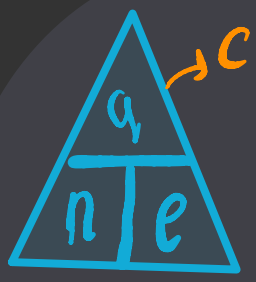
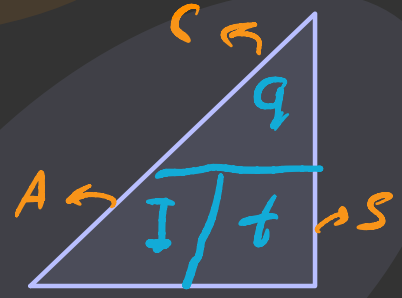
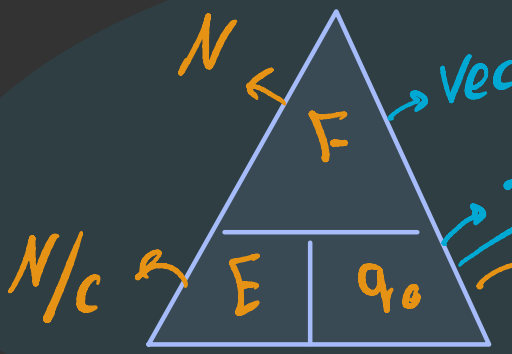
شحنتين متماثلتين ← داخلي ← الاتزان ← خارجي ← شحنتين مختلفتين

$$\frac{\sqrt{q_1}}{r_1} = \frac{\sqrt{q_2}}{r_2}$$

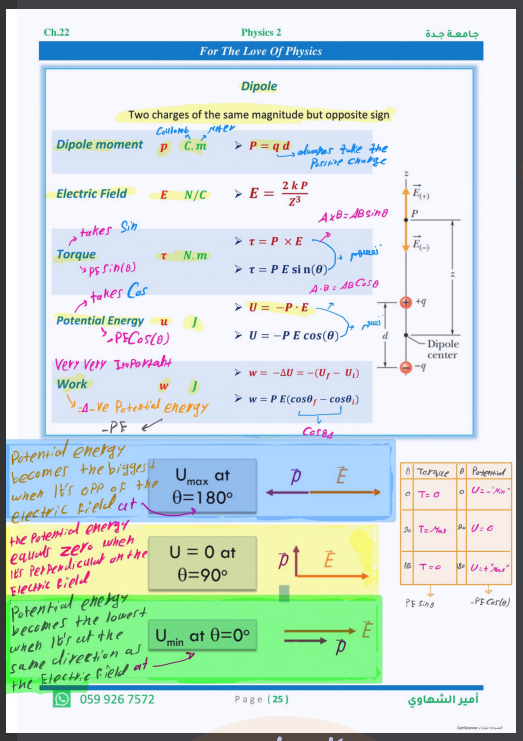




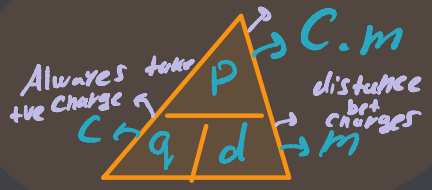
Columb → A.S



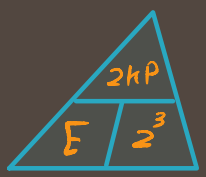
Point Charge's law : $E = \frac{kq}{r^2}$

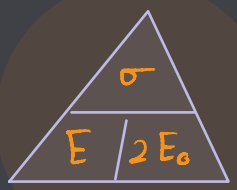


dipole moment

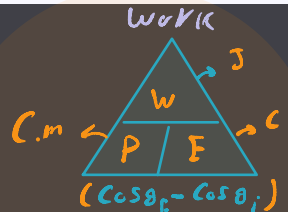


Electric field

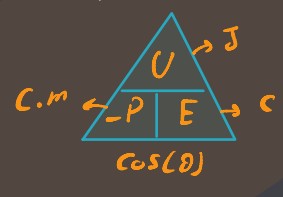




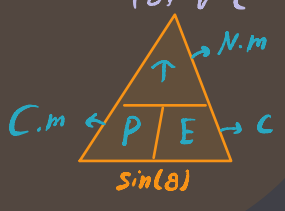
Work



Potenicl energy



Torque



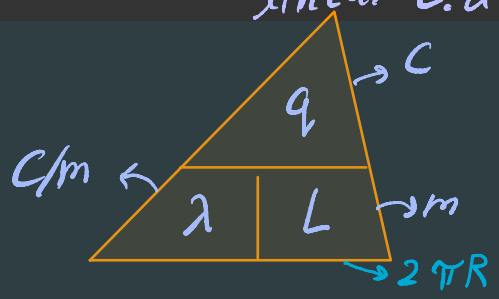
Disk

small distance $z = R$ → القانون الطويل

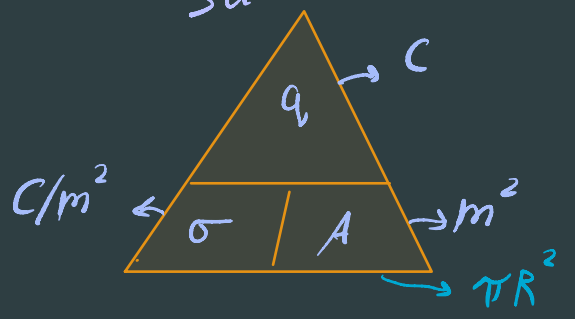
large distance $z > R$ → $E = 0$

At the center / infinite sheet → $E = \frac{\sigma}{2\varepsilon_0}$

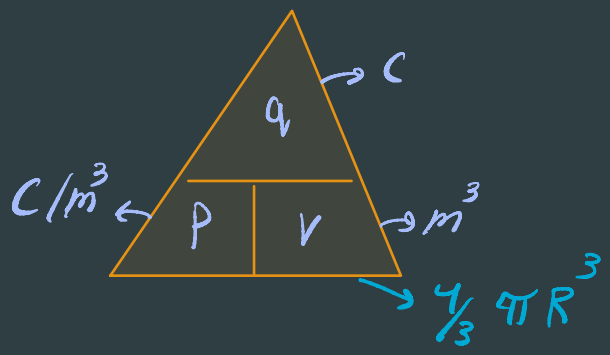
linear C.d



surface C.d

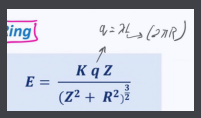


Volume C.d



Ring

Small distance $z = R$ → القانون الطويل



large distance $z > R$ → Point Charge's law

At the Center $z = 0$ → $E = 0$

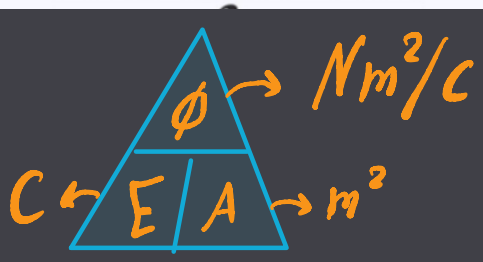
أو

Ring at large distance appear like a point Charge

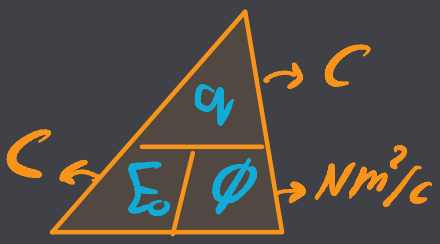
Flux ϕ

الشحنة في الحجم فقط

Flux of an Electric Field



Gauss's Law



$$\phi = E \cdot A$$

$$\phi = E\ A \cos\theta$$

θ between the electric field and Area unit vector (not plane)

- Perpendicular $\theta = 90 \rightarrow \phi = Zero$
- Parallel $\theta = 0 \rightarrow \phi = E\ A$
- Anti-parallel $\theta = 180 \rightarrow \phi = -E\ A$

ملاحظات هامة

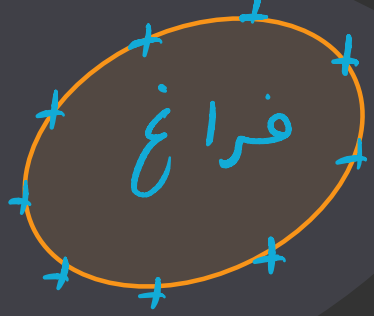
- $if\ q_{enc} = +ve \rightarrow E\ is\ out\ ward$
- $if\ q_{enc} = -ve \rightarrow E\ is\ inward$
- Charge outside the surface is not included in q_{enc}

Electric field due to a charged plastic rod / wire / line of Charge

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

2) $E_1 r_1 = E_2 r_2$

A charged Isolated Conductor

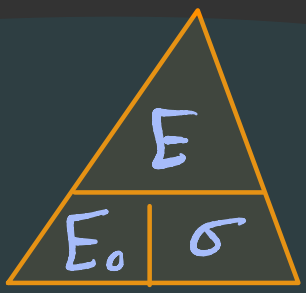


$q = \sigma$

$F = \sigma$

$E = \sigma$

$\phi = 0$



Electric field due to a charged conductor

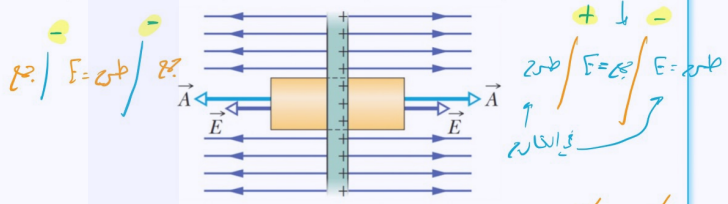
Ch.23 Physics 2 جامعة جدة

For The Love of Physics

Electric field due to a charged sheet

Conducting or nonconducting

A thin infinite nonconducting or nonconducting sheet with a uniform σ



Sheet of charge

$$E = \frac{\sigma}{2\,\varepsilon_o}$$

(7) The Figure shows portions of two large, parallel,

Two parallel plates conducting plates carry equal surface charge density

The electric field between the plates

$$E = 0$$

The direction of E from +ve to -ve

The electric field between the plates

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

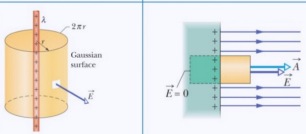
Outside the plates Electric field equal zero

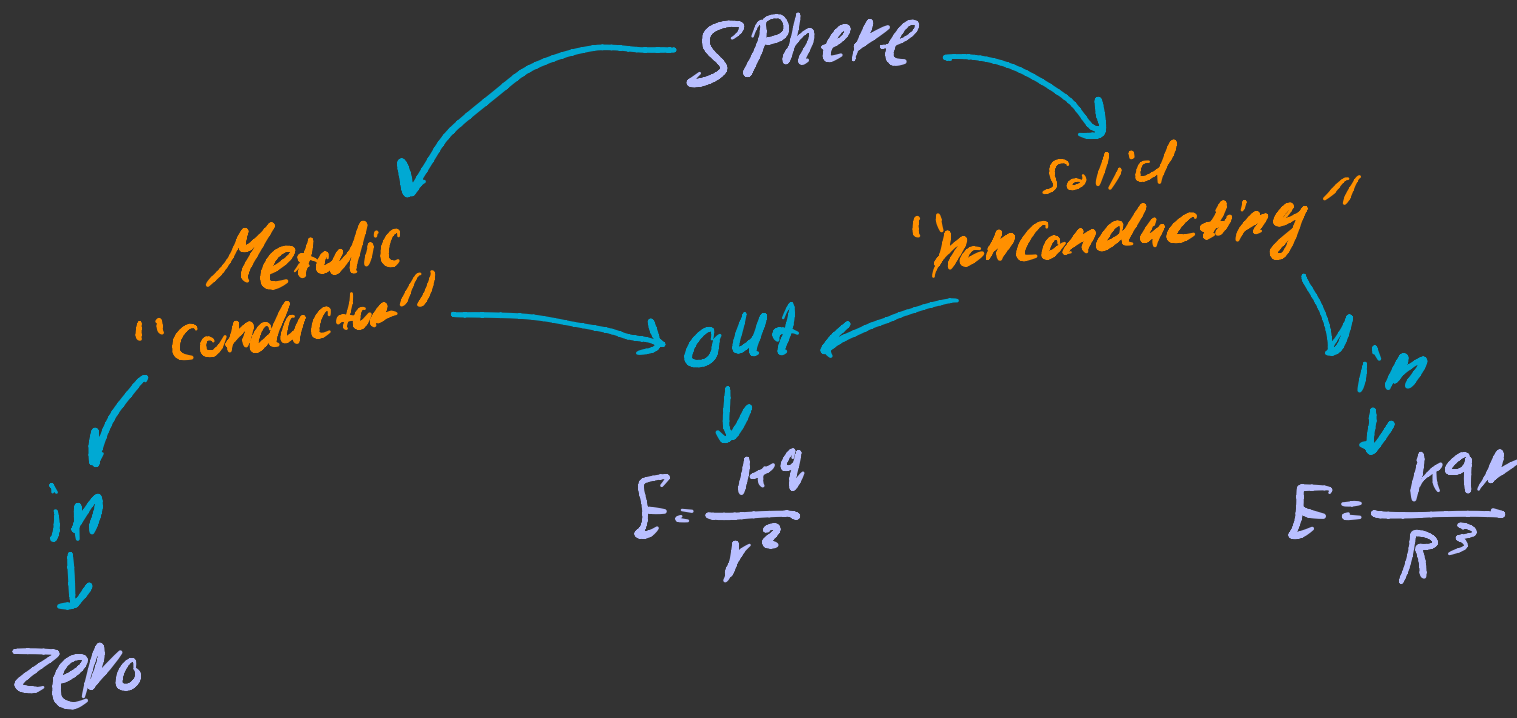
$$E = 0$$

Sphere & Shell

out	in
$r \geq R$	$r < R$
$E = \frac{Kq}{r^2}$	Conducting shell enclosing Charge conducting Sphere metalic sphere: $E = 0$ (تتوزع الشحنة على السطح الخارجي فقط)
	non conducting solid sphere: $E = \frac{Kq\,r}{R^3}$ (تتوزع الشحنة داخل الكرة وخارجها)

Electric Field due to

Charged Plastic rod	Charged conductor	Conducting plates		Charged Sheet
		in	out	
$E = \frac{2\,k\,\lambda}{r}$	$E = \frac{\sigma}{\varepsilon_o}$	$E = 0$	$E = \frac{\sigma}{\varepsilon_o}$	$E = \frac{\sigma}{2\varepsilon_o}$
				
		اذا كان اللوحين لهم نفس الشحنة نعكس القوانين		


Sphere
Metallic
"conductor"
Solid
"nonconducting"
out
in
in
zero
$E = \frac{kq}{r^2}$
$E = \frac{kqr}{R^3}$