

Electric Charges and Fields (MCQs)

(Total Questions: 50)

- Three point charges $+q$, $-2q$, and $+q$ are placed at the corners of an equilateral triangle. Find the net dipole moment of the system and its direction:
(a) $\sqrt{3}qa$ upward (b) $\sqrt{3}qa$ downward (c) $2qa$ to the right (d) zero
- An infinite number of charges each of $1 \mu\text{C}$ are placed at $x = 1, 2, 4, 8, \dots$ on x-axis. Find the net force on $1 \mu\text{C}$ charge at origin:
(a) 9000 N (b) 12000 N (c) 24000 N (d) 3600 N
- Two equal and opposite charges $2 \times 10^{-10} \text{ C}$ placed 1 cm apart in a uniform electric field of $2 \times 10^5 \text{ N/C}$. Find maximum torque on dipole:
(a) $2\sqrt{2} \times 10^{-6} \text{ Nm}$ (b) $8 \times 10^8 \text{ Nm}$ (c) $4 \times 10^{-9} \text{ Nm}$ (d) $4 \times 10^{-7} \text{ Nm}$
- Find the electric flux through one face of cube if a charge Q is placed at centre:
(a) Q/ϵ_0 (b) $Q/2\epsilon_0$ (c) $Q/4\epsilon_0$ (d) $Q/6\epsilon_0$
- If a point charge is enclosed by a Gaussian surface of radius R , what will be flux if radius is doubled?
(a) Halved (b) Doubled (c) Same (d) Zero
- A dipole of dipole moment P is placed in a uniform electric field E , then torque acting on it is:
(a) $P \cdot E$ (b) $P \times E$ (c) $P + E$ (d) $P - E$
- A comb when run through dry hair attracts small bits of paper. This is due to:
(a) Comb is a good conductor (b) Paper is a good conductor (c) Paper gets induced by the charged comb (d) Comb possesses magnetic properties
- Two point charges separated by a distance d repel each other with a force of 9 N. If the separation becomes $3d$, the force of repulsion will be:
(a) 1 N (b) 3 N (c) 6 N (d) 27 N
- Two charges of equal magnitudes are kept at a distance r . If charges are halved and distance is doubled, the new force is:
(a) $F/8$ (b) $F/4$ (c) $4F$ (d) $F/16$
- If Q is situated at the centre of a cube, then the electric flux through one face is:
(a) Q/ϵ_0 (b) $Q/2\epsilon_0$ (c) $Q/4\epsilon_0$ (d) $Q/6\epsilon_0$
- Which of the following is not a property of electric field lines?
(a) Field lines are continuous (b) Two field lines cannot cross (c) Field lines start at +ve and end at -ve charge (d) Field lines form closed loops
- An electric dipole of moment p is lying along a uniform electric field E . The work done in rotating the dipole by 90° is: (a) pE (b) $\sqrt{2} pE$ (c) $pE/2$ (d) $2pE$
- The S.I. units of $k = 1/4\pi\epsilon_0$ are:
(a) $\text{C}^2\text{N}^{-1}\text{m}^{-2}$ (b) Nm^2C^{-2} (c) Nm^2C^2 (d) None of these
- Electric field due to infinite long wire is proportional to: (a) r^3 (b) $1/r^3$ (c) $1/r^2$ (d) $1/r$

15. A charge q is placed at the centre of the line joining two equal positive charges Q . System is in equilibrium if q is:
(a) $-Q/4$ (b) $+Q$ (c) $-Q$ (d) $Q/2$
16. In a hydrogen atom, the electrical force between electron and proton separated by 2.5×10^{-11} m is:
(a) 2.8×10^{-7} N (b) 6.2×10^{-7} N (c) 3.7×10^{-7} N (d) 9.1×10^{-7} N
17. The maximum charge that can be given to a sphere of diameter 5 m in air is:
(a) 2×10^{-2} C (b) 2×10^{-3} C (c) 2×10^{-4} C (d) 2×10^{-5} C
18. What is the angle between the dipole moment and the electric field on equatorial line?
(a) 0° (b) 90° (c) 180° (d) None of these
19. Field lines between two charges bend towards each other. Which combination is correct?
(a) Both +ve (b) Upper +ve and lower -ve (c) Upper -ve and lower +ve (d) Both -ve
20. The flux linked with the cube if a charge q is placed at center of cube with side L is:
(a) $q/6L^2\epsilon_0$ (b) $q/L^2\epsilon_0$ (c) q/ϵ_0 (d) Zero
21. A comb attracting bits of paper is an example of:
(a) Magnetic property (b) Induction (c) Good conductor property (d) Friction
22. Three charges $+q$, $-2q$ and $+q$ are placed at corners of an equilateral triangle. The dipole moment direction is:
(a) $\sqrt{2}q$ along x-axis (b) $\sqrt{2}q$ along y-axis (c) $x = 0, y = a/2$ (d) $x = 0, y = 0$
23. Total electric flux out of cube with 8 dipoles of charge $\pm e$: (a) 0 (b) ∞ (c) e (d) $-e$
24. The number of electrons removed to produce a charge of 1×10^{-7} C is:
(a) 6.25×10^{11} (b) 6.45×10^{13} (c) 6.25×10^{-11} (d) 6.45×10^{-13}
25. The electrostatic force between two charges varies as:
(a) r^2 (b) r^{-1} (c) r (d) r^{-2}
26. The electric field required to suspend a water drop of mass m with charge e is:
(a) mg (b) mg/e (c) emg (d) e/mg
27. Two equal and opposite charges of 2×10^{-10} C are 1 cm apart. The max torque in field 2×10^5 N/C is:
(a) $2\sqrt{2} \times 10^{-6}$ Nm (b) 8×10^8 Nm (c) 4×10^{-9} Nm (d) 4×10^{-7} Nm
28. The dielectric constant K of a metal is:
(a) 1 (b) >1 (c) 0 (d) Infinite
29. Two spheres of $10 \mu\text{C}$ and $40 \mu\text{C}$ are 90 cm apart. Electric field is zero at what distance from A?
(a) 22.5 cm (b) 18 cm (c) 30 cm (d) 36 cm
30. The law of force between two charges was discovered by:
(a) Ampere (b) Faraday (c) Ohm (d) Coulomb
31. A charge q placed at cube center. Total flux coming out of the cube is: (a) 0 (b) ∞ (c) e (d) $-e$

32. Electrons remain bound to nucleus due to which force?
(a) Electrostatic (b) van der Waal (c) Gravitational (d) Nuclear
33. The torque on a dipole in uniform electric field is maximum when angle is:
(a) 0° (b) 90° (c) 45° (d) 180°
34. Dimensions of Electric Field Intensity in M, L, T, Q are:
(a) $ML^2T^{-2}Q$ (b) $MLT^{-2}Q^{-1}$ (c) $M^2LT^{-2}Q^{-1}$ (d) $ML^2T^{-2}Q^{-1}$
35. Work done in rotating dipole by 180° in uniform field:
(a) Zero (b) $2pE$ (c) pE (d) $pE \cos\theta$
36. Which force is responsible for attraction between electron and proton in H-atom?
(a) Magnetic (b) Electrostatic (c) Nuclear (d) Gravitational
37. Electric flux due to charge enclosed in surface S is:
(a) $3q/\epsilon_0$ (b) $2q/\epsilon_0$ (c) q/ϵ_0 (d) Zero
38. A body with negative charge implies:
(a) Lost neutrons (b) Lost protons (c) Acquired electrons (d) Acquired protons
39. A point charge is enclosed by Gaussian spherical surface. If radius is doubled, flux is:
(a) Halved (b) Doubled (c) Same (d) Becomes zero
40. Direction of electric field lines is from:
(a) + to - (b) - to + (c) Both (d) Radial
41. Direction of force is direction of:
(a) Velocity (b) Acceleration (c) Displacement (d) Charge
42. Field inside a conductor is:
(a) Zero (b) Constant (c) Infinite (d) Non-uniform
43. Electric field is maximum at:
(a) Midpoint of +q and -q (b) At +q (c) At -q (d) Equator of dipole
44. Work done in moving a charge in equipotential surface:
(a) Positive (b) Zero (c) Negative (d) Depends on path
45. Force between two like charges is:
(a) Attractive (b) Repulsive (c) Zero (d) Directionless
46. Which one is not scalar?
(a) Charge (b) Potential (c) Electric field (d) Energy
47. Electric field lines give idea of:
(a) Field direction (b) Charge quantity (c) Field strength (d) Both (a) and (c)
48. A positive test charge is placed at rest in a field. It will move:
(a) Toward +ve charge (b) Away from -ve (c) Along field lines (d) Opposite to lines

49. What happens to electric force if distance is doubled?
 (a) Doubled (b) Halved (c) Becomes 1/4 (d) Becomes 4 times

50. A charged body is touched to an uncharged one. It transfers:
 (a) All charge (b) Half charge (c) Depends on mass (d) No charge

Answer Key

1. a 2. b 3. a 4. d 5. c
 6. b 7. c 8. a 9. a 10. d
 11. d 12. a 13. b 14. d 15. a
 16. c 17. b 18. b 19. b 20. c
 21. b 22. c 23. a 24. a 25. d
 26. b 27. a 28. d 29. a 30. d
 31. a 32. a 33. b 34. b 35. b
 36. b 37. c 38. c 39. c 40. a
 41. b 42. a 43. a 44. b 45. b
 46. c 47. d 48. c 49. c 50. b

Some Additional Questions

1. Three infinitely long charged sheets having charge densities $-\sigma$, -2σ , and σ are placed as shown. The electric field at point P is

(a) $\frac{2\sigma}{\epsilon_0} \hat{k}$

(b) $\frac{4\sigma}{\epsilon_0} \hat{k}$

(c) $-\frac{2\sigma}{\epsilon_0} \hat{k}$

(d) $-\frac{4\sigma}{\epsilon_0} \hat{k}$



2. Three nonconducting large parallel plates have surface charge densities σ , -2σ and 4σ respectively as shown in figure. The electric field at the point P is :

(a) $\frac{3\sigma}{2\epsilon_0}$

(b) $\frac{3\sigma}{\epsilon_0}$

(c) $\frac{\sigma}{\epsilon_0}$

(d) $\frac{\sigma}{2\epsilon_0}$



3. An imaginary, closed spherical surface S of radius R is centered on the origin. A positive charge $+q$ is originally at the origin and electric flux through the surface is ϕ_E . Three additional charges are now added along the x axis : $-3q$ at $x = -\frac{R}{2}$, $+5q$ at $x = \frac{R}{2}$ and $4q$

at $x = \frac{3R}{2}$. The flux through S is now :

(a) $3\phi_E$

(b) $4\phi_E$

(c) $6\phi_E$

(d) $7\phi_E$

4. A sphere of radius R has a uniform distribution of electric charge in its volume. At a distance x from its centre for $x < R$, the electric field is directly proportional to :

(a) $\frac{1}{x^2}$

(b) $\frac{1}{x}$

(c) x

(d) x^2

5. The charged spherical shell of radius 1m does not produce an electric field at any :

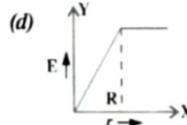
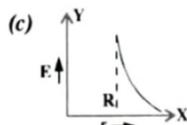
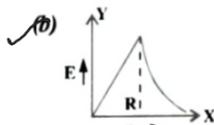
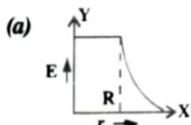
(a) interior point

(b) point beyond 2 m

(c) point beyond 10 m

(d) none of these

6. The electric field E due to a uniformly charged non-conducting sphere of radius R as a function of distance r from its centre is represented by :



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