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# Important Formulas of Adsorption Isotherm

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# List of 11 Important Formulas of Adsorption Isotherm

## Important Formulas of Adsorption Isotherm

### 1) Adsorption constant k using Freundlich Adsorption Constant

$$fx \quad k = \frac{x_{\text{gas}}}{m \cdot P_{\text{gas}}^{\frac{1}{n}}}$$

Open Calculator 

$$ex \quad 3.338493 = \frac{8g}{4g \cdot (0.215Pa)^{\frac{1}{3}}}$$

### 2) Equilibrium Concentration of Aqueous Adsorbate using Freundlich Equation

$$fx \quad c = \left( \frac{M}{(m \cdot k)^n} \right)$$

Open Calculator 

$$ex \quad 4770.507 = \left( \frac{12g}{(4g \cdot 3.4)^3} \right)$$



### 3) Equilibrium Pressure of Gaseous Adsorbate using Freundlich Equation



$$fx \quad p = \left( \left( \frac{M}{m \cdot k} \right)^n \right)$$

[Open Calculator](#)

$$ex \quad 0.686953 = \left( \left( \frac{12g}{4g \cdot 3.4} \right)^3 \right)$$

### 4) Mass of Adsorbent for Langmuir Adsorption

$$fx \quad m_L = \frac{x_{gas} \cdot (1 + k \cdot P_{gas})}{k \cdot P_{gas}}$$

[Open Calculator](#)

$$ex \quad 18.94391g = \frac{8g \cdot (1 + 3.4 \cdot 0.215Pa)}{3.4 \cdot 0.215Pa}$$

### 5) Mass of Adsorbent using Freundlich Adsorption Isotherm

$$fx \quad m = \frac{x_{gas}}{k \cdot P_{gas}^{\frac{1}{n}}}$$

[Open Calculator](#)

$$ex \quad 3.927639g = \frac{8g}{3.4 \cdot (0.215Pa)^{\frac{1}{3}}}$$

### 6) Mass of Gas Adsorbed

$$fx \quad x_{gas} = m \cdot k \cdot P_{gas}^{\frac{1}{n}}$$

[Open Calculator](#)

$$ex \quad 8.147388g = 4g \cdot 3.4 \cdot (0.215Pa)^{\frac{1}{3}}$$



7) Mass of Gas Adsorbed in grams for Langmuir Adsorption 

$$\text{fx } x_{\text{gas}} = \frac{m_L \cdot k \cdot P_{\text{gas}}}{1 + (k \cdot P_{\text{gas}})}$$

Open Calculator 


$$\text{ex } 8.023686\text{g} = \frac{19\text{g} \cdot 3.4 \cdot 0.215\text{Pa}}{1 + (3.4 \cdot 0.215\text{Pa})}$$

8) Surface Area of Adsorbent Covered 

$$\text{fx } \theta = \frac{k \cdot P_{\text{gas}}}{1 + (k \cdot P_{\text{gas}})}$$

Open Calculator 

$$\text{ex } 0.422299 = \frac{3.4 \cdot 0.215\text{Pa}}{1 + (3.4 \cdot 0.215\text{Pa})}$$

9) Total Volume of Gas Adsorbed at Equilibrium by BET Equation 

fx

Open Calculator 

$$V_{\text{total}} = \frac{V_{\text{mono}} \cdot C \cdot \left(\frac{P_v}{P_0}\right)}{\left(P_v - \left(\frac{P_v}{P_0}\right)\right) \cdot \left(1 + \left(C \cdot \left(\frac{P_v}{P_0}\right)\right)\right) - \left(\frac{P_v}{P_0}\right)}$$

$$\text{ex } 998.5352\text{L} = \frac{15192\text{L} \cdot 2 \cdot \left(\frac{6\text{Pa}}{21\text{Pa}}\right)}{\left(6\text{Pa} - \left(\frac{6\text{Pa}}{21\text{Pa}}\right)\right) \cdot \left(1 + \left(2 \cdot \left(\frac{6\text{Pa}}{21\text{Pa}}\right)\right)\right) - \left(\frac{6\text{Pa}}{21\text{Pa}}\right)}$$



10) Van Der Waals Interaction Energy 

$$fx \quad U_{VW\text{aals}} = -\frac{A}{12 \cdot \pi \cdot (h)^2}$$

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a\_img.jpg\)](#)

$$ex \quad -8.3E^{-27}J = -\frac{3.2E^{-21}J}{12 \cdot \pi \cdot (101m)^2}$$

11) Volume of Monolayer Gas by BET Equation 

$$fx \quad V_{\text{mono}} = \frac{\left(P_v - \left(\frac{P_v}{P_0}\right)\right) \cdot \left(1 + \left(C \cdot \left(\frac{P_v}{P_0}\right)\right)\right) - \left(\frac{P_v}{P_0}\right) \cdot V_{\text{total}}}{C \cdot \left(\frac{P_v}{P_0}\right)}$$

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021\_img.jpg\)](#)

$$ex \quad 15215.29L = \frac{\left(6Pa - \left(\frac{6Pa}{21Pa}\right)\right) \cdot \left(1 + \left(2 \cdot \left(\frac{6Pa}{21Pa}\right)\right)\right) - \left(\frac{6Pa}{21Pa}\right) \cdot 998L}{2 \cdot \left(\frac{6Pa}{21Pa}\right)}$$








## Variables Used

- **A** Hamaker Coefficient (*Joule*)
- **c** Equilibrium Concentration of Aqueous Adsorbate
- **C** Adsorbent Constant
- **h** Surface Separation (*Meter*)
- **k** Adsorption Constant
- **m** Mass of Adsorbent (*Gram*)
- **M** Mass of Adsorbate (*Gram*)
- **m<sub>L</sub>** Mass of Adsorbent for Langmuir Adsorption (*Gram*)
- **n** Freundlich Adsorption Constant
- **p** Equilibrium Pressure of the Gaseous Adsorbate
- **P<sub>0</sub>** Saturated Vapor Pressure of Gas (*Pascal*)
- **P<sub>gas</sub>** Pressure of Gas (*Pascal*)
- **P<sub>v</sub>** Vapour Pressure (*Pascal*)
- **U<sub>vW</sub>** Van der Waals Interaction Energy (*Joule*)
- **V<sub>mono</sub>** Monolayer Volume of Gas (*Liter*)
- **V<sub>total</sub>** Total Equilibrium Volume of Gas (*Liter*)
- **x<sub>gas</sub>** Mass of Gas Adsorbed (*Gram*)
- **θ** Surface Area of Adsorbent covered



## Constants, Functions, Measurements used

- **Constant:** **pi**, 3.14159265358979323846264338327950288  
*Archimedes' constant*
- **Measurement:** **Length** in Meter (m)  
*Length Unit Conversion* 
- **Measurement:** **Weight** in Gram (g)  
*Weight Unit Conversion* 
- **Measurement:** **Volume** in Liter (L)  
*Volume Unit Conversion* 
- **Measurement:** **Pressure** in Pascal (Pa)  
*Pressure Unit Conversion* 
- **Measurement:** **Energy** in Joule (J)  
*Energy Unit Conversion* 



## Check other formula lists

- [BET Adsorption Isotherm Formulas](#) 
- [Freundlich adsorption isotherm Formulas](#) 
- [Important Formulas of Adsorption Isotherm](#) 
- [Important Formulas of Colloids](#) 
- [Important Formulas on Surface Tension](#) 
- [Langmuir Adsorption Isotherm Formulas](#) 

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