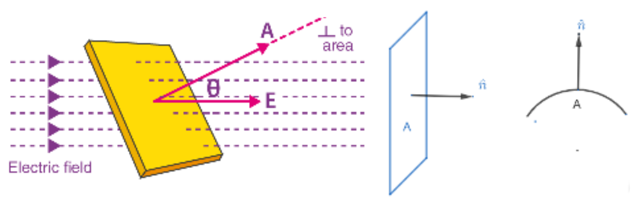
Chapter 23
Gauss' Law

Electric flux

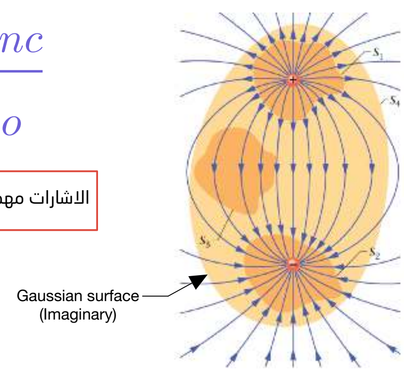
$$\phi = EA\cos\theta$$



ϕ = electric flux
E = electric field
A = area

$$\phi = \frac{q_{enc}}{\varepsilon_O}$$

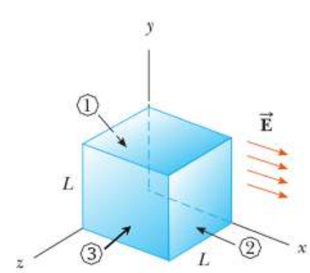
q_{enc} الاشارات مهمة في



ϕ = electric flux
q_{enc} = enclosed charges
ε_O = 8.85×10^{-12}

Q1. Gaussian surface encloses three charges, q1 = 15 C, q2 = - 8 C, q3 = 5 C. Find the electric flux through the gaussian surface

Q2. According to the figure, find the electric flux through surface 1, if the electric field is 250 N/C to the positive x direction and L = 5

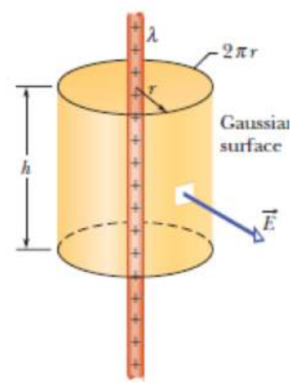


Infinite line

$$E = \frac{2k\lambda}{r}$$

$$E_1 r_1 = E_2 r_2$$

E = electric field
λ = linear charge density
r = distance
k = 9×10^9

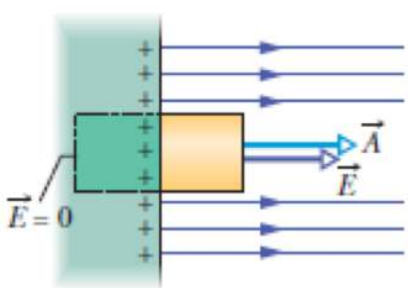


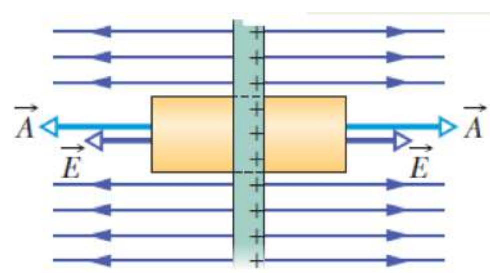
Q3. The electric field at 5 cm from an infinite line is 120 N/C, find the electric field at 18 cm

Q4. The electric field at 10 from an infinite line with linear charge density of $5 \times 10^{-6} C/m$ is:

Conductors
Non-conductors

Conductors	Non- conducting sheet
$E = \frac{\sigma}{\varepsilon_o}$	$E = \frac{\sigma}{2\varepsilon_o}$





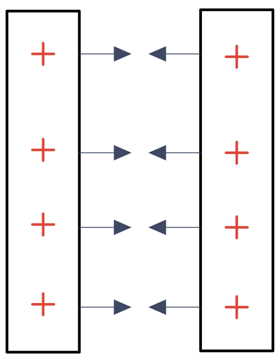
Q5. An electron placed near non-conducting sheet carrying a surface charge density of $17.7nC/m^2$. The magnitude of the electric force acting on the electron is:

Q6. An electron placed near a conducting sheet carrying a surface charge density of $17.7nC/m^2$. The magnitude of the electric field on the electron is:

Parallel plates

Same charges

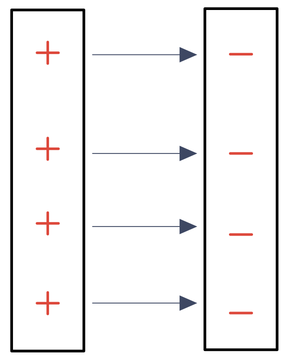
$$\sigma_1 \neq \sigma_2$$



$$E = E_1 - E_2$$

Different charges

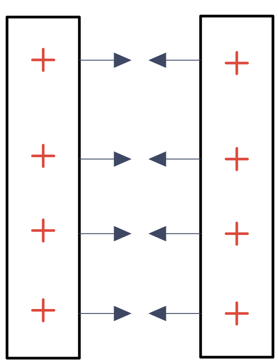
$$\sigma_1 \neq \sigma_2$$



$$E = E_1 + E_2$$

Same charges
(Equal)

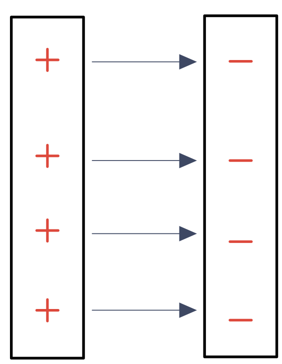
$$\sigma_1 = \sigma_2$$



$$E = 0$$

Different charges
(Equal)

$$\sigma_1 = \sigma_2$$



$$E = \frac{\sigma}{\varepsilon_o}$$

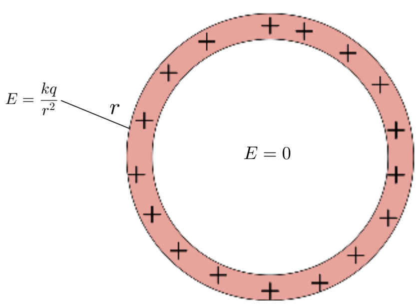
Parallel plates

Q.7 two parallel non-conducting sheet carry equal but opposite surface charges of $5.5\mu C/m^2$. The electric field between them is:

Q.8 two parallel non-conducting sheet carry equal surface charges of $5.5\mu C/m^2$. The electric field between them is:

Electric field (spheres)

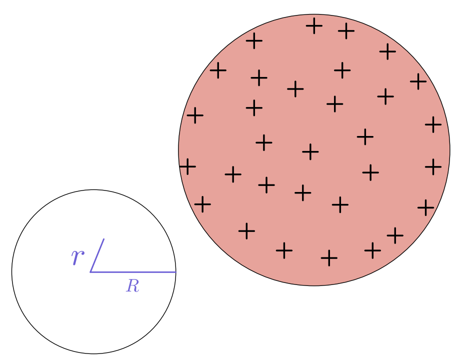
Conducting sphere (metal)



In $E = 0$

Out $E = \frac{kq}{r^2}$

Non -Conducting sphere (solid)



In $E = \frac{kqr}{R^3}$

Out $E = \frac{kq}{r^2}$

Q9. A metalic sphere of radius 10 cm has a charge of 3 C.
a) Find the electric field at 8 cm from its center
b) find the electric field at 15 cm from its center

Q9. A solid sphere of radius 5 cm has a charge of
a) Find the electric field at 2 cm from its center
b) find the electric field at 10 cm from its center

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$$\phi = EA\cos\theta$$

$$\phi = \frac{q_{enc}}{\varepsilon_o}$$

Electric flux

$$E = \frac{2k\lambda}{r}$$

$$E_1 r_1 = E_2 r_2$$

Long wire

$E = 0$ In

$E = \frac{kq}{r^2}$ Out

Conducting sphere (metal)

$E = \frac{kqr}{R^3}$ In

$E = \frac{kq}{r^2}$ Out

Non -Conducting sphere (solid)

$E = \frac{\sigma}{\varepsilon_o}$ Conductor

$E = \frac{\sigma}{2\varepsilon_o}$ Non-conducting sheet