

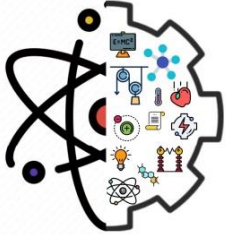
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الفيزياء لكليات التقنية

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Technical and Vocational Training Corporation



Chapter 5 Electricity

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عناصر الوحدة

Electric Force (F) and
Coulomb's Law

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Charge

1

Ohm's Law

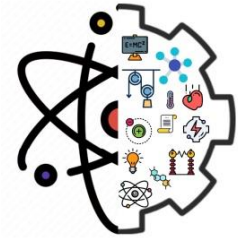
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Electric Field (E)

3

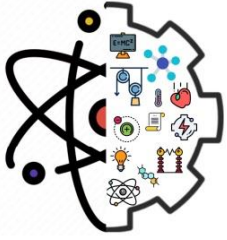
Electric Power (P)

5



Charge

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Charge:

- Electric Charge:

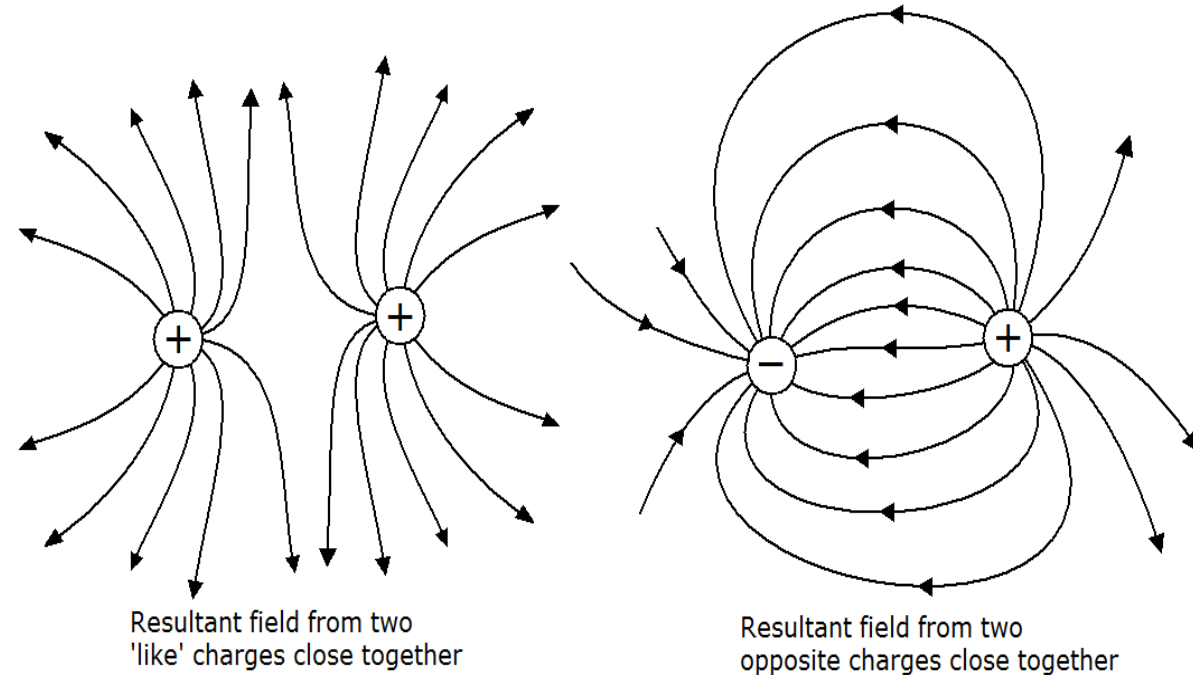
is the physical property of matter that causes it to experience a force when placed in an electromagnetic field

The SI unit for charge is coulombs (c).

- For example:

Electrons and protons.

- Electrons are **negatively charged** while protons are **positively charged**.





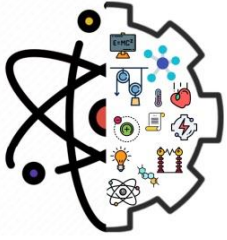
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Electric Force (F) and Coulomb's Law

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02



Electric Force (F) and Coulomb's Law:

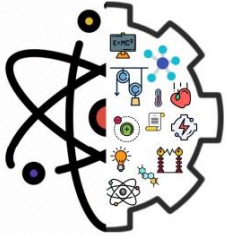
- Electric Force:

It is the attractive or repulsive interaction between charged objects.

- The SI unit for electric force is (N).

The **attractive interaction** would be between the different type of charges.

The **repulsive interaction** would be between the same type of charges



Electric Force (F) and Coulomb's Law:

- Coulomb's Law:

It describes the force (F) between charges.

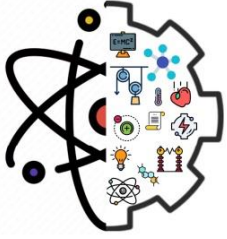
$$F = k \frac{q_1 q_2}{r^2}$$

F: electric force

K: constant ($K = 9 \times 10^9 \text{ N.m}^2/\text{C}^2$)

$q_1 q_2$: charges

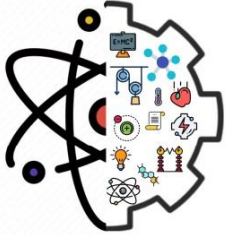
r: distance between charges



Electric Force (F) and Coulomb's Law:

Example 1:

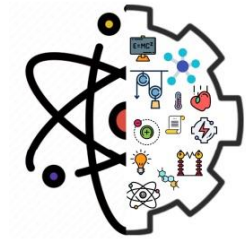
Find the electric force between two charges where the distance between them is 1m and their magnitudes is 1c each. They are negatively charged.



Electric Force (F) and Coulomb's Law:

Example 2:

Find the electric force between two charges where the distance between them is 50 cm and their magnitudes is 2C each. They are negative and positive.



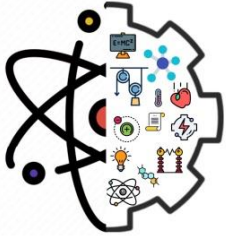
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Electric Field (E)

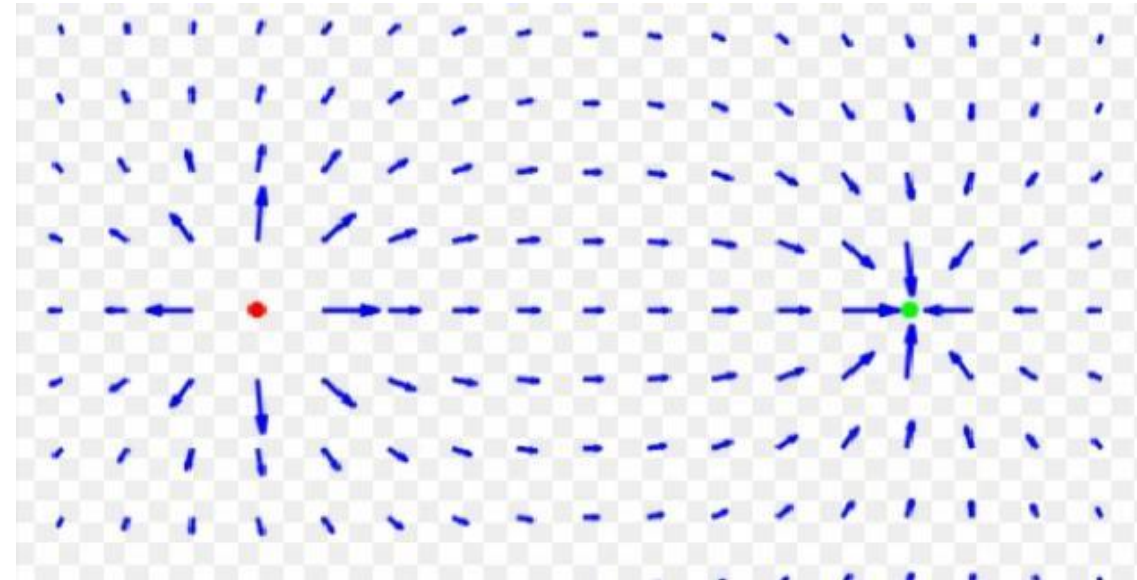
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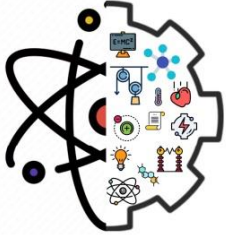


Electric Field (E):

- Electric field is the electric force per unit charge.
- **The SI unit for electric field is (N/c).**
- The electric field is radially outward from a positive charge and radially in toward a negative point charge.
- The electric field formula is:

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

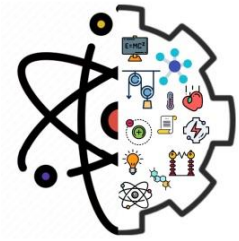




Electric Field (E):

Example 1:

Find the electric field at 1m from a positive charge its magnitude is 4c.



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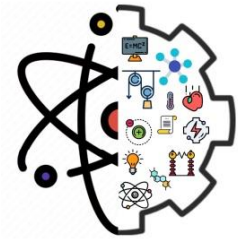
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Electric Field (E):

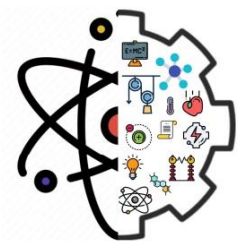
Example 2:

Find the electric field at 3m from a positive charge its magnitude is 10c.



Ohm's Law

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04



Ohm's Law:

the voltage across a conductor is directly proportional to the current flowing through it.

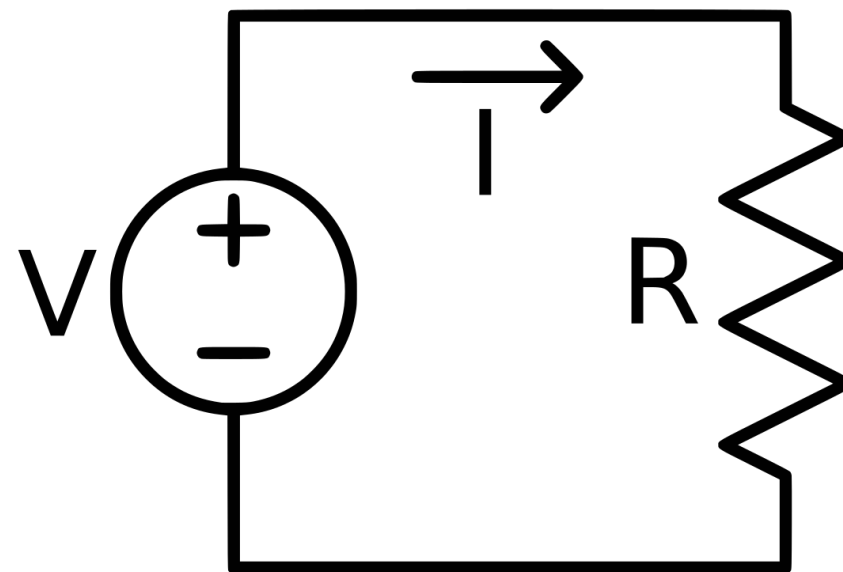
- Ohm's Law formula is:

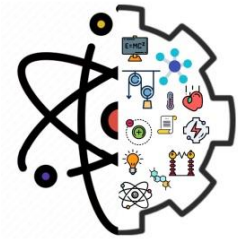
$$V = IR$$

V is Voltage and has units of volt, with symbol *V*

I is electric current and has units of Ampere, with symbol *A*

R is Resistance and has units of ohms, with symbol Ω .

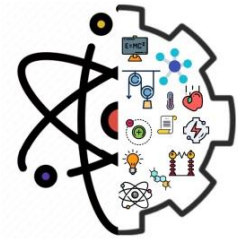




Ohm's Law:

Example 1:

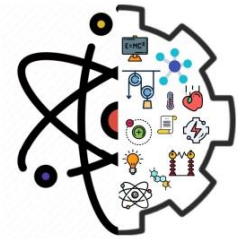
If a conductor between two points has resistance of 2Ω and the current passing through it is 3A, what is the voltage across these points?



Ohm's Law:

Example 2:

A conductor between two points has resistance of 3Ω and the voltage across these points is 12V, find the current passing through.



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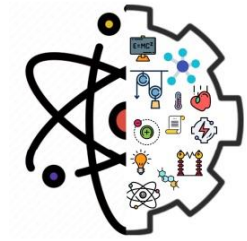
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Ohm's Law:

Example 3:

Find the resistance of a conductor between two points when the voltage between them is 6V and the current 4A.



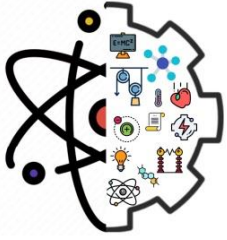
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Electric Power (P)

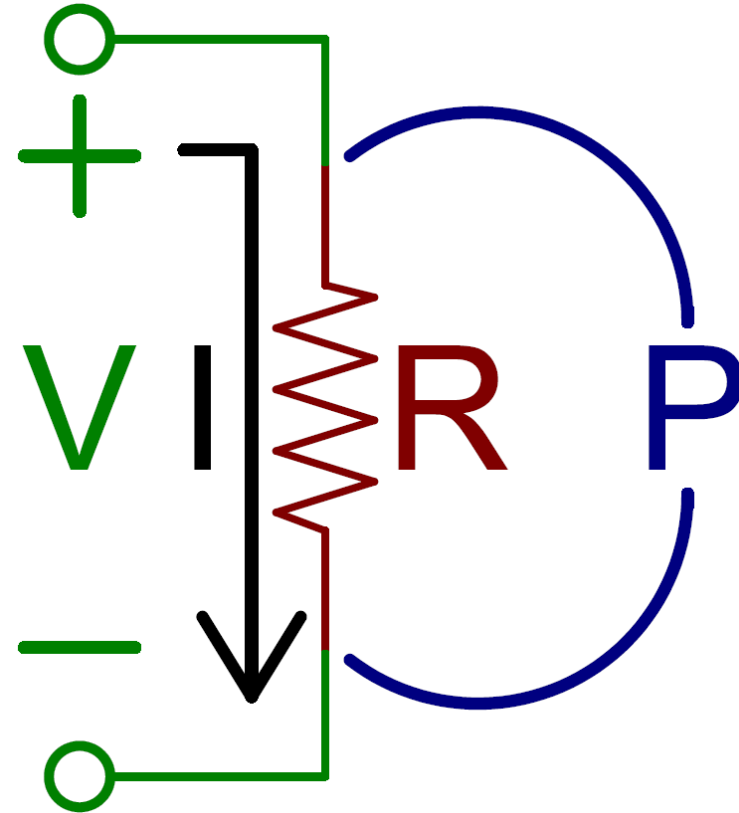
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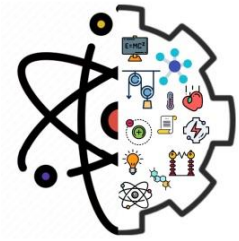


Electric Power (P):

- Electric power is the rate of the electrical energy transferring per unit of time.
- The SI unit for electric power is (W).
- The electric power formula is:

$$P = VI$$

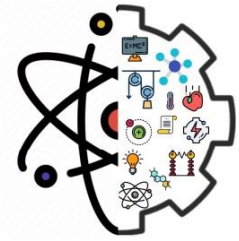




Electric Power (P):

Example 1:

Find the electric power in an electric circuit its voltage 12V and the current passing through is 2A.



Electric Power (P):

Example 2:

Find the electric power in an electric circuit its voltage 6V and the resistance is 3Ω .

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Thank you