Physics Formula Sheet

Chapter by chapter, topic by topic. Written by the PadhoNa team for quick revision.

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CHAPTER 19

Capacitance

Capacitors

$$C = \frac{Q}{V}; \qquad \text{parallel plate } C = \frac{\varepsilon_0 A}{d}; \qquad \text{sphere } C = 4\pi\varepsilon_0 R$$

SPHERICAL AND CYLINDRICAL

$$C = 4\pi\varepsilon_0 \frac{ab}{b-a}, \qquad C = \frac{2\pi\varepsilon_0 L}{\ln(b/a)}$$

Combinations

$$\text{series: } \frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \cdots; \qquad \text{parallel: } C = C_1 + C_2 + \cdots$$

CHARGING (RC)

$$q = CV\left(1 - e^{-t/RC}\right), \qquad \text{discharging: } q = q_0 e^{-t/RC}, \qquad \tau = RC$$

Dielectrics

$$C = K\frac{\varepsilon_0 A}{d}; \qquad \text{slab of thickness } t: \; C = \frac{\varepsilon_0 A}{d - t + t/K}$$

CONDUCTING SLAB

$$C = \frac{\varepsilon_0 A}{d - t}$$

Energy stored

$$U = \tfrac{1}{2}CV^2 = \frac{Q^2}{2C} = \tfrac{1}{2}QV, \qquad u = \tfrac{1}{2}\varepsilon_0 E^2$$

SHARING CHARGE

$$\Delta U = \frac{C_1 C_2 (V_1 - V_2)^2}{2(C_1 + C_2)} \text{ lost}$$

FORCE BETWEEN PLATES

$$F = \frac{Q^2}{2\varepsilon_0 A}$$

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