Important Measurement of Viscosity Viscometers **Formulas PDF**



Formulas Examples with Units

List of 30

Important Measurement of Viscosity **Viscometers Formulas**

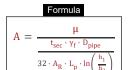
Evaluate Formula (

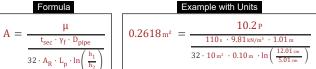
Evaluate Formula (

Evaluate Formula (

1) Capillary Tube Viscometer Formulas (

1.1) Cross-Sectional Area of Tube using Dynamic Viscosity Formula 🕝





1.2) Diameter of Pipe given Dynamic Viscosity with Length Formula 🕝

 $D_{\text{pipe}} = \left(\frac{Q}{(\pi \cdot Y_{f} \cdot H)} / (128 \cdot L_{p} \cdot \mu)\right)^{\frac{1}{4}}$

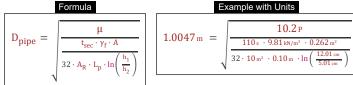
$$0.0196\,{\rm m}\,=\left(\frac{55\,{\rm m}^3/s}{\left(\,3.1416\cdot 9.81\,{\rm kN/m}^3\,\cdot 926.7\,{\rm m}\,\,\right)}\,/\,\left(\,128\cdot 0.10\,{\rm m}\,\cdot 10.2\,{\rm P}\,\,\right)\,\right)^{\frac{1}{4}}$$

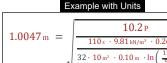
1.3) Diameter of Pipe given Kinematic Viscosity Formula C

 $D_{pipe} = \frac{\left(\left(\frac{\upsilon}{\left([\mathbf{g}] \cdot H_{t} \cdot \pi \cdot t_{sec}\right)} / \left(128 \cdot L_{p} \cdot V_{T}\right)\right)\right)^{T}}{4}$

$$0.0002 \, \mathrm{m} \, = \, \frac{\left(\left(\frac{15.1 \, \mathrm{m}^2/\mathrm{s}}{\left(9.8066 \, \mathrm{m/s}^2 \, \cdot \, 12.02 \, \mathrm{cm} \, \cdot \, 3.1416 \, \cdot \, 110 \, \mathrm{s} \, \right)} \, / \, \left(\, 128 \, \cdot \, 0.10 \, \mathrm{m} \, \cdot \, 4.1 \, \mathrm{m}^2 \, \, \right) \, \right) \right)^1}{4}$$

1.4) Diameter of Pipe using Dynamic Viscosity with Time Formula 🕝





Evaluate Formula (

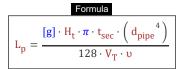
1.5) Dynamic Viscosity of Fluids in Flow Formula [

Formula

$$\mu = \left(\frac{t_{sec} \cdot A \cdot \gamma_f \cdot D_{pipe}}{32 \cdot A_R \cdot L_p \cdot ln\left(\frac{h_1}{h_2}\right)}\right) \\ 10.2064 P = \left(\frac{110 \text{ s} \cdot 0.262 \text{ m}^2 \cdot 9.81 \text{ kN/m}^3 \cdot 1.01 \text{ m}}{32 \cdot 10 \text{ m}^2 \cdot 0.10 \text{ m} \cdot ln\left(\frac{12.01 \text{ cm}}{5.01 \text{ cm}}\right)}\right)$$

Evaluate Formula (

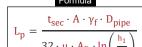
1.6) Length of Pipe given Kinematic Viscosity Formula C

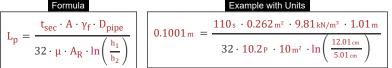


Evaluate Formula

$$0.0535\,\text{m} \,=\, \frac{9.8066\,\text{m/s}^2\,\cdot\,12.02\,\text{cm}\,\cdot3.1416\cdot110\,\text{s}\,\cdot\left(\,1.01\,\text{m}^{\,\,4}\right)}{128\cdot4.1\,\text{m}^2\,\cdot\,15.1\,\text{m}^2/\text{s}}$$

1.7) Length of Reservoir using Dynamic Viscosity Formula 🕝





Evaluate Formula C

1.8) Redwood Viscometer Formulas 🕝

1.8.1) Dynamic Viscosity given Velocity Formula C

Formula

Formula Example with Units
$$\mu = \left(\frac{D_S^2}{18 \cdot V_{mean}}\right) \quad \boxed{10.2124_P = \left(\frac{10\,\text{m}^2}{18 \cdot 5.44\,\text{m/s}}\right)}$$

Evaluate Formula 🕝

1.8.2) Mean Velocity of Sphere given Dynamic Viscosity Formula

 $V_{\text{mean}} = \left(\frac{D_S^2}{18 \cdot \mu}\right) \left| 5.4466 \, \text{m/s} \right| = \left(\frac{10 \, \text{m}^2}{18 \cdot 10.2 \, \text{P}}\right) \right|$

Evaluate Formula (

- 1.9) SayBolt Universal Viscometer Formulas 🕝
- 1.9.1) Kinematic Viscosity given Time Formula 🕝

Formula $\upsilon = 0.0022 \cdot \Delta t - \left(\frac{1.80}{\Delta t}\right) \left[15.0477 \, m^2/s \right] = 0.0022 \cdot 1.9 \, h - \left(\frac{1.80}{1.9 \, h}\right)$

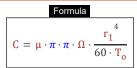
Example with Units

Evaluate Formula

Evaluate Formula

2) Coaxial Cylinder Viscometers Formulas (7)

2.1) Clearance given Torque exerted on Outer Cylinder Formula



Example with Units

$$15.6144\,\mathrm{mm} \; = \; 10.2\,\mathrm{P} \; \cdot \\ 3.1416 \cdot 3.1416 \cdot 5\,\mathrm{rev/s} \; \cdot \\ \frac{12\,\mathrm{m}^{-4}}{60 \cdot 7000\,\mathrm{kN^*m}}$$

2.2) Dynamic Viscosity given Torque exerted on Outer Cylinder Formula 🕝

$$\mu = \frac{T_0}{\pi \cdot \pi \cdot \Omega \cdot \frac{r_1^4}{60 \cdot C}}$$

Example with Units $\mu = \frac{T_0}{\pi \cdot \pi \cdot \Omega \cdot \frac{r_1^4}{60 \cdot C}} \left| 10.1253 P \right| = \frac{7000 \, \text{kN*m}}{3.1416 \cdot 3.1416 \cdot 5 \, \text{rev/s} \cdot \frac{12 \, \text{m}}{60 \cdot 15.5 \, \text{mm}}}$ Evaluate Formula C

2.3) Dynamic Viscosity given Total Torque Formula 🗂

Formula

Example with Units $\mu = \left. \frac{T_{Torque}}{V_c \cdot \Omega} \, \right| \, \left| \, 10.0851_P \, = \frac{320 \, \text{N*m}}{10.1 \cdot 5 \, \text{rev/s}} \, \right|$ Evaluate Formula

2.4) Dynamic Viscosity of Fluid Flow given Torque Formula

Evaluate Formula

Evaluate Formula (

Evaluate Formula (

Evaluate Formula [

Evaluate Formula 🕝

Evaluate Formula

 $\mu = \frac{15 \cdot T \cdot \left(r_2 - r_1\right)}{\pi \cdot \pi \cdot r_1 \cdot r_1 \cdot r_2 \cdot h \cdot \Omega}$

Example with Units

$$10.8582_{P} = \frac{15 \cdot 500_{\text{kN*m}} \cdot (13_{\text{m}} \cdot 12_{\text{m}})}{3.1416 \cdot 3.1416 \cdot 12_{\text{m}} \cdot 12_{\text{m}} \cdot 13_{\text{m}} \cdot 11.9_{\text{m}} \cdot 5_{\text{rev/s}}}$$

2.5) Height of Cylinder given Dynamic Viscosity of Fluid Formula

 $h = \frac{15 \cdot T \cdot (r_2 - r_1)}{\pi \cdot \pi \cdot r_1 \cdot r_1 \cdot r_2 \cdot \mu \cdot \Omega}$

Example with Units
$$12.6679_{m} = \frac{15 \cdot 500_{\text{kN*m}} \cdot (13_{\text{m}} - 12_{\text{m}})}{3.1416 \cdot 3.1416 \cdot 12_{\text{m}} \cdot 12_{\text{m}} \cdot 13_{\text{m}} \cdot 10.2_{\text{P}} \cdot 5_{\text{rev/s}}}$$

2.6) Height of Cylinder given Torque exerted on Inner Cylinder Formula

 $h = \frac{T}{2 \cdot \pi \cdot \left(\left(r_1\right)^2\right) \cdot \tau} \qquad \boxed{ \begin{aligned} & \text{Example with Units} \\ & 5.9358\,\text{m} = \frac{500\,\text{kN*m}}{2 \cdot 3.1416 \cdot \left(\left(12\,\text{m}\right)^2\right) \cdot 93.1\,\text{Pa}} \end{aligned}}$

2.7) Radius of Inner Cylinder given Torque exerted on Inner Cylinder Formula

2.8) Radius of Inner Cylinder given Torque exerted on Outer Cylinder Formula 🗂

2.9) Radius of Inner Cylinder given Velocity Gradient Formula

Formula Example with Units $r_1 = \frac{30 \cdot V_G \cdot r_2 \cdot \pi \cdot r_2 \cdot \Omega}{30 \cdot V_G}$ $12.4417_m = \frac{30 \cdot 76.6 \, \text{m/s} \cdot 13 \, \text{m} \cdot 3.1416 \cdot 13 \, \text{m} \cdot 5 \, \text{rev/s}}{30 \cdot 76.6 \, \text{m/s}}$

2.10) Radius of Outer Cylinder given Velocity Gradient Formula 🕝

$$r_2 = \frac{30 \cdot V_G \cdot r_1}{300 \cdot V_G \cdot r_1}$$

Evaluate Formula (

$$r_2 = \frac{30 \cdot V_G \cdot r_1}{30 \cdot V_G \cdot \pi \cdot \Omega} \qquad 12.5385 \,\text{m} = \frac{30 \cdot 76.6 \,\text{m/s} \cdot 12 \,\text{m}}{30 \cdot 76.6 \,\text{m/s} \cdot 3.1416 \cdot 5 \,\text{rev/s}}$$

2.11) Shear Stress on Cylinder given Torque exerted on Inner Cylinder Formula 🕝

Formula Example with Units
$$\tau = \frac{T}{2 \cdot \pi \cdot \left(\left(r_1\right)^2\right) \cdot h} \quad 46.4388 \, Pa = \frac{500 \, kN^*m}{2 \cdot 3.1416 \cdot \left(\left(12\,m\right)^2\right) \cdot 11.9 \, m}$$

Evaluate Formula (

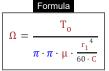
Evaluate Formula

2.12) Speed of Outer Cylinder given Dynamic Viscosity of Fluid Formula C

Formula
$$\Omega = \frac{15 \cdot T \cdot \left(r_2 - r_1 \right)}{\pi \cdot \pi \cdot r_1 \cdot r_1 \cdot r_2 \cdot h \cdot \mu}$$

$$5.3227_{\text{rev/s}} = \frac{15 \cdot 500_{\text{kN*m}} \cdot (13_{\text{m}} - 12_{\text{m}})}{3.1416 \cdot 3.1416 \cdot 12_{\text{m}} \cdot 12_{\text{m}} \cdot 13_{\text{m}} \cdot 11.9_{\text{m}} \cdot 10.2_{\text{P}}}$$

2.13) Speed of Outer Cylinder given Torque exerted on Outer Cylinder Formula (



Formula Example with Units
$$\Omega = \frac{T_0}{\pi \cdot \pi \cdot \mu \cdot \frac{r_1^4}{60 \cdot C}} = \frac{7000 \, \text{kN*m}}{3.1416 \cdot 3.1416 \cdot 10.2 \, \text{P} \cdot \frac{12 \, \text{m}}{60 \cdot 15.5 \, \text{mm}}}$$

2.14) Speed of Outer Cylinder given Total Torque Formula C

$$\Omega = \frac{T_{Torque}}{V_{c} \cdot \mu}$$

Formula Example with Units
$$\Omega = \frac{T_{Torque}}{V_c \cdot \mu} \quad \boxed{ 4.9437 \, \text{rev/s} } = \frac{320 \, \text{N*m}}{10.1 \cdot 10.2 \, \text{P}}$$

Evaluate Formula C

Evaluate Formula (

2.15) Speed of Outer Cylinder given Velocity Gradient Formula



Formula Example with Units
$$\Omega = \frac{V_G}{\frac{\pi \cdot r_2}{30 \cdot \left(r_2 \cdot r_1\right)}} = \frac{8.9552 \, \text{rev/s}}{\frac{3.1416 \cdot 13 \, \text{m}}{30 \cdot \left(13 \, \text{m} - 12 \, \text{m}\right)}}$$



2.16) Torque exerted on Inner Cylinder Formula C

Example with Units

 $T_{Torque} = 2 \cdot \left(\left(r_1 \right)^2 \right) \cdot h \cdot \tau \quad \left| \quad 319.0723 \, N^*m \right| = 2 \cdot \left(\left(12 \, \text{m} \right)^2 \right) \cdot 11.9 \, \text{m} \cdot 93.1 \, \text{Pa}$

Evaluate Formula (

Evaluate Formula (

Evaluate Formula [

Evaluate Formula [

Evaluate Formula 🕝

2.17) Torque exerted on Inner Cylinder given Dynamic Viscosity of Fluid Formula 🕝

Formula

$$T = \frac{\mu}{\frac{15 \cdot (r_2 \cdot r_1)}{\pi \cdot \pi \cdot r_1 \cdot r_1 \cdot r_2 \cdot h \cdot \Omega}}$$

Example with Units

$$469.69\,{_{kN^*m}}\,=\,\frac{10.2\,{_{P}}}{\frac{15\cdot\left(\,13\,{_{M}}\,-\,12\,{_{m}}\,\right)}{3.1416\cdot3.1416\cdot12\,{_{m}}\,\cdot\,12\,{_{m}}\,\cdot\,13\,{_{m}}\,\cdot\,11.9\,{_{m}}\,\cdot\,5\,{_{rev/s}}}}$$

2.18) Torque Exerted on Outer Cylinder Formula C

Formula
$$T_{o} = \mu \cdot \pi \cdot \pi \cdot \Omega \cdot \frac{r_{1}^{4}}{60 \cdot C}$$

Example with Units

$$7051.6675\,\text{kN*m} \; = \; 10.2\,\text{P} \; \cdot \; 3.1416 \cdot \; 3.1416 \cdot \; 5\,\text{rev/s} \; \cdot \; \frac{12\,\text{m}^{-4}}{60 \cdot 15.5\,\text{mm}}$$

2.19) Total Torque Formula 🕝

Formula

 $T_{Torque} = V_c \cdot \mu \cdot \Omega$

Example with Units

 $323.6469 \, \text{N*m} = 10.1 \cdot 10.2 \, \text{P} \cdot 5 \, \text{rev/s}$

2.20) Velocity Gradients Formula C

Formula

$$V_{G} = \pi \cdot r_{2} \cdot \frac{\Omega}{30 \cdot \left(r_{2} - r_{1}\right)}$$

Example with Units

 $42.7683 \,\text{m/s} = 3.1416 \cdot 13 \,\text{m} \cdot \frac{5 \,\text{rev/s}}{30 \cdot (13 \,\text{m} - 12 \,\text{m})}$

Variables used in list of Measurement of Viscosity Viscometers Formulas above

- A Cross Sectional Area of Pipe (Square Meter)
- A_R Average Reservoir Area (Square Meter)
- C Clearance (Millimeter)
- d_{pipe} Pipe Diameter (Meter)
- D_{pipe} Diameter of Pipe (Meter)
- D_S Diameter of Sphere (Meter)
- **h** Height of Cylinder (Meter)
- H Head of the Liquid (Meter)
- h₁ Height of Column 1 (Centimeter)
- h₂ Height of Column 2 (Centimeter)
- H_t Total Head (Centimeter)
- L_p Length of Pipe (Meter)
- Q Discharge in Laminar Flow (Cubic Meter per Second)
- r₁ Radius of Inner Cylinder (Meter)
- r₂ Radius of Outer Cylinder (Meter)
- **T** Torque on Inner Cylinder (Kilonewton Meter)
- Torque on Outer Cylinder (Kilonewton Meter)
- t_{sec} Time in Seconds (Second)
- V_c Viscometer Constant
- V_G Velocity Gradient (Meter per Second)
- V_{mean} Mean Velocity (Meter per Second)
- V_T Volume of Liquid (Cubic Meter)
- γ_f Specific Weight of Liquid (Kilonewton per Cubic Meter)
- Δt Time Interval or Time Period (Hour)
- µ Dynamic Viscosity (Poise)
- T_{Torque} Total Torque (Newton Meter)
- U Kinematic Viscosity (Square Meter per Second)
- Ω Angular Speed (Revolution per Second)
- τ Shear Stress (Pascal)

Constants, Functions, Measurements used in list of Measurement of Viscosity Viscometers Formulas above

- constant(s): pi,
 3.14159265358979323846264338327950288
 Archimedes' constant
- constant(s): [g], 9.80665 Gravitational acceleration on Earth
- Functions: In, In(Number)
 The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.
- Functions: sqrt, sqrt(Number)
 A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: Length in Meter (m), Centimeter (cm), Millimeter (mm)
 Length Unit Conversion
- Measurement: Time in Second (s), Hour (h)
 Time Unit Conversion
- Measurement: Volume in Cubic Meter (m³)
 Volume Unit Conversion
- Measurement: Area in Square Meter (m²)
 Area Unit Conversion
- Measurement: Speed in Meter per Second (m/s)
 Speed Unit Conversion
- Measurement: Volumetric Flow Rate in Cubic Meter per Second (m³/s)
 Volumetric Flow Rate Unit Conversion
- Measurement: Dynamic Viscosity in Poise (P)
 Dynamic Viscosity Unit Conversion
- Measurement: Kinematic Viscosity in Square Meter per Second (m²/s)
- Measurement: Angular Velocity in Revolution per Second (rev/s)

Kinematic Viscosity Unit Conversion

- Angular Velocity Unit Conversion
- Measurement: Torque in Kilonewton Meter (kN*m), Newton Meter (N*m)
 Torque Unit Conversion

- Measurement: Specific Weight in Kilonewton per Cubic Meter (kN/m³)
 Specific Weight Unit Conversion
- Measurement: Stress in Pascal (Pa)
 Stress Unit Conversion

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🔹 🌆 Subtract fraction 💣

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