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Important Formulas of Polymers

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List of 11 Important Formulas of Polymers

Important Formulas of Polymers

1) Average Functionality Factor

$$fx \quad f_{avg} = \frac{M \cdot f}{N_T}$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)](#)

$$ex \quad 8.75 = \frac{14\text{mol} \cdot 5}{8\text{mol}}$$

2) Compressive Strength of Material

$$fx \quad CS = \frac{F_{material}}{A_r}$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d_img.jpg\)](#)

$$ex \quad 9.8E^8Pa = \frac{1960N}{2mm^2}$$

3) Contour Length of Macromolecule

$$fx \quad R_c = N_{mer} \cdot l$$

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d_img.jpg\)](#)

$$ex \quad 3A = 100 \cdot 0.03A$$



4) Number-Average Degree of Polymerization

$$fx \quad DP_N = \frac{N_o}{N}$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$ex \quad 3 = \frac{9}{3}$$

5) Number-Average Molecular Weight

$$fx \quad M_n = \frac{m_{\text{repeating}}}{1 - p}$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)

$$ex \quad 23.37662 \text{g/mol} = \frac{18 \text{g}}{1 - 0.23}$$

6) Polydispersity Index for Step-Reaction Polymers

$$fx \quad PDI = \frac{M_w}{M_n}$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f_img.jpg\)](#)

$$ex \quad 1.229782 = \frac{28.74 \text{g/mol}}{23.37 \text{g/mol}}$$

7) Rate of Polycondensation

$$fx \quad R_p = k \cdot (A)^2 \cdot D$$

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754_img.jpg\)](#)

$$ex \quad 29.4 = 0.1 \text{s}^{-1} \cdot (7 \text{mol/m}^3)^2 \cdot 6 \text{mol/m}^3$$




8) Sedimentation Coefficient of Particle 

$$fx \quad s = \frac{v_t}{a}$$

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)

$$ex \quad 0.024118S_v = \frac{4.1\text{mm/s}}{1.7E^{-14}\text{m/s}^2}$$

9) Tensile Strength given Cross-Sectional Area 

$$fx \quad TS = \frac{F_{\text{material}}}{Ar}$$

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2_img.jpg\)](#)


$$ex \quad 9.8E^8\text{Pa} = \frac{1960\text{N}}{2\text{mm}^2}$$

10) Viscosity Number 

$$fx \quad VN = \frac{t}{t_o - 1} \cdot c$$

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7_img.jpg\)](#)

$$ex \quad 60.49607 = \frac{\frac{2000\text{s}}{30\text{s} - 1}}{1.14\text{g/mL}}$$

11) Weight-Average Molecular Weight in General Step Reaction Polymerization 

$$fx \quad M_w = M_n \cdot (1 + p)$$

[Open Calculator !\[\]\(899d8b7697d64725bf017d3296cfcf1b_img.jpg\)](#)

$$ex \quad 28.7451\text{g/mol} = 23.37\text{g/mol} \cdot (1 + 0.23)$$



Variables Used














- **a** Applied Acceleration (Meter per Square Second)
- **A** Diacid Concentration (Mole per Cubic Meter)
- **Ar** Cross Sectional Area of Polymer (Square Millimeter)
- **c** Polymer Concentration (Gram per Milliliter)
- **CS** Compressive Strength of Material (Pascal)
- **D** Diol Concentration (Mole per Cubic Meter)
- **DP_N** Number-Average Degree of Polymerization
- **f** Functionality
- **f_{avg}** Average Functional Factor
- **F_{material}** Force Applied on Material (Newton)
- **k** Rate Constant (1 Per Second)
- **l** Length of Monomer Unit (Angstrom)
- **M** Mole of each Reactant (Mole)
- **M_n** Number-Average Molecular Weight (Gram Per Mole)
- **m_{repeating}** Molecular Weight of Repeating Unit (Gram)
- **M_w** Weight-Average Molecular Weight (Gram Per Mole)
- **N** Number of Molecules at Specific Time
- **N_{mer}** Number of Monomers
- **N_O** Number of Original Molecules
- **N_T** Total Number of Moles (Mole)
- **p** Probability of Finding Repeating Unit AB
- **PDI** Polydispersity Index



- **R_c** Contour Length (Angstrom)
- **R_p** Rate of Polycondensation
- **s** Sedimentation Coefficient (Svedberg)
- **t** Flow Time of Polymer Solution (Second)
- **t_o** Flow Time of Solvent (Second)
- **TS** Tensile Strength (Pascal)
- **v_t** Sedimentation Speed (Millimeter per Second)
- **VN** Viscosity Number



Constants, Functions, Measurements used

- **Measurement: Length** in Angstrom (A)
Length Unit Conversion 
- **Measurement: Weight** in Gram (g)
Weight Unit Conversion 
- **Measurement: Time** in Svedberg (Sv), Second (s)
Time Unit Conversion 
- **Measurement: Amount of Substance** in Mole (mol)
Amount of Substance Unit Conversion 
- **Measurement: Area** in Square Millimeter (mm²)
Area Unit Conversion 
- **Measurement: Pressure** in Pascal (Pa)
Pressure Unit Conversion 
- **Measurement: Speed** in Millimeter per Second (mm/s)
Speed Unit Conversion 
- **Measurement: Acceleration** in Meter per Square Second (m/s²)
Acceleration Unit Conversion 
- **Measurement: Force** in Newton (N)
Force Unit Conversion 
- **Measurement: Molar Concentration** in Mole per Cubic Meter (mol/m³)
Molar Concentration Unit Conversion 
- **Measurement: Density** in Gram per Milliliter (g/mL)
Density Unit Conversion 
- **Measurement: Molar Mass** in Gram Per Mole (g/mol)
Molar Mass Unit Conversion 
- **Measurement: First Order Reaction Rate Constant** in 1 Per Second (s⁻¹)
First Order Reaction Rate Constant Unit Conversion 



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- [Important Formulas of Polymers](#) 
- [Polymers Formulas](#) 
- [Spectrometric Characterization of Polymers Formulas](#) 
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