

PHYSICS CLASSES

Worksheet - 3

Topic: Electrostatic Force & Field (analytical)

1. What is the dimensional formula for ϵ_0 ?
2. Define dielectric constant of a medium in terms of force between charges?
3. Define permittivity.
4. What is the relevance of large value of $K (=81)$ for water?
5. What is the dielectric constant of a metal?
6. What does $q_1 + q_2 = 0$ signify in electro statics?
7. Ordinary rubber is an insulator. But the special rubber tyres of air crafts are made slightly conducting .Why is this necessary?
8. Can two similarly charged balls attract each other?
9. What is the importance of Coulomb's law of electric force in vector form?
10. What is the basic cause of quantization of charge?
11. In an electric field an electron is kept freely. If the electron is replaced by a proton, what will be the relationship between the forces experienced by them?
12. Sketch the electric lines of force due to (i) $q > 0$ and (ii) $q < 0$
13. Draw lines of force to represent a uniform electric field.
14. Sketch the electric lines of force for two positive charges
15. Draw electric lines of force due to an electric dipole.
16. What is an ideal dipole?
17. What is the nature of symmetry of the dipole field?
18. How does a torque affect the dipole in an electric field?
19. Which rule gives you the direction of torque?
20. What is the nature of symmetry of field due to a point charge?
21. What orientations of an electric dipole in a uniform electric field corresponds to its
(i) Stable equilibrium (ii) unstable equilibrium
22. A small test charge is released at rest at a point in an electrostatic field configuration. Will it travel along the line of force passing through that point?
23. We know that electric field is discontinuous across the surface of a charged conductor. Is electric potential also discontinuous there?
24. Two large conducting spheres carrying charges Q_1 and Q_2 are brought close to each other. Is the magnitude of electrostatic force between them exactly given by $\frac{Q_1 Q_2}{4\pi r^2 \epsilon_0}$ where r is distance between their centres.
25. Draw the variation of electric field intensity E with distance from the centre of a uniformly charged spherical shell.
26. Two protons A and B are placed between two parallel plates having a potential difference V as shown in the figure Will these protons experience equal or unequal force?
27. A spherical conducting shell of inner radius r_1 and outer radius r_2 has a charge Q .
 - (a) Show that the field inside the cavity is zero.
 - (b) A charge q is placed at the centre of the shell. What is the surface charge density on the inner and outer surfaces of the shell?
 - (c) Is the electric field inside a cavity (with no charge) zero, even if the shell is not spherical; but had any irregular shape? Explain.
28. Two charged conducting spheres of radii a and b are connected to each other by a wire. What is the ratio of electric fields at the surfaces of two spheres ?Use the result obtained to explain why charge density on the sharp and pointed ends of a conductor is higher than on its flatter portions?