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Electrostatics Formulas

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List of 13 Electrostatics Formulas

Electrostatics

1) Electric Current given Drift Velocity

fx $I = n \cdot [Charge\text{-}e] \cdot A \cdot V_d$ Open Calculator

ex $1.6E\hat{}\text{-}27A = 7 \cdot [Charge\text{-}e] \cdot 14mm^2 \cdot 0.1mm/s$

2) Electric Dipole Moment

fx $p = Q \cdot d$ Open Calculator

ex $0.6C*m = 0.3C \cdot 2m$

3) Electric Field

fx $E = \frac{\Delta V}{l}$ Open Calculator

ex $20V/m = \frac{18V}{0.9m}$

4) Electric Field between Two Oppositely Charged Parallel Plates

Open Calculator

fx $$E = \frac{\sigma}{[\text{Permitivity-vacuum}]}$$

ex $$2.8\text{E}\hat{}11\text{V/m} = \frac{2.5\text{C/m}^2}{[\text{Permitivity-vacuum}]}$$

5) Electric Field due to Infinite Sheet

Open Calculator

fx $$E = \frac{\sigma}{2 \cdot [\text{Permitivity-vacuum}]}$$

ex $$1.4\text{E}\hat{}11\text{V/m} = \frac{2.5\text{C/m}^2}{2 \cdot [\text{Permitivity-vacuum}]}$$

6) Electric Field due to Line Charge

Open Calculator

fx $$E = \frac{2 \cdot [\text{Coulomb}] \cdot \lambda}{r_{\text{ring}}}$$

ex $$2.2\text{E}\hat{}10\text{V/m} = \frac{2 \cdot [\text{Coulomb}] \cdot 6\text{C/m}}{5\text{m}}$$

7) Electric Field due to Point Charge

Open Calculator

fx $$E = \frac{[\text{Coulomb}] \cdot Q}{d^2}$$

ex $$6.7\text{E}\hat{}8\text{V/m} = \frac{[\text{Coulomb}] \cdot 0.3\text{C}}{(2\text{m})^2}$$

8) Electric Field for Uniformly Charged Ring

Open Calculator

fx $$E = \frac{[Coulomb] \cdot Q \cdot x}{\left(r_{ring}^2 + x^2\right)^{\frac{3}{2}}}$$

ex $$2.6E\hat{}7V/m = \frac{[Coulomb] \cdot 0.3C \cdot 8m}{\left((5m)^2 + (8m)^2\right)^{\frac{3}{2}}}$$

9) Electric Field Intensity

Open Calculator

fx $$E = \frac{F}{q}$$

ex $$3.428571V/m = \frac{2.4N}{0.7C}$$

10) Electric Force by Coulomb's Law

Open Calculator

fx $$F = \frac{[Coulomb] \cdot q_1 \cdot q_2}{d^2}$$

ex $$2.7E\hat{}10N = \frac{[Coulomb] \cdot 4C \cdot 3C}{(2m)^2}$$

11) Electric Potential of Dipole

Open Calculator

fx $$V = \frac{[\text{Coulomb}] \cdot p \cdot \cos(\theta)}{r^2}$$

ex $$0.128003\text{V} = \frac{[\text{Coulomb}] \cdot 12\text{C*m} \cdot \cos(90^\circ)}{(0.5\text{m})^2}$$

12) Electrostatic Potential due to Point Charge

Open Calculator

fx $$V = \frac{[\text{Coulomb}] \cdot Q}{d}$$

ex $$1.3\text{E}\hat{}9\text{V} = \frac{[\text{Coulomb}] \cdot 0.3\text{C}}{2\text{m}}$$

13) Electrostatic Potential Energy of Point Charge or System of Charges

Open Calculator

fx $$U_e = \frac{[\text{Coulomb}] \cdot q_1 \cdot q_2}{d}$$

ex $$5.4\text{E}\hat{}10\text{J} = \frac{[\text{Coulomb}] \cdot 4\text{C} \cdot 3\text{C}}{2\text{m}}$$

Variables Used

- **A** Cross-Sectional Area *(Square Millimeter)*
- **d** Separation between Charges *(Meter)*
- **E** Electric Field *(Volt per Meter)*
- **E** Electric Field Intensity *(Volt per Meter)*
- **F** Electric Force *(Newton)*
- **F** Electric Force *(Newton)*
- **I** Electric Current *(Ampere)*
- **l** Length of Conductor *(Meter)*
- **n** Number of Free Charge Particles per Unit Volume
- **p** Electric Dipole Moment *(Coulomb Meter)*
- **q** Electric Charge *(Coulomb)*
- **Q** Charge *(Coulomb)*
- q_1 Charge 1 *(Coulomb)*
- q_2 Charge 2 *(Coulomb)*
- **r** Magnitude of Position Vector *(Meter)*
- r_{ring} Radius of Ring *(Meter)*
- U_e Electrostatic Potential Energy *(Joule)*
- **V** Electrostatic Potential *(Volt)*
- V_d Drift Speed *(Millimeter per Second)*
- **x** Distance *(Meter)*
- **ΔV** Electric Potential Difference *(Volt)*
- **θ** Angle between any two vectors *(Degree)*
- **λ** Linear Charge Density *(Coulomb per Meter)*

- **σ** Surface Charge Density *(Coulomb per Square Meter)*

Constants, Functions, Measurements used

- Constant: **[Charge-e]**, 1.60217662E-19 Coulomb
  Charge of electron
- Constant: **[Coulomb]**, 8.9875517923E9 Newton * Meter ^2 / Coulomb ^2
  Coulomb constant
- Constant: **[Permitivity-vacuum]**, 8.85E-12 Farad / Meter
  Permittivity of vacuum
- Function: **cos**, cos(Angle)
  Trigonometric cosine function
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Electric Current** in Ampere (A)
  Electric Current Unit Conversion
- Measurement: **Area** in Square Millimeter (mm²)
  Area Unit Conversion
- Measurement: **Speed** in Millimeter per Second (mm/s)
  Speed Unit Conversion
- Measurement: **Energy** in Joule (J)
  Energy Unit Conversion
- Measurement: **Electric Charge** in Coulomb (C)
  Electric Charge Unit Conversion
- Measurement: **Force** in Newton (N)
  Force Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Linear Charge Density** in Coulomb per Meter (C/m)
  Linear Charge Density Unit Conversion

- Measurement: **Surface Charge Density** in Coulomb per Square Meter (C/m²)
  Surface Charge Density Unit Conversion
- Measurement: **Electric Field Strength** in Volt per Meter (V/m)
  Electric Field Strength Unit Conversion
- Measurement: **Electric Potential** in Volt (V)
  Electric Potential Unit Conversion
- Measurement: **Electric Dipole Moment** in Coulomb Meter (C*m)
  Electric Dipole Moment Unit Conversion

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- **Capacitor Formulas**
- **Electromagnetic Induction Formulas**
- **Electrostatics Formulas**
- **Magnetic Field due to Current Formulas**

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