What is the electric field | Electric field intensity

Electric field

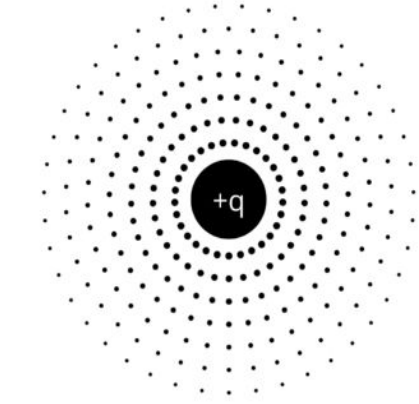
At the atomic level, the electric field is involved in the attractive force between the nucleus and the electrons that hold them together.

What is the electric field?

“The space or region around a point charge to which another charge receives a force is called an electric field”.

To explain the transmission of electric forces, Michael Faraday introduced the concept of electric field lines.

According to Faraday, the presence of an electric field in the space around the electric charge is an essential property of nature.



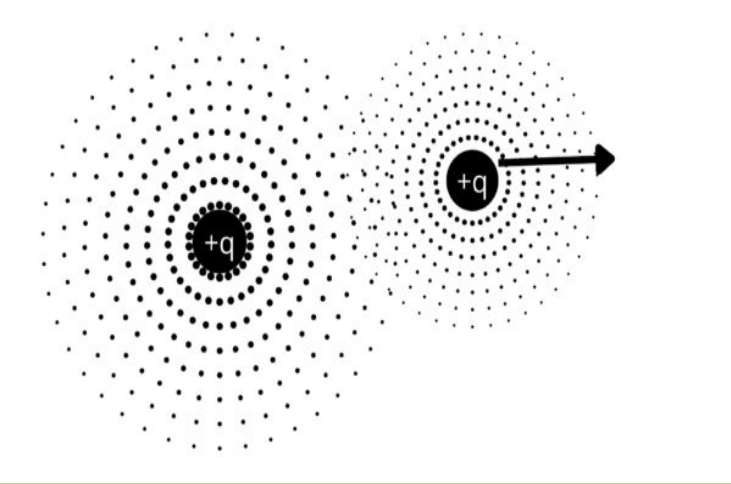
A charge produces an electric field in the space surrounding it in the form of a sphere. This field is tested only by taking another charge in the field.

Electric field intensity

A measure of the force a charged object exerts on another charge within the electric field of that charge.

$$E=\frac{F}{q}$$

Consider the charge q that creates the field. When charge q0 is introduced into the field, charge q interacts with q0 to generate electrical force. If F is the force that the positive test charge q0 receives, then the test charge q0 should be very small so as not to disturb the field being measured. The density of points indicates the strength of the field.



SI unit of Electric field

As the electric field is force per unit charge thus S.I unit is

NC^{-1}

Electric field direction

It is a vector quantity whose direction is in the direction of the force.

Electric intensity due to a point charge

Suppose a point charge q produces its own electric field placed in a vacuum. A test charge q0 is placed in the field at a distance r from the point charge. The charge q exerts a force on test charge qo which is given by coulomb's law.

$$F=\frac{1}{4\pi\varepsilon 0}\frac{qq0}{r2}\hat{r}$$

$$E=\frac{F}{q0}=\frac{1}{q0}\frac{1}{4\pi\varepsilon 0}\frac{qq0}{r2}\hat{r}$$

$$E=\frac{1}{4\pi\varepsilon 0}\frac{q}{r2}\hat{r}$$

$$E=\frac{1}{4\pi\varepsilon 0}\frac{q}{r2}$$

❖ $K=\frac{1}{4\pi\varepsilon 0}$

$$E=K\frac{q}{r2}$$

Frequently Asked Questions on Electric Field

What are an electric field and its formula?

The space around a charge or a group of charges to which another charge receives a force is called an electric field.

$$E = F / Q.$$

When is the electric field said to be uniform?

The field is uniform if the force on the test charge is equal in magnitude and direction at all points in the field.

is the electric field non-uniform?

A field is said to be non-uniform if the force exerted on the test charge varies from point to point in the field.

Does a charge experience a force due to its own field?

No. A charge will not experience any force due to its own field.

Do electric fields exist in space?

Yes, according to Maxwell's equations, the electric field exists in empty space.