What is electric flux? | Maximum & Minimum flux

Electric flux measures the electric field that permeates a given surface but the electric field itself cannot flow. This is a method of expressing the intensity of the electric field at an arbitrary distance from the electric charge that creates the electric field.

The electric field E can exert a force on the charge at any point in space.

Definition of electric flux

A total number of electric field lines passing through a vector area is called electric flux or "The scalar product of electric intensity E and vector area A".

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What is the Vector area?

It is an area whose magnitude is equal to the surface area A of the element but its direction is normal to this area

Electric Flux Formula

Electric flux is denoted by the Greek letter Ø.

Mathematically,

$$Ø=E.A=EAcosθ$$

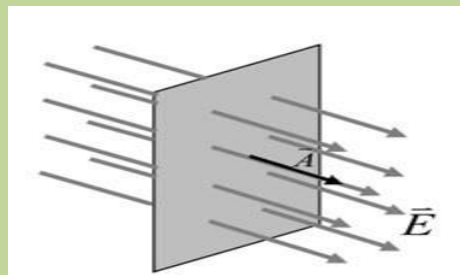θ is the angel between field lines and normal to the area

Unit of electric flux

$$Nm^2C^{-1}$$

Electric flux depends on

- **Electric intensity**
- **Vector area**

Case 1: Maximum electric flux

When the area is held perpendicular to the field lines having uniform electric field intensity E then electric flux, in this case, is given as

$$\varnothing = EA\cos\theta$$

$$\theta = 0 \text{ so}$$
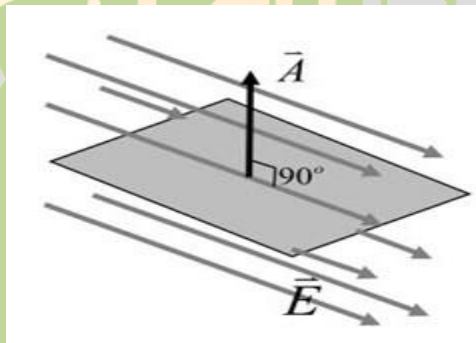
$$\varnothing = EA\cos0$$

$$\text{As } \cos0 = 1$$

$$\varnothing = EA$$

The area is held perpendicular to the electric field lines. It is the maximum flux.

Case 2: Minimum electric flux

When area A has placed parallel to the field lines, in this case, no line in this area so flux, in this case, is given as

$$\varnothing = EA\cos\theta$$

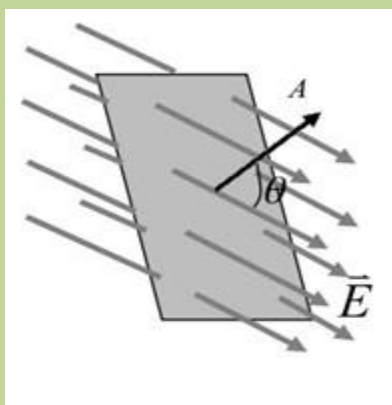$$\theta = 90 \text{ so}$$

$$\varnothing = EA\cos90$$

$$\text{As } \cos90 = 0$$

$$\varnothing = 0$$

A is held parallel to the field lines. In this flux is zero.

Case 3:

When A is inclined at an angle θ with the lines then we will take the projection of the area which is perpendicular to the field lines. The area of projection, in this case, is equal to Acosθ, thus flux is given as

$$\emptyset = EA\cos\theta$$

θ is the angel between field lines and normal to the area

Frequently Asked Questions – FAQs

What are electric flux and its unit?

Electric flux is defined as a measure of the number of field lines that cross a surface. Electric flux $\varphi = EA\cos\theta$. The unit of electric flux is Nm^2C^{-1}.

What is an electric field?

An electric field is a physical field that surrounds an electrically activated particle or object. It exerts a force (repulsion or attraction) on

other charged particles or objects in the field. In other words, it can be defined as the physical field of the body of a charged particle.

What is the basic nature of an electric field line?

Lines of the electric field are generated with a positive charge and end with a negative charge.