DOI: 10.5281/zenodo.3993683
ISSN 2349-6193
Impact Factor: 3.866

IJESMR

International Journal of Engineering Sciences & Management Research

STUDY ABOUT ELECTROSTATIC AND ELECTRIC FIELD

Vipula Tripathi
St. Wilfred Girls College, Jaipur, Rajasthan, India

ABSTRACT
An electric field (sometimes E-field), is a vector quantity that varies from point to point. All of us have the experience of seeking a spark or hearing a crackle when we take off our synthetic clothes or sweater particularly in dry weather. This is almost inevitable with ladies garments like polyester sari. The reason for these experiences is discharge of electric charges. Electrostatics deals with the study of forces, fields and potentials arising from static charges.

Keyword: *Electric field (E-field), Electrostatic, Equi -potential surface, Electric dipole, Electric field lines.*

INTRODUCTION
There are two types of charges exist:
(a) positive charge
(b) negative charge.

When a metal rod held in hand and rubbed with wool will not show any sign of being charged. However, if a metal rod with a wooden or plastic handle is rubbed without touching its metal part, it shows signs of charging. Some substance readily allow passage of electricity through them, others do not. Those which allow electricity to pass through them easily are called CONDUCTOR. They have electric charges (electron) that are comparatively free to move inside the materials. Metals, human and animal bodies and earth are conductors. Most of the non-metals like glass, plastic, nylon, wood offer high resistance to the passage of electricity through them. They called INSULATOR.

THEORY
The force of attraction or repulsion between two point charges is directly proportional to the product of charges and inversely proportional to the square of distance between them this is Coulomb's law. As shown in Equation (1)

$$F = k\frac{q_1 q_2}{r^2} \qquad (1)$$

Where, $k=\frac{1}{4\pi\varepsilon}$ is constant of proportionality; r is distance between the charges; ε is permittivity of medium between the charges. If ε_0 is permittivity of free space and K the dielectric constant of medium, then $\varepsilon = k\varepsilon_0$
If we have several point charges $q_1, q_2, q_3, \ldots, q_n$ at distance $r_1, r_2, r_3, \ldots, r_n$ from Q, the total force on Q is evidently

$$F = F_1 + F_2 + \ldots = \frac{1}{4\pi\varepsilon_0}\frac{q_1}{r_1^2}Q + \frac{q_2}{r_2^2}Q + \ldots$$

$$E(r) = \frac{1}{4\pi\varepsilon_0}\sum_{i=1}^{n}\frac{q_1}{r_i^2}$$

$$\boxed{F = QE}$$

E is called the Electric field. E(r) is the force per unit charge. Electrostatic is all about static electricity. Electric charge produces electric field. Static electricity work best, with poor conductor of electricity you also call them insulator. Electrostatic is also useful in photocopies. Electric field is imaginary lines, the tangent to which, at any point, gives the direction of the electric field. Accordingly nearer the electric field lines, stronger is the electric field.

There are three types of charge distribution-
1) Linear charge distribution (λ) – In this charge is distributed uniformly along the line.
2) Surface charge density (σ) – In this charge is distributed over the surface.
3) Volume charge density (ρ) - In this charge is distributed within the surface.

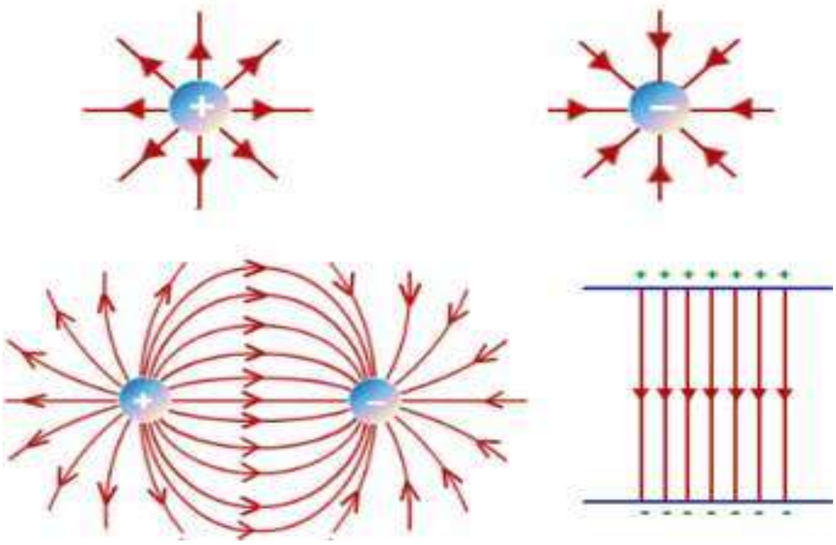
ISSN 2349-6193
Impact Factor: 3.866
IJESMR
International Journal of Engineering Sciences & Management Research

What is electric field at point 'P' (P lies outside the surface) -

1) Due to point charge $\vec{E} = \frac{k\,Q}{r^2}\hat{r}$
2) Due to ring $\vec{E} = \frac{k\lambda z(2\pi r)}{(z^2 + r^2)^{3/2}}\hat{r}$
   (a) $\vec{E} = 0$ (inside)
   (b) $\vec{E} = \frac{KQ}{Z^2}\hat{z}$ (outside)
3) Due to disc $\vec{E} = 2k\pi\sigma\left(1 - \frac{z}{\sqrt{z^2+r^2}}\right)\hat{z}$
4) Due to spherical shell (conductor) -
   (a) $\vec{E} = 0$ (inside)
   (b) $\vec{E} = \frac{\sigma}{\varepsilon_0}\frac{R^2}{r^2}\hat{r}$ (outside)
5) Due to solid sphere -
   (a) $\vec{E} = \rho\frac{r}{3\varepsilon_0}\hat{r}$ (inside)
   (b) $\vec{E} = \frac{\rho}{3\varepsilon_0}\frac{R^3}{r^2}\hat{r}$ (outside)
6) Due to solid cylinder -
   (a) $\vec{E} = \rho\frac{r}{2\varepsilon_0}\hat{r}$ (inside)
   (b) $\vec{E} = \frac{\rho}{3\varepsilon_0}\frac{R^2}{r}\hat{r}$ (outside)

CONCLUSION AND DISCUSSION

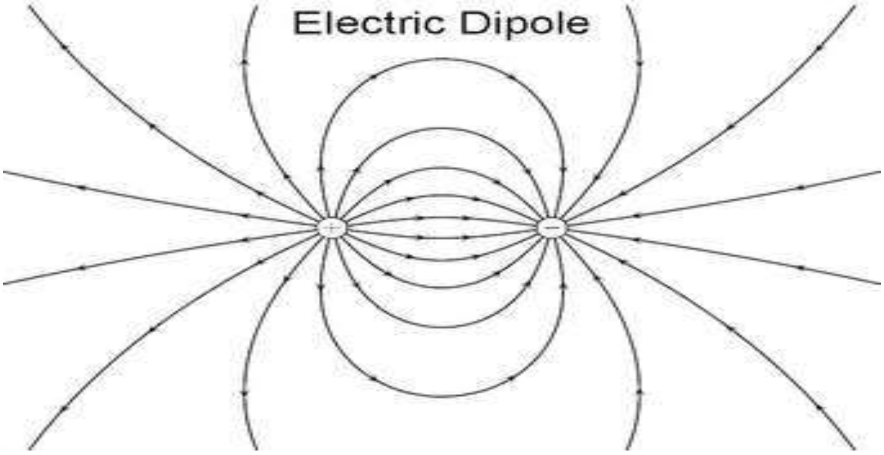
S.I. unit -of electric field is newton per coulomb. Additionally, I have learned to determine the electric field of an object and the direction of electric field. Electric fields never move and never intersect each other. When the electric field is strong then electric field lines will either be dense or rare. When electric field is weak then electric field lines will be far apart.



q>0 then direction of line is radially outward.
q<0 then direction of line is radially inward.

ISSN 2349-6193
Impact Factor: 3.866

IJESMR
International Journal of Engineering Sciences & Management Research



The pair of equal and opposite charge –q and +q are separated by distance 2a are called electric dipole.

REFERENCE

1. *http://physicsinstitute.org/*
2. *https://xamidea.in/*
3. *https://www.ncertbooks.guru/ncert-books-pdf*
4. *https://en.wikipedia.org/wiki/Electric_dipole_moment*
5. *https://www.khanacademy.org/science/physics/electric-charge-electric-force-and-vol*