

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 Φ .

Mathematically,

$$\Phi = E \cdot A = EA \cos \theta$$

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

Unit of electric flux

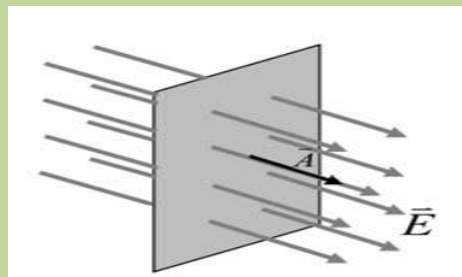
$$\text{Nm}^2\text{C}^{-1}$$

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



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

$$\theta = 0 \text{ so}$$

$$\phi = EA \cos 0$$

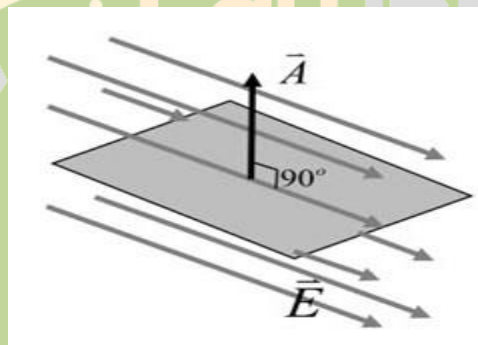
$$\text{As } \cos 0 = 1$$

$$\phi = EA$$

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



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

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

$$\phi = EA \cos 90$$

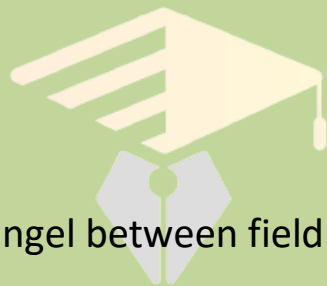
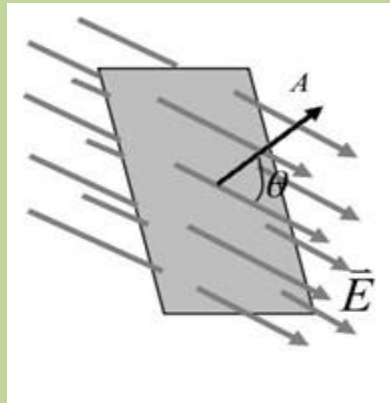
$$\text{As } \cos 90 = 0$$

$$\phi = 0$$

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 $A\cos\theta$, thus flux is given as



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

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θ is the angle 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 $\phi = EA \cos \theta$. 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.



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