



Properties of Equilibrium Constant Formulas

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Examples!

Conversions!

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List of 21 Properties of Equilibrium Constant Formulas

Properties of Equilibrium Constant

1) Active Mass

$$\mathbf{K} \mathbf{M} = rac{\mathbf{w}}{\mathbf{M} \mathbf{W}}$$

 $oxed{ex} 0.000175 \mathrm{mol/L} = rac{21 \mathrm{g}}{120 \mathrm{g}}$

2) Equilibrium Constant for Reaction when Multiplied with Integer 🗗

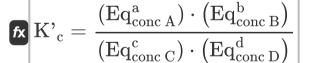
fx
$$\mathrm{K^{"}_{c}}=(\mathrm{K}^{\mathrm{n}}_{\mathrm{c}})$$

Open Calculator 🗗

Open Calculator

$$\boxed{\mathbf{ex} \left[3600 = \left((60 \mathrm{mol/L})^2 \right) \right]}$$

3) Equilibrium Constant for Reverse Reaction



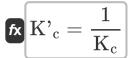
Open Calculator

$$\boxed{ 1.6 \text{E}^8 \text{mol/L} = \frac{\left((45 \text{mol/L})^{17} \right) \cdot \left((25 \text{mol/L})^3 \right)}{\left((30 \text{mol/L})^9 \right) \cdot \left((35 \text{mol/L})^7 \right)} }$$



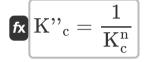


4) Equilibrium Constant for Reverse Reaction given Constant for Forward Reaction



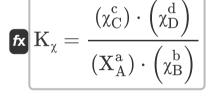
Open Calculator 🚰

- $oxed{ex} 0.016667 \mathrm{mol/L} = rac{1}{60 \mathrm{mol/L}}$
- 5) Equilibrium Constant for Reversed Reaction when Multiplied with Integer



Open Calculator

- $0.000278 = rac{1}{\left(60 \mathrm{mol/L}
 ight)^2}$
- 6) Equilibrium Constant with respect to Mole Fraction



Open Calculator 🗗

$$\boxed{ 20.01216 \mathrm{mol/L} = \frac{\left(\left(8 \mathrm{mol/L} \right)^9 \right) \cdot \left(\left(10 \mathrm{mol/L} \right)^7 \right)}{\left(\left(0.6218 \mathrm{mol/L} \right)^{17} \right) \cdot \left(\left(6 \mathrm{mol/L} \right)^3 \right)} }$$



7) Equilibrium Constant with respect to Partial Pressure

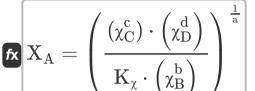


Open Calculator

$$\mathbf{K}_{\mathrm{p}} = rac{\left(\mathrm{p_{\mathrm{C}}^{\mathrm{c}}}
ight)\cdot\left(\mathrm{p_{\mathrm{D}}^{\mathrm{d}}}
ight)}{\left(\mathrm{P_{\mathrm{A}}^{\mathrm{a}}}
ight)\cdot\left(\mathrm{p_{\mathrm{B}}^{\mathrm{b}}}
ight)}$$

ex
$$149.6158 \text{mol/L} = \frac{\left((80 \text{Bar})^9 \right) \cdot \left((40 \text{Bar})^7 \right)}{\left((0.77 \text{Bar})^{17} \right) \cdot \left((50 \text{Bar})^3 \right)}$$

8) Equilibrium Mole Fraction of Substance A 🖸



Open Calculator 🖸

$$\boxed{ 0.621822 \mathrm{mol/L} = \left(\frac{\left(\left(8 \mathrm{mol/L} \right)^9 \right) \cdot \left(\left(10 \mathrm{mol/L} \right)^7 \right)}{20 \mathrm{mol/L} \cdot \left(\left(6 \mathrm{mol/L} \right)^3 \right)} \right)^{\frac{17}{17}} }$$



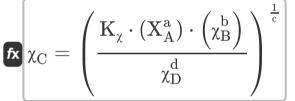
9) Equilibrium Mole Fraction of Substance B

 $\chi_{
m B} = \left(rac{\left(\chi_{
m C}^{
m c}
ight)\cdot\left(\chi_{
m D}^{
m d}
ight)}{{
m K}_{\chi}\cdot\left({
m X}_{
m A}^{
m a}
ight)}
ight)^{rac{1}{
m b}}$

Open Calculator

 $\texttt{ex} \ 6.001216 \mathrm{mol/L} = \left(\frac{\left(\left(8 \mathrm{mol/L}\right)^9\right) \cdot \left(\left(10 \mathrm{mol/L}\right)^7\right)}{20 \mathrm{mol/L} \cdot \left(\left(0.6218 \mathrm{mol/L}\right)^{17}\right)}\right)^{\frac{1}{3}}$

10) Equilibrium Mole Fraction of Substance C



Open Calculator

ex

$$7.99946 \mathrm{mol/L} = \left(rac{20 \mathrm{mol/L} \cdot \left(\left(0.6218 \mathrm{mol/L}
ight)^{17}
ight) \cdot \left(\left(6 \mathrm{mol/L}
ight)^{3}
ight)}{\left(10 \mathrm{mol/L}
ight)^{7}}
ight)^{rac{1}{9}}$$



11) Equilibrium Mole Fraction of Substance D

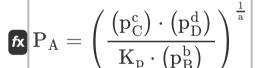
 $\chi_{\mathrm{D}} = \left(rac{\mathrm{K}_{\chi} \cdot (\mathrm{X}_{\mathrm{A}}^{\mathrm{a}}) \cdot \left(\chi_{\mathrm{B}}^{\mathrm{b}}
ight)}{\chi_{\mathrm{C}}^{\mathrm{c}}}
ight)^{\mathrm{d}}$

Open Calculator 2

ex

$$\boxed{9.999132 \text{mol/L} = \left(\frac{20 \text{mol/L} \cdot \left(\left(0.6218 \text{mol/L}\right)^{17}\right) \cdot \left(\left(6 \text{mol/L}\right)^{3}\right)}{\left(8 \text{mol/L}\right)^{9}}\right)^{\frac{1}{7}}}$$

12) Equilibrium Partial Pressure of Substance A



Open Calculator 🖸

$$\mathbf{ex} \ 0.769884 \mathrm{Bar} = \left(\frac{\left((80 \mathrm{Bar})^9 \right) \cdot \left((40 \mathrm{Bar})^7 \right)}{150 \mathrm{mol/L} \cdot \left((50 \mathrm{Bar})^3 \right)} \right)^{\frac{1}{17}}$$





13) Equilibrium Partial Pressure of Substance B 🚰

$$\mathbf{x} \mathbf{p}_{\mathrm{B}} = \left(rac{\left(\mathbf{p}_{\mathrm{C}}^{\mathrm{c}}
ight) \cdot \left(\mathbf{p}_{\mathrm{D}}^{\mathrm{d}}
ight)}{\mathrm{K}_{\mathrm{p}} \cdot \left(\mathrm{P}_{\mathrm{A}}^{\mathrm{a}}
ight)}
ight)^{rac{1}{\mathrm{b}}}$$

Open Calculator 🚰

 $\frac{\left(\begin{array}{c} \text{11p} \cdot \left(\text{1 A}\right) \end{array}\right)}{\left(\left(80\text{Bar}\right)^9\right)}$

$$49.95728 \text{Bar} = \left(\frac{\left((80 \text{Bar})^{9}\right) \cdot \left((40 \text{Bar})^{7}\right)}{150 \text{mol/L} \cdot \left((0.77 \text{Bar})^{17}\right)}\right)^{\frac{1}{3}}$$

14) Equilibrium Partial Pressure of Substance C

$$\mathbf{p}_{C} = \left(\frac{K_{p} \cdot (P_{A}^{a}) \cdot \left(p_{B}^{b}\right)}{p_{D}^{d}}\right)^{\frac{1}{c}}$$

Open Calculator

 $80.0228 \mathrm{Bar} = \left(\frac{150 \mathrm{mol/L} \cdot \left(\left(0.77 \mathrm{Bar}\right)^{17}\right) \cdot \left(\left(50 \mathrm{Bar}\right)^{3}\right)}{\left(40 \mathrm{Bar}\right)^{7}}\right)^{\frac{1}{9}}$

15) Equilibrium Partial Pressure of Substance D

$$\mathbf{f}_{D} = \left(\frac{K_{p} \cdot (P_{A}^{a}) \cdot \left(p_{B}^{b}\right)}{p_{C}^{c}}\right)^{\frac{1}{d}}$$

Open Calculator 🗗

 $= 20.01466 \text{Bar} = \left(\frac{150 \text{mol/L} \cdot \left((0.77 \text{Bar})^{17} \right) \cdot \left((50 \text{Bar})^3 \right)}{(80 \text{Bar})^9} \right)^{\frac{1}{7}}$





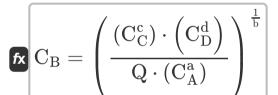
16) Molar Concentration of Substance A

 $\mathbf{fx} \left[\mathrm{C_A} = \left(rac{\left(\mathrm{C_C^c}
ight) \cdot \left(\mathrm{C_D^d}
ight)}{\mathrm{Q} \cdot \left(\mathrm{C_B^b}
ight)}
ight)^{rac{1}{\mathrm{a}}}$

Open Calculator

$$= 1.618969 \text{mol/L} = \left(\frac{\left(\left(18 \text{mol/L}\right)^9 \right) \cdot \left(\left(22 \text{mol/L}\right)^7 \right)}{50 \cdot \left(\left(14 \text{mol/L}\right)^3 \right)} \right)^{\frac{1}{17}}$$

17) Molar Concentration of Substance B



Open Calculator 🗗

$$13.94961 \text{mol/L} = \left(\frac{\left(\left(18 \text{mol/L}\right)^9 \right) \cdot \left(\left(22 \text{mol/L}\right)^7 \right)}{50 \cdot \left(\left(1.62 \text{mol/L}\right)^{17} \right)} \right)^{\frac{3}{3}}$$



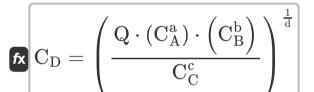
18) Molar Concentration of Substance C 🔄

 $\boxed{\mathbf{fx}} \mathbf{C_C} = \left(\frac{\mathbf{Q} \cdot (\mathbf{C_A^a}) \cdot \left(\mathbf{C_B^b}\right)}{\mathbf{C_D^d}} \right)^{\frac{1}{c}}$

Open Calculator

$$= \mathbf{x} \ 18.02165 \mathrm{mol/L} = \left(\frac{50 \cdot \left(\left(1.62 \mathrm{mol/L} \right)^{17} \right) \cdot \left(\left(14 \mathrm{mol/L} \right)^{3} \right)}{\left(22 \mathrm{mol/L} \right)^{7}} \right)^{\frac{1}{9}}$$

19) Molar Concentration of Substance D



Open Calculator

$$22.03402 \mathrm{mol/L} = \left(\frac{50 \cdot \left((1.62 \mathrm{mol/L})^{17} \right) \cdot \left((14 \mathrm{mol/L})^3 \right)}{\left(18 \mathrm{mol/L} \right)^9} \right)^{7}$$



20) Reaction Quotient

 $\left| \mathbf{fx}
ight| Q = rac{\left(C_{\mathrm{C}}^{\mathrm{c}}
ight) \cdot \left(C_{\mathrm{D}}^{\mathrm{d}}
ight)}{\left(C_{\mathrm{A}}^{\mathrm{a}}
ight) \cdot \left(C_{\mathrm{B}}^{\mathrm{b}}
ight)}
ight|$

Open Calculator 🖸

$$\boxed{ 49.46203 = \frac{\left((18 \mathrm{mol/L})^9 \right) \cdot \left((22 \mathrm{mol/L})^7 \right)}{\left((1.62 \mathrm{mol/L})^{17} \right) \cdot \left((14 \mathrm{mol/L})^3 \right)} }$$

21) Weight of Reactant given Active Mass



Open Calculator 🗗

 $\textbf{ex} \ 21 \text{g} = 0.000175 \text{mol/L} \cdot 120 \text{g}$



Variables Used

- a Number of Moles of A
- b No. of Moles of B
- C No. of Moles of C
- C_▲ Concentration of A (Mole per Liter)
- C_B Concentration of B (Mole per Liter)
- C_C Concentration of C (Mole per Liter)
- C_D Concentration of D (Mole per Liter)
- d No. of Moles of D
- Eqconc A Equilibrium Concentration of A (Mole per Liter)
- Eqconc B Equilibrium Concentration of B (Mole per Liter)
- Eq_{conc C} Equilibrium Concentration of C (Mole per Liter)
- Eqconc D Equilibrium Concentration of D (Mole per Liter)
- K_c Equilibrium Constant (Mole per Liter)
- K'c Reverse Equilibrium Constant (Mole per Liter)
- K"_c Equilibrium Constant Multiplied
- K_p Equilibrium Constant for Partial Pressure (Mole per Liter)
- K_Y Equilibrium Constant for Mole Fraction (Mole per Liter)
- M Active mass (Mole per Liter)
- MW Molecular Weight (Gram)
- n Number
- PA Equilibrium Partial Pressure A (Bar)





- p_B Equilibrium Partial Pressure B (Bar)
- **p**_C Equilibrium Partial Pressure C (Bar)
- p_D Equilibrium Partial Pressure D (Bar)
- Q Reaction Quotient
- W Weight of Solute (Gram)
- X_▲ Equilibrium Mole Fraction A (Mole per Liter)
- XB Equilibrium Mole Fraction B (Mole per Liter)
- XC Equilibrium Mole Fraction C (Mole per Liter)
- χ_D Equilibrium Mole Fraction D (Mole per Liter)





Constants, Functions, Measurements used

- Measurement: Weight in Gram (g)
 Weight Unit Conversion
- Measurement: Pressure in Bar (Bar)
 Pressure Unit Conversion
- Measurement: Molar Concentration in Mole per Liter (mol/L)

 Molar Concentration Unit Conversion





Check other formula lists

- Equilibrium Constant
 Formulas
- Properties of Equilibrium Constant Formulas
- Relation between Equilibrium Constant and Degree of
- Dissociation Formulas
- Relation between Vapour Density and Degree of Dissociation
 Formulas
- Thermodynamics in Chemical Equilibrium Formulas

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