formula

$$T_f = \frac{T_i \cdot V_f}{V_i}$$

Example with Units

$$196.6741\,\text{K} = \frac{400.5\,\text{K} \cdot 5.5\,\text{L}}{11.2\,\text{L}}$$

7) Final Temperature by Gay Lussac's law Formula

Evaluate Formula

Formula

$$T_{fin} = \frac{T_i \cdot P_{fin}}{P_i}$$

Example with Units

$$247.9286\,\text{K} = \frac{400.5\,\text{K} \cdot 13\,\text{Pa}}{21\,\text{Pa}}$$

8) Final Volume of Gas by Avogadro's Law Formula

Evaluate Formula

Formula

$$V_f = \left(\frac{V_i}{n_1}\right) \cdot n_2$$

Example with Units

$$5.04\,\text{L} = \left(\frac{11.2\,\text{L}}{2\,\text{mol}}\right) \cdot 0.9\,\text{mol}$$

9) Final Volume of Gas by Charles's law Formula

Evaluate Formula

Formula

$$V_f = \left(\frac{V_i}{T_i}\right) \cdot T_f$$

Example with Units

$$5.5007\,\text{L} = \left(\frac{11.2\,\text{L}}{400.5\,\text{K}}\right) \cdot 196.7\,\text{K}$$

10) Final Volume of Gas from Boyle's Law Formula

Evaluate Formula

Formula

$$V_f = \frac{P_i \cdot V_i}{P_f}$$

Example with Units

$$5.5082\,\text{L} = \frac{21\,\text{Pa} \cdot 11.2\,\text{L}}{42.7\,\text{Pa}}$$

11) Mass of Atom of Element using Avogadro's Number Formula

Evaluate Formula

Formula

$$M_{atom} = \frac{GAM}{[Avaga\text{-}no]}$$

Example with Units

$$2E\text{-}23\,\text{g} = \frac{12\,\text{g}}{6E+23}$$

12) Mass of Molecule of Substance using Avogadro's Number Formula

Evaluate Formula

Formula

$$M_{molecule} = \frac{M_{molar}}{[Avaga\text{-}no]}$$

Example with Units

$$7.3E\text{-}23\,\text{g} = \frac{44.01\,\text{g/mol}}{6E+23}$$

13) Molar Mixing Ratio in Aqueous Phase by Henry Solubility Formula

Evaluate Formula

Formula

$$x = H^{xp} \cdot P_{species}$$

Example with Units

$$100 = 10\,\text{Pa}^{-1} \cdot 10\,\text{Pa}$$

14) Mole Fraction of Gas by Dalton's law Formula

Evaluate Formula

Formula

$$X = \left(\frac{p_{partial}}{P} \right)$$

Example with Units

$$0.7524 = \left(\frac{7.9\,\text{Pa}}{10.5\,\text{Pa}} \right)$$

15) Partial Pressure of Gas by Dalton's law Formula

Evaluate Formula

Formula

$$p_{partial} = (P \cdot X)$$

Example with Units

$$7.875\,\text{Pa} = (10.5\,\text{Pa} \cdot 0.75)$$

16) Partial Pressure of Species in Gas Phase by Henry Solubility Formula

Evaluate Formula

Formula

$$P_{species} = \frac{c_a}{H^{cp}}$$

Example with Units

$$10\,\text{Pa} = \frac{0.1\,\text{M}}{10\,\text{mol/(m}^3\text{*Pa)}}$$

17) Total Gas Pressure by Dalton's law Formula

Evaluate Formula

Formula

$$P = \left(\frac{p_{partial}}{X} \right)$$

Example with Units

$$10.5333\,\text{Pa} = \left(\frac{7.9\,\text{Pa}}{0.75} \right)$$

18) Volume at Temperature t Degree Celsius by Charles's law Formula

Evaluate Formula

Formula

$$V_t = V_0 \cdot \left(\frac{273 + t}{273} \right)$$

Example with Units

$$15.5823\,\text{L} = 7.1\,\text{L} \cdot \left(\frac{273 + 53\,^\circ\text{C}}{273} \right)$$

Variables used in list of Important Formulas of Gaseous State above

- c_a Concentration of Species in Aqueous Phase *(Molar(M))*
- c_g Concentration of Species in Gaseous Phase *(Molar(M))*
- **GAM** Gram Atomic Mass *(Gram)*
- H^{cc} Dimensionless Henry Solubility
- H^{cp} Henry Solubility *(Mole per Cubic Meter per Pascal)*
- H^{xp} Henry Solubility via Aqueous-Phase Mixing Ratio *(Per Pascal)*
- M_{atom} Mass of 1 Atom of Element *(Gram)*
- M_{molar} Molar Mass *(Gram Per Mole)*
- $M_{molecule}$ Mass of 1 Molecule of Substance *(Gram)*
- n_1 Initial Moles of Gas *(Mole)*
- n_2 Final Moles of Gas *(Mole)*
- **P** Total Pressure *(Pascal)*
- P_f Final Pressure of Gas for Boyle's law *(Pascal)*
- P_{fin} Final Pressure of Gas *(Pascal)*
- P_i Initial Pressure of Gas *(Pascal)*
- $p_{partial}$ Partial Pressure *(Pascal)*
- $P_{species}$ Partial Pressure of that Species in Gas Phase *(Pascal)*
- **t** Temperature in Degree Celsius *(Celsius)*
- T_f Final Temperature of Gas for Charles's law *(Kelvin)*
- T_{fin} Final Temperature of Gas *(Kelvin)*
- T_i Initial Temperature of Gas *(Kelvin)*
- V_0 Volume at Zero Degree Celsius *(Liter)*
- V_f Final Volume of Gas *(Liter)*
- V_i Initial Volume of Gas *(Liter)*
- V_t Volume at given Temperature *(Liter)*
- **x** Molar Mixing Ratio in Aqueous Phase

Constants, Functions, Measurements used in list of Important Formulas of Gaseous State above

- constant(s): **[Avaga-no]**, 6.02214076E+23 *Avogadro's number*
- Measurement: **Weight** in Gram (g) *Weight Unit Conversion*
- Measurement: **Temperature** in Kelvin (K), Celsius (°C) *Temperature Unit Conversion*
- Measurement: **Amount of Substance** in Mole (mol) *Amount of Substance Unit Conversion*
- Measurement: **Volume** in Liter (L) *Volume Unit Conversion*
- Measurement: **Pressure** in Pascal (Pa) *Pressure Unit Conversion*
- Measurement: **Molar Concentration** in Molar(M) (M) *Molar Concentration Unit Conversion*
- Measurement: **Molar Mass** in Gram Per Mole (g/mol) *Molar Mass Unit Conversion*
- Measurement: **Henry's Law Solubility Constant** in Mole per Cubic Meter per Pascal (mol/(m³*Pa)) *Henry's Law Solubility Constant Unit Conversion*
- Measurement: **Henry's Law Constant for Aqueous-Phase** in Per Pascal (Pa^{-1}) *Henry's Law Constant for Aqueous-Phase Unit Conversion*

- **X** Mole Fraction

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