



Capacitor Formulas

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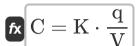


List of 19 Capacitor Formulas

Capacitor 2

Capacitance

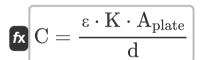
1) Capacitance



Open Calculator 🗗

$$0.01125F = 4.5 \cdot \frac{0.3C}{120V}$$

2) Capacitance for Parallel Plate Capacitors with Dielectric between them



Open Calculator 🗗

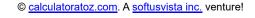
$$oxed{ex} 0.036 \mathrm{F} = rac{5 \cdot 4.5 \cdot 400 \mathrm{mm}^2}{250 \mathrm{mm}}$$

3) Capacitance of Cylindrical Capacitor

$$\mathbf{K} = rac{\mathrm{K} \cdot \mathrm{l}}{2 \cdot [\mathrm{Coulomb}] \cdot (\mathrm{r}_2 - \mathrm{r}_1)}$$

Open Calculator 🗗







Open Calculator 2

Open Calculator

Open Calculator

4) Capacitance of Parallel Plate Capacitor

Open Calculator 2

 $\mathbf{K} | \mathrm{C}_{\parallel} = rac{\mathrm{K} \cdot [\mathrm{Permitivity-vacuum}] \cdot \mathrm{A_{plate}}}{\mathrm{C}_{\parallel}}$

ex $1.3E^-14F = \frac{4.5 \cdot [Permitivity-vacuum] \cdot 400mm^2}{1200}$ 1200mm

5) Capacitance of Spherical Capacitor

 $ag{C} = rac{ ext{K} \cdot ext{R}_{ ext{s}} \cdot ext{a}_{ ext{shell}}}{ ext{[Coulomb]} \cdot (ext{a}_{ ext{shell}} - ext{R}_{ ext{s}})}$

6) Capacitor with Dielectric

 $\mathbf{C} = rac{\mathbf{\epsilon} \cdot \mathbf{a} \cdot \mathbf{A}_{ ext{plate}}}{\mathbf{d}}$

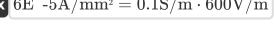
 $0.0192 \mathrm{F} = rac{5 \cdot 2.4 \cdot 400 \mathrm{mm}^2}{250 \mathrm{mm}}$

Current Density G

7) Current Density given Conductivity

fx $J = \sigma \cdot E$

ex $6\mathrm{E^-5A/mm^2} = 0.1\mathrm{S/m \cdot 600V/m}$









8) Current Density given Electric Current and Area

 $extbf{J} = rac{ ext{I}}{ ext{A}_{ ext{cond}}}$

Open Calculator

Open Calculator

Open Calculator

- $oxed{ex} 0.402299 {
 m A/mm^2} = rac{2.1 {
 m A}}{5.22 {
 m mm^2}}$
- 9) Current Density given Resistivity
- $J = rac{E}{
 ho}$
- ex $35.29412\mathrm{A/mm^2} = rac{600\mathrm{V/m}}{0.017\Omega^*\mathrm{mm}}$

Energy Density and Energy Stored

10) Energy Density given Electric Field

$$\mathbf{E} = rac{1}{2 \cdot \epsilon \cdot \mathrm{E}^2}$$

$$extbf{ex} 2.8 ext{E^--7J} = rac{1}{2\cdot 5\cdot \left(600 ext{V/m}
ight)^2}$$



11) Energy Density in Electric Field 🖸

1

Open Calculator 🗗

 $\mathbf{E} = \frac{1}{2} \cdot [\text{Permitivity-vacuum}] \cdot \mathbf{E}^2$

= 1.6E^-6J = $\frac{1}{2} \cdot [\text{Permitivity-vacuum}] \cdot (600 \text{V/m})^2$

12) Energy Density in Electric Field given Free Space Permittivity

 $extbf{X} = rac{1}{2 \cdot \epsilon \cdot ext{E}^2}$

Open Calculator

ex $2.8\text{E}^{-7}\text{J} = \frac{1}{2 \cdot 5 \cdot (600 \text{V/m})^2}$

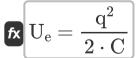
13) Energy Stored in Capacitor given Capacitance and Voltage

 $\left| \mathbf{U}_{\mathrm{e}} = rac{1}{2} \cdot \mathrm{C} \cdot \mathrm{V}^{2}
ight|$

Open Calculator 🗗

= 28800 $J = rac{1}{2} \cdot 4 F \cdot (120 V)^2$

14) Energy Stored in Capacitor given Charge and Capacitance

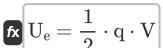


Open Calculator 🗗

$$oxed{ex} 0.01125 \mathrm{J} = rac{(0.3 \mathrm{C})^2}{2 \cdot 4 \mathrm{F}}$$

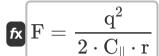


15) Energy Stored in Capacitor given Charge and Voltage



 $\boxed{\textbf{ex}} \ 18 \textbf{J} = \frac{1}{2} \cdot 0.3 \textbf{C} \cdot 120 \textbf{V}$

16) Force between Parallel Plate Capacitors



Open Calculator

$ext{ex} 0.075 ext{N} = rac{(0.3 ext{C})^2}{2 \cdot 0.5 ext{F} \cdot 1200 ext{mm}}$

Equivalent Capacitance 🖸

17) Equivalent Capacitance for Two Capacitors in Parallel $oxed{C}$ $oxed{c}$ $oxed{C} = C_1 + C_2$

9F = 6F + 3F



Open Calculator

18) Equivalent Capacitance for Two Capacitors in Series

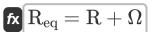
$$\mathbf{K} = rac{\mathrm{C}_1 \cdot \mathrm{C}_2}{\mathrm{C}_1 + \mathrm{C}_2}$$

Open Calculator

$$\mathbf{ex}$$
 $2\mathrm{F} = rac{6\mathrm{F} \cdot 3\mathrm{F}}{6\mathrm{F} + 3\mathrm{F}}$



19) Equivalent Resistance in Series 🚰



Open Calculator 🗗

$$oldsymbol{ex} 65\Omega = 15\Omega + 50\Omega$$



Variables Used

- a Constant a
- A_{cond} Area of Conductor (Square Millimeter)
- Aplate Area of Plates (Square Millimeter)
- **a**_{shell} Radius of Shell (Millimeter)
- C Capacitance (Farad)
- C_{II} Parallel Plate Capacitance (Farad)
- C₁ Capacitance of Capacitor 1 (Farad)
- C₂ Capacitance of Capacitor 2 (Farad)
- **d** Distance between Deflecting Plates (Millimeter)
- **E** Electric Field (Volt per Meter)
- **E** Electric Field (Volt per Meter)
- **F** Force (Newton)
- I Electric Current (Ampere)
- J Electric Current Density (Ampere per Square Millimeter)
- K Dielectric Constant
- I Length of Cylinder (Millimeter)
- q Charge (Coulomb)
- r Distance between Two Masses (Millimeter)
- **R** Resistance (Ohm)
- r₁ Inner Radius of Cylinder (Millimeter)
- r₂ Outer Radius of Cylinder (Millimeter)
- Reg Equivalent Resistance (Ohm)





- R_s Radius of Sphere (Millimeter)
- **U** Energy Density (Joule)
- **U**_e Electrostatic Potential Energy (Joule)
- V Voltage (Volt)
- ε Permittivity
- ρ Resistivity (Ohm Millimeter)
- **σ** Conductivity (Siemens per Meter)
- **Ω** Final Resistance (Ohm)





Constants, Functions, Measurements used

- Constant: [Coulomb], 8.9875517923E9 Newton * Meter ^2 / Coulomb ^2
 Coulomb constant
- Constant: [Permitivity-vacuum], 8.85E-12 Farad / Meter Permittivity of vacuum
- Measurement: Length in Millimeter (mm)
 Length Unit Conversion
- Measurement: Electric Current in Ampere (A)
 Electric Current Unit Conversion
- Measurement: Area in Square Millimeter (mm²)
 Area 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: Capacitance in Farad (F)
 Capacitance Unit Conversion
- Measurement: Electric Resistance in Ohm (Ω)
 Electric Resistance Unit Conversion
- Measurement: Surface Current Density in Ampere per Square Millimeter (A/mm²)
 - Surface Current 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 Resistivity in Ohm Millimeter (Ω^* mm) Electric Resistivity Unit Conversion
- Measurement: Electric Conductivity in Siemens per Meter (S/m)

 Electric Conductivity Unit Conversion





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- Capacitor Formulas
- Electromagnetic Induction Formulas
- Electrostatics Formulas
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