

Notebook

Physics

102

تلخيص

قوانين مادة الفيرست

الطالبة

دانة الزعبي



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Chap 1

$$* F_e = \frac{k|q_1||q_2|}{r^2}$$

$$* E = \frac{kQ}{r^2} \rightarrow \text{المصدر}$$

$$F_e = q_0 E$$

لشحنة صغيرة داخل
الحقل الكهربائي

$$* \frac{N_2}{N_1} = \frac{|Q_2|}{|Q_1|}$$

$$* qE = ma \Rightarrow a = \frac{qE}{m}$$

$$* \rho = \frac{Q}{V}$$

$$\sigma = \frac{Q}{A}$$

$$\lambda = \frac{Q}{l}$$

$$* E = \frac{\sigma}{2\epsilon_0}$$

← for a disk (uniformly charged)
infinite plane of charges.

Chapter 3

$$* \Delta V = \frac{\Delta U_E}{q} = - \int_A^B \vec{E} \cdot d\vec{s}$$

$$* \Delta V = -Ed$$

$$* \Delta V = \frac{W}{q}$$

$$* V = \frac{Kq}{r}$$

Electric potential due to point charges. *zindagi ke*

$$U_E = \frac{Kq_1 q_2}{r_{12}}$$

potential Energy " " " " pair of charges

- Obtaining Value of the Electric Field from the Electric Potential.

$$\Delta V = - \int_A^B \vec{E} \cdot d\vec{s}$$

$$dV = -\vec{E} \cdot d\vec{s}$$

⋮

$$E_x = - \frac{dV}{dx}$$

Electric potential Due to Continuous Charge Distributions:-

$$V = k_e \int \frac{dq}{r}$$

Electric potential due to a Uniformly charged Ring /

$$V = k_e \int \frac{dq}{r}$$

Electrostatic Equilibrium :

is a condition

For a Conductor:

regular Elliptical Conductors.

inside it : $E=0$ / $V = \frac{kQ}{r}$

قوة المجال داخل الكرة (مثلاً) صفر لقوة على سطح

$$E_x = - \frac{\partial V}{\partial x} = - \frac{\partial}{\partial x} (Ax^2y - Bxy^2) = - (2Axy - By^2)$$

Chap. 2

Electric Flux : $\Phi = EA \cos \theta$

دالة A

$$\Phi = \oint \vec{E} \cdot d\vec{A}$$

عامودية على المسطح

- The Flux through the Cube is always zero.

Gauss's Law :

$$E = \frac{K_e q}{r^2}$$

$$\Phi = EA = \left(\frac{K_e q}{r^2}\right)(4\pi r^2) = 4\pi K_e q = \frac{q_{in}}{\epsilon_0}$$

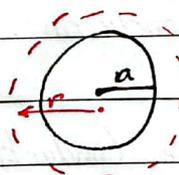
دالة

- Net Flux through any closed surface surrounding a point charge q is given by q/ϵ_0 , and is independent of the shape of that surface.

- The net electric flux is the same through all surfaces.

- Net Flux through a closed surface that surrounds NO charge is zero.

For insulating sphere



$$E = \frac{Kq}{r^2}$$

$$E = \frac{Kq}{a^3} r$$

$$E = \frac{Kq}{a^2}$$

if $(r > a)$

if $(r < a)$

if $(r = a)$

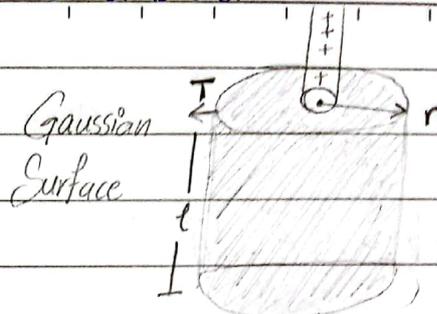
* A Cylindrically Symmetric Charge Distribution around infinite length rod:

$$EA = \frac{q_{in}}{\epsilon_0} = \frac{\lambda l}{\epsilon_0}$$

$$E(2\pi r l) = \frac{\lambda l}{\epsilon_0}$$

$$E = \frac{\lambda}{2\pi\epsilon_0 r} = \frac{2K_e\lambda}{r}$$

$$\Rightarrow \boxed{E = \frac{2K_e\lambda}{r}}$$



if the line segment were not infinitely long then

$$E \neq \frac{2K_e\lambda}{r}$$

* A plane of charge

$$\boxed{E = \frac{\sigma}{2\epsilon_0}}$$



$$2EA = \frac{q_{in}}{\epsilon_0}$$

* Conductors in electrostatic equilibrium:

$E = 0$ inside a conductor.

E at point just outside the conductor, perpendicular to surface, has magnitude q/ϵ_0 .

Chap. 4

$$C = \frac{Q}{\Delta V} \quad (1F = 1C/V)$$

$$C = \frac{\epsilon_0 A}{d}$$

Combinations of Capacitors :

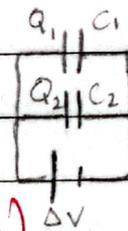
[1] parallel Combination

$$\Delta V_1 = \Delta V_2 = \Delta V$$

$$Q_{\text{total}} = Q_1 + Q_2 \\ = C_1 \Delta V_1 + C_2 \Delta V_2$$

$$Q_{\text{total}} = C_{\text{eq}} \Delta V$$

$$C_{\text{eq}} = C_1 + C_2 + \dots \quad (\text{parallel Combination})$$

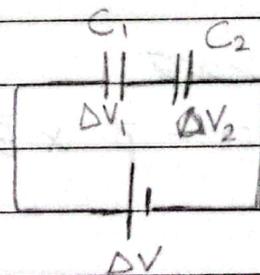


[2] Series Combination

$$Q_1 = Q_2 = Q$$

$$\Delta V_{\text{total}} = \Delta V_1 + \Delta V_2$$

$$\frac{Q_1}{C_1} + \frac{Q_2}{C_2}$$



$$\Delta V_{\text{total}} = \frac{Q}{C_{\text{eq}}}$$

$$\frac{1}{C_{\text{eq}}} = \frac{1}{C_1} + \frac{1}{C_2} + \dots \quad (\text{Series Combination})$$

$$\text{For Two Capacitors: } C_{\text{eq}} = \frac{C_1 C_2}{C_1 + C_2}$$

Energy Stored in a charged Capacitor

$$U_E = \frac{Q^2}{2C} = \frac{1}{2} QV = \frac{1}{2} C (\Delta V)^2$$

* For parallel plate capacitor $C = \frac{\epsilon_0 A}{d}$

$$U_E = \frac{1}{2} \left(\frac{\epsilon_0 A}{d} \right) (Ed)^2 = \frac{1}{2} (\epsilon_0 Ad) E^2$$

* Energy per unit volume $u_E = U_E / Ad$ (energy density)

$$u_E = \frac{1}{2} \epsilon_0 E^2$$

Electric Dipole in an Electric Field

$$p = 2aq$$

\vec{p} : Electric dipole moment

~~4/14/21~~

$$\tau = \vec{p} \times \vec{E}$$

Magnitude of net torque