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Laminar Flow around a Sphere Stokes' Law Formulas

Calculators! Examples! Conversions!

List of 18 Laminar Flow around a Sphere Stokes' Law Formulas

Laminar Flow around a Sphere Stokes' Law

1) Coefficient of Drag given density

Open Calculator

fx $$C_D = \frac{24 \cdot F_D \cdot \mu}{\rho \cdot V_{mean} \cdot D_S}$$

ex $$0.002666 = \frac{24 \cdot 1.1\text{kN} \cdot 10.2\text{P}}{1000\text{kg/m}^3 \cdot 10.1\text{m/s} \cdot 10\text{m}}$$

2) Coefficient of Drag given Drag Force

Open Calculator

fx $$C_D = \frac{F_D}{A \cdot V_{mean} \cdot V_{mean} \cdot \rho \cdot 0.5}$$

ex $$0.010783 = \frac{1.1\text{kN}}{2\text{m}^2 \cdot 10.1\text{m/s} \cdot 10.1\text{m/s} \cdot 1000\text{kg/m}^3 \cdot 0.5}$$

3) Coefficient of Drag given Reynolds Number

Open Calculator

fx $$C_D = \frac{24}{Re}$$

ex $$0.01 = \frac{24}{2400}$$

4) Density of Fluid given Drag Force

Open Calculator

fx $$\rho = \frac{F_D}{A \cdot V_{mean} \cdot V_{mean} \cdot C_D \cdot 0.5}$$

ex $$1078.326\text{kg/m}^3 = \frac{1.1\text{kN}}{2\text{m}^2 \cdot 10.1\text{m/s} \cdot 10.1\text{m/s} \cdot 0.01 \cdot 0.5}$$

5) Diameter of Sphere for given Fall Velocity

Open Calculator

fx $$D_S = \sqrt{\frac{V_{mean} \cdot 18 \cdot \mu}{\gamma_f}}$$

ex $$0.013749\text{m} = \sqrt{\frac{10.1\text{m/s} \cdot 18 \cdot 10.2\text{P}}{9.81\text{kN/m}^3}}$$

6) Diameter of Sphere given Coefficient of Drag

Open Calculator

fx $$D_S = \frac{24 \cdot \mu}{\rho \cdot V_{mean} \cdot C_D}$$

ex $$0.242376\text{m} = \frac{24 \cdot 10.2\text{P}}{1000\text{kg/m}^3 \cdot 10.1\text{m/s} \cdot 0.01}$$

7) Diameter of Sphere given Resistance Force on Spherical Surface

Open Calculator

fx $$D_S = \frac{F_{resistance}}{3 \cdot \pi \cdot \mu \cdot V_{mean}}$$

ex $$9.990312\text{m} = \frac{0.97\text{kN}}{3 \cdot \pi \cdot 10.2\text{P} \cdot 10.1\text{m/s}}$$

8) Drag Force given Coefficient of Drag

Open Calculator

fx $$F_D = C_D \cdot A \cdot V_{mean} \cdot V_{mean} \cdot \rho \cdot 0.5$$

ex $$1.0201\text{kN} = 0.01 \cdot 2\text{m}^2 \cdot 10.1\text{m/s} \cdot 10.1\text{m/s} \cdot 1000\text{kg/m}^3 \cdot 0.5$$

9) Dynamic Viscosity of fluid given Resistance Force on Spherical Surface

Open Calculator

fx $$\mu = \frac{F_{resistance}}{3 \cdot \pi \cdot D_S \cdot V_{mean}}$$

ex $$10.19012\text{P} = \frac{0.97\text{kN}}{3 \cdot \pi \cdot 10\text{m} \cdot 10.1\text{m/s}}$$

10) Dynamic Viscosity of fluid given Terminal Fall Velocity

Open Calculator

fx $$\mu = \left(\frac{D_S^2}{18 \cdot V_{terminal}}\right) \cdot (\gamma_f - S)$$

ex $$10.27211\text{P} = \left(\frac{(10\text{m})^2}{18 \cdot 49\text{m/s}}\right) \cdot (9.81\text{kN/m}^3 - 0.75\text{kN/m}^3)$$

11) Projected Area given Drag Force

Open Calculator

$$A = \frac{F_D}{C_D \cdot V_{mean} \cdot V_{mean} \cdot \rho \cdot 0.5}$$

$$2.156651\text{m}^2 = \frac{1.1\text{kN}}{0.01 \cdot 10.1\text{m/s} \cdot 10.1\text{m/s} \cdot 1000\text{kg/m}^3 \cdot 0.5}$$

12) Resistance Force on Spherical Surface

Open Calculator

$$F_{resistance} = 3 \cdot \pi \cdot \mu \cdot V_{mean} \cdot D_S$$

$$0.970941\text{kN} = 3 \cdot \pi \cdot 10.2\text{P} \cdot 10.1\text{m/s} \cdot 10\text{m}$$

13) Resistance Force on Spherical Surface given Specific Weights

Open Calculator

$$F_{resistance} = \left(\frac{\pi}{6}\right) \cdot \left(D_S^3\right) \cdot (\gamma_f)$$

$$5.136504\text{kN} = \left(\frac{\pi}{6}\right) \cdot \left((10\text{m})^3\right) \cdot (9.81\text{kN/m}^3)$$

14) Reynolds Number given Coefficient of Drag

Open Calculator

$$Re = \frac{24}{C_D}$$

$$2400 = \frac{24}{0.01}$$

15) Terminal Fall Velocity

Open Calculator

fx $$V_{terminal} = \left(\frac{D_S^2}{18 \cdot \mu}\right) \cdot (\gamma_f - S)$$

ex $$49.34641\text{m/s} = \left(\frac{(10\text{m})^2}{18 \cdot 10.2\text{P}}\right) \cdot (9.81\text{kN/m}^3 - 0.75\text{kN/m}^3)$$

16) Velocity of Sphere given Coefficient of Drag

Open Calculator

fx $$V_{mean} = \frac{24 \cdot \mu}{\rho \cdot C_D \cdot D_S}$$

ex $$0.2448\text{m/s} = \frac{24 \cdot 10.2\text{P}}{1000\text{kg/m}^3 \cdot 0.01 \cdot 10\text{m}}$$

17) Velocity of Sphere given Drag Force

Open Calculator

fx $$V_{mean} = \sqrt{\frac{F_D}{A \cdot C_D \cdot \rho \cdot 0.5}}$$

ex $$10.48809\text{m/s} = \sqrt{\frac{1.1\text{kN}}{2\text{m}^2 \cdot 0.01 \cdot 1000\text{kg/m}^3 \cdot 0.5}}$$

18) Velocity of Sphere given Resistance Force on Spherical Surface

Open Calculator

$$V_{mean} = \frac{F_{resistance}}{3 \cdot \pi \cdot \mu \cdot D_S}$$

$$10.09022\text{m/s} = \frac{0.97\text{kN}}{3 \cdot \pi \cdot 10.2\text{P} \cdot 10\text{m}}$$

Variables Used

- **A** Cross Sectional Area of Pipe *(Square Meter)*
- C_D Coefficient of Drag
- D_S Diameter of Sphere *(Meter)*
- F_D Drag Force *(Kilonewton)*
- $F_{resistance}$ Resistance Force *(Kilonewton)*
- **Re** Reynolds Number
- **S** Specific Weight of Liquid in Piezometer *(Kilonewton per Cubic Meter)*
- V_{mean} Mean Velocity *(Meter per Second)*
- $V_{terminal}$ Terminal Velocity *(Meter per Second)*
- γ_f Specific Weight of Liquid *(Kilonewton per Cubic Meter)*
- **μ** Dynamic Viscosity *(Poise)*
- **ρ** Density of Fluid *(Kilogram per Cubic Meter)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Function: **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)
  Length Unit Conversion
- Measurement: **Area** in Square Meter (m^2)
  Area Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Force** in Kilonewton (kN)
  Force Unit Conversion
- Measurement: **Dynamic Viscosity** in Poise (P)
  Dynamic Viscosity Unit Conversion
- Measurement: **Density** in Kilogram per Cubic Meter (kg/m^3)
  Density Unit Conversion
- Measurement: **Specific Weight** in Kilonewton per Cubic Meter (kN/m^3)
  Specific Weight Unit Conversion

Check other formula lists

- **Dash Pot Mechanism Formulas**
- **Laminar Flow around a Sphere Stokes' Law Formulas**
- **Laminar Flow between Parallel Flat Plates, one plate moving and other at rest, Couette Flow Formulas**
- **Laminar Flow between Parallel Plates, both Plates at Rest Formulas**
- **Laminar Flow of Fluid in an Open Channel Formulas**
- **Measurement of Viscosity Viscometers Formulas**
- **Steady Laminar Flow in Circular Pipes Formulas**

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