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Properties of Equilibrium Constant Formulas

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List of 21 Properties of Equilibrium Constant Formulas

Properties of Equilibrium Constant

1) Active Mass

Open Calculator

fx $$M = \frac{w}{MW}$$

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

2) Equilibrium Constant for Reaction when Multiplied with Integer

Open Calculator

fx $$K''_c = (K_c^n)$$

ex $$3600 = \left((60\text{mol/L})^2\right)$$

3) Equilibrium Constant for Reverse Reaction

Open Calculator

fx $$K'_c = \frac{(Eq_{\text{conc A}}^a) \cdot (Eq_{\text{conc B}}^b)}{(Eq_{\text{conc C}}^c) \cdot (Eq_{\text{conc D}}^d)}$$

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

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

Open Calculator

fx $$K'_c = \frac{1}{K_c}$$

ex $$0.016667\text{mol/L} = \frac{1}{60\text{mol/L}}$$

5) Equilibrium Constant for Reversed Reaction when Multiplied with Integer

Open Calculator

fx $$K''_c = \frac{1}{K_c^n}$$

ex $$0.000278 = \frac{1}{(60\text{mol/L})^2}$$

6) Equilibrium Constant with respect to Mole Fraction

Open Calculator

fx $$K_\chi = \frac{(\chi_C^c)\cdot\left(\chi_D^d\right)}{(X_A^a)\cdot\left(\chi_B^b\right)}$$

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

7) Equilibrium Constant with respect to Partial Pressure

Open Calculator

fx $$K_p = \frac{\left(p_C^c\right) \cdot \left(p_D^d\right)}{\left(P_A^a\right) \cdot \left(p_B^b\right)}$$

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

fx $$X_A = \left(\frac{\left(\chi_C^c\right) \cdot \left(\chi_D^d\right)}{K_\chi \cdot \left(\chi_B^b\right)} \right)^{\frac{1}{a}}$$

ex $$0.621822\text{mol/L} = \left(\frac{\left((8\text{mol/L})^9\right) \cdot \left((10\text{mol/L})^7\right)}{20\text{mol/L} \cdot \left((6\text{mol/L})^3\right)} \right)^{\frac{1}{17}}$$

9) Equilibrium Mole Fraction of Substance B

Open Calculator

fx $$\chi_B = \left(\frac{\left(\chi_C^c\right) \cdot \left(\chi_D^d\right)}{K_\chi \cdot \left(X_A^a\right)} \right)^{\frac{1}{b}}$$

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

10) Equilibrium Mole Fraction of Substance C

Open Calculator

fx $$\chi_C = \left(\frac{K_\chi \cdot \left(X_A^a\right) \cdot \left(\chi_B^b\right)}{\chi_D^d} \right)^{\frac{1}{c}}$$

ex $$7.99946\text{mol/L} = \left(\frac{20\text{mol/L} \cdot \left((0.6218\text{mol/L})^{17}\right) \cdot \left((6\text{mol/L})^3\right)}{(10\text{mol/L})^7} \right)^{\frac{1}{9}}$$

11) Equilibrium Mole Fraction of Substance D

Open Calculator

fx $$\chi_D = \left(\frac{K_\chi \cdot \left(X_A^a \right) \cdot \left(\chi_B^b \right)}{\chi_C^c} \right)^{\frac{1}{d}}$$

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

12) Equilibrium Partial Pressure of Substance A

Open Calculator

fx $$P_A = \left(\frac{\left(p_C^c \right) \cdot \left(p_D^d \right)}{K_p \cdot \left(p_B^b \right)} \right)^{\frac{1}{a}}$$

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

13) Equilibrium Partial Pressure of Substance B

Open Calculator

fx $$p_B = \left(\frac{\left(p_C^c\right) \cdot \left(p_D^d\right)}{K_p \cdot \left(P_A^a\right)} \right)^{\frac{1}{b}}$$

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

14) Equilibrium Partial Pressure of Substance C

Open Calculator

fx $$p_C = \left(\frac{K_p \cdot \left(P_A^a\right) \cdot \left(p_B^b\right)}{p_D^d} \right)^{\frac{1}{c}}$$

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

15) Equilibrium Partial Pressure of Substance D

Open Calculator

fx $$p_D = \left(\frac{K_p \cdot \left(P_A^a\right) \cdot \left(p_B^b\right)}{p_C^c} \right)^{\frac{1}{d}}$$

ex $$40.01466\text{Bar} = \left(\frac{150\text{mol/L} \cdot \left((0.77\text{Bar})^{17}\right) \cdot \left((50\text{Bar})^3\right)}{(80\text{Bar})^9} \right)^{\frac{1}{7}}$$

16) Molar Concentration of Substance A

Open Calculator

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

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

17) Molar Concentration of Substance B

Open Calculator

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

ex $$13.94961\text{mol/L} = \left(\frac{\left((18\text{mol/L})^9\right) \cdot \left((22\text{mol/L})^7\right)}{50 \cdot \left((1.62\text{mol/L})^{17}\right)} \right)^{\frac{1}{3}}$$

18) Molar Concentration of Substance C

Open Calculator

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

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

19) Molar Concentration of Substance D

Open Calculator

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

ex $$22.03402\text{mol/L} = \left(\frac{50 \cdot \left((1.62\text{mol/L})^{17}\right) \cdot \left((14\text{mol/L})^{3}\right)}{(18\text{mol/L})^{9}} \right)^{\frac{1}{7}}$$

20) Reaction Quotient

Open Calculator

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

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

21) Weight of Reactant given Active Mass

Open Calculator

fx $$w = M \cdot MW$$

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_A 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
- $Eq_{conc\ A}$ Equilibrium Concentration of A *(Mole per Liter)*
- $Eq_{conc\ B}$ Equilibrium Concentration of B *(Mole per Liter)*
- $Eq_{conc\ C}$ Equilibrium Concentration of C *(Mole per Liter)*
- $Eq_{conc\ D}$ 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_X Equilibrium Constant for Mole Fraction *(Mole per Liter)*
- **M** Active mass *(Mole per Liter)*
- **MW** Molecular Weight *(Gram)*
- **n** Number
- P_A 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_A Equilibrium Mole Fraction A *(Mole per Liter)*
- X_B Equilibrium Mole Fraction B *(Mole per Liter)*
- X_C Equilibrium Mole Fraction C *(Mole per Liter)*
- X_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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