CHAPTER-1
ELECTRIC CHARGES AND FIELDS
ASSIGNMENT-2

(1 MARK QUESTION)

Q1. Draw a pattern of electric field lines due to two positive charges placed a distance d apart?

Q2. Why do the electrostatic field lines not form closed loop?

Assertions and Reasons

Directions

In the following questions (3-8), a statement of Assertion (A) is followed be a statement of Reason (R). Mark the correct choice as:

(a) If both assertion and reason are true and reason is the correct explanation of the assertion.

(b) If both assertion and reason are true and reason is not the correct explanation of assertion.

(c) If assertion is true but reason is false.

(d) If both assertion and reasons are false.

Q3. **Assertion:** A negative charge in an electric field moves along the direction of the electric field.

Reason: On a negative charge a force acts in the direction of electric field.

Q4. **Assertion:** Acceleration of a charged particle in non-uniform electric field does not depend on velocity of charged particle.

Reason: Charge is an invariant quantity. That is the amount of charge on particle does not depend on frame of reference.

Q5. **Assertion:** Net electric field inside a conductor is zero.

Reason: Total positive charge equals to the total negative charge in a charged conductor.

Q6. **Assertion:** All the charge in a conductor gets distributed on whole of its outer surface.

Reason: In dynamic system charges try to keep their potential energy minimum.

Q7. **Assertion:** The tires of aircrafts are made slightly conducting.

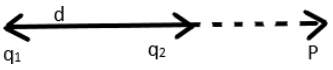
Reason: If a conductor is connected to the ground, the extra charge induced on the conductor will flow to the ground.

Q8. **Assertion:** The Coulomb force is the dominating force in the universe.

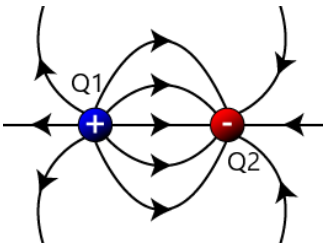
Reason: The Coulomb force is weaker than the gravitational force.

Q9. Draw the pattern of electric field lines when a point charge +Q is kept near an uncharged conducting plate.

Q10. Two point charges q_1 and q_2 are placed at a distance d apart as shown in the fig. The electric filed intensity is zero at the point P on the line joining them as shown. Write two conclusions that you draw from this.

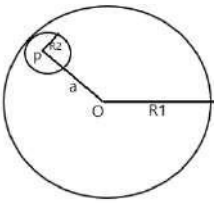


Q11. A few electric field lines for a system of two charges Q_1 and Q_2 are fixed at two different points on the x-axis are shown in the fig. What is the nature of charges?



MCQ Types Question

Q12. Consider a uniform spherical distribution of Radius R1 centered at the origin O. In this distribution, a spherical cavity of Radius R2 centered at P with distance OP=a=R1-R2 is made. If the electric field inside the cavity at position r is E(r), then the correct statement is



(a) $\vec{E}$ is uniform, its magnitude is independent of R2, but its direction depends on r

(b)$\vec{E}$ is uniform, its magnitude depends of R2, but its direction depends on r

(c)$\vec{E}$ is uniform, its magnitude is independent of a, but its direction depends on a

(d)$\vec{E}$ is uniform and both its magnitude and direction depends on a

Q13. The surface densities on the surfaces of two charged spherical conductors of radii R1 and R2 are equal. The ratio of electric field intensity on the surface is

(a) $R1^2/R2^2$ (b) $R2^2/R1^2$ (c) R1/R2 (d) 1:1

Assertion/Reasoning Type MCQ

Q14.**Assertion:** Electric lines of force never cross each other.

Reason : Electric field at a point superimpose to give one resultant electric field.

Q15. **Assertion :** Electric lines of field cross each other.

Reason : Electric field at a point superimpose to give one resultant electric field.

Q16. **Assertion :** The electric lines of forces diverges from a positive charge and converge at

a negative charge.

Reason : A charged particle free to move in an electric field always move along an electric line of force.

Q17. **Assertion :** A negative charge in an field moves along the direction of electric field.

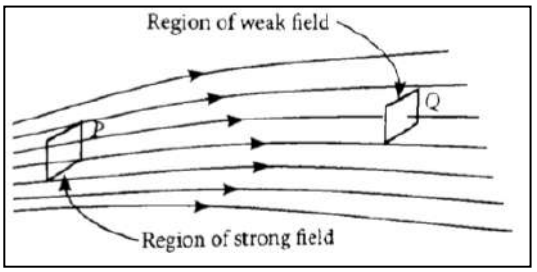
Reason : On a negative charge a force acts in the direction of electric field.

Q18. **Assertion :** In a non-uniform electric field a dipole will have translator as well as rotatory motion

Reason : In a non-uniform electric field a dipole experience a force as well as torque.

Case Study base type question

Electric field strength is proportional to the density of lines of force i.e., electric field strength at a point is proportional to the number of lines of force cutting a unit area element placed normal to the field at that point. As illustrated in given figure, the electric field at P is stronger than at Q.



Q19. Electric field lines are curved

(a) in the field of a single positive or negative charge

(b) in the field of two equal and opposite charges.

(c) in the field of two like charges.

(d) both (b) and (c)

Q20. **E**lectric lines of force about a positive point charge are

(a) radially outwards (b) circular clockwise

(c) radially inwards (d) parallel straight lines

Q21. Which of the following is false for electric lines of force?

(a) They always start from positive charge and terminate on negative charges.

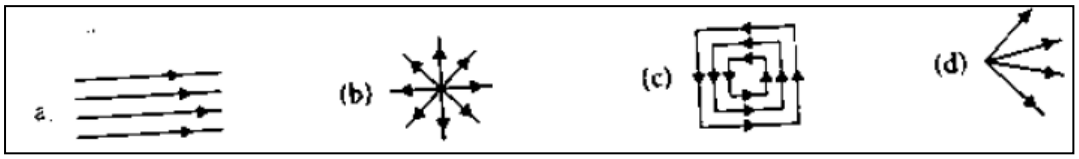
(b) They are always perpendicular to the surface of a charged conductor.

(c) They always form closed loops.

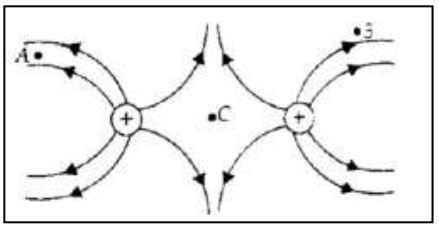
(d) They are parallel and equally spaced in a region of uniform electric field.

Q22. Which one of the following patterns of electric line of force is not possible in field due

to stationary charges?



Q23. The figure below shows the electric field lines due to two positive charges. The magnitudes E_A, E_B and E_C of the electric fields at point A, B and C respectively are related as



(a)$E_A > E_B > E_C$ (b) $E_B > E_A > E_C$

(c) $E_A = E_B > E_C$ (d) $E_A > E_B = E_C$

Q24. A closed surface in vacuum encloses charges -q and +3q. Another charge -2q lies outside the surface. Total electric flux over the surface is

(a) Zero (b) $2q/\epsilon o$ (c) $-3q/\epsilon o$ (d) $4q/\epsilon o$

Q25. The number of electric lines of force radiating from a closed surface in vacuum is 1.13×10^{11}. The charge enclosed by the surface is

(a)1 C (b) 1 μC (c) 0.1 C (d) 0.1 μC

Q26. The value of electric field inside a conducting sphere of radius R and charge Q will be:

(a)$\frac{KQ}{R^2}$ (b) $\frac{KQ}{R}$ (c) Zero (d) $\frac{KQ^2}{R^2}$

Q27. Charge Q is kept in a sphere of 5 cm radius first, then it is kept in a cube of side 15 cm, the outgoing flux will be

(a)More in case of sphere (b)More in case of cube

(c)Same in both cases (d)Information incomplete

Q28. Electric flux is a …….. quantity and its units are …… .

Q29. Net electric flux from a closed surface does not depend upon distribution of ……. inside the surface.

ASSERTION & REASONING

Q30. Assertion- A closed spherical shell has inward electric flux.

Reason- Net charge enclosed inside spherical shell is negative.

Q31. Assertion- Electric field at any point due to infinitely long plain charged sheet is same.

Reason- Electric field at any point due to infinitely long plain charged sheet is expressed as $E=\sigma/\epsilon o$.

Q32. **Assertion-** A charge Q is placed on a height of h/2 above the centre of a square of height h. The charge is displaced to point h/4 below. The flux through the square remains unchanged.

Reason- The flux associated with the square is independent of position of the charge inside cube but depends only on magnitude of charge.

Q33. **Assertion-** Number of electric lines of forces emanating from 1 μ C charge in vacuum is 1.13×10^5.

Reason- This follows from Gauss Theorem in Electrostatics.

Q34. **Assertion-** Electric flux through a given area changes as its orientation with field direction changes.

Reason- $\Phi_E = \oint_s \boldsymbol{E\, dS} \cos\boldsymbol{\theta}$

Q35. **Assertion-** In case of charged spherical shells, E-r graph is discontinuous while V -r graph is continuous.

Reason- According to Gauss's theorem only the charge inside a closed surface can produce electric field at some point.

Q36. **Assertion-** Net electric flux through closed spherical surface of radius 5 cm enclosing charge +q is halved when radius is increased to 10 cm.

Reason- Electric flux through closed surface decreases with increase in its volume if charge enclosed is fixed.

Q37. **Assertion-** Displacing the charges within the closed surface does not affect net electricflux through the closed surface.

Reason- Net electric flux through a closed surface is independent of charge distribution/location within the closed surface.

Two-mark questions

Q38. State the law of conservation of charge. Give two examples to illustrate it.

Q39. How does the speed of an electrically charged particle affects its mass and charge?

Q40. Write Coulombs law in vector form. What is the importance of expressing it in vector form?

Q41. Two-point charge 4μc and 1μc are separated by a distance of 2m in air. Find the point on the line joining charges at which the net electric field of the system is zero.

Q42. Two identical point charges q each are kept 2m apart in air. A third point charge Q of unknown magnitude and sign is placed on the line joining the charges such that the system remains in equilibrium. Find the position and nature of Q.

Q43. Explain briefly, using proper diagram in difference in behavior of conductor and dielectric in the presence of external electric field.

Q44. Write any two properties of electric field lines.

Q45. Three small spheres each of charge +q are placed on circumference of a circle such that they form an equilateral triangle. What is the electric field intensity at the center of the circle?

Q46. A surface element $\vec{dS} = 25\hat{i}$ is placed in an electric field $\vec{E} = 4\hat{i} + 8\hat{j} + 14\hat{k}$ What is the electric flux emanating from the surface?

Q47. An infinite line charge produces a field of 9×10^4 N C-1 at a distance of 0.02 m. Calculate the linear charge density.

Three-mark questions

Q48. Give six properties of electric charges? (Given in NCERT book)

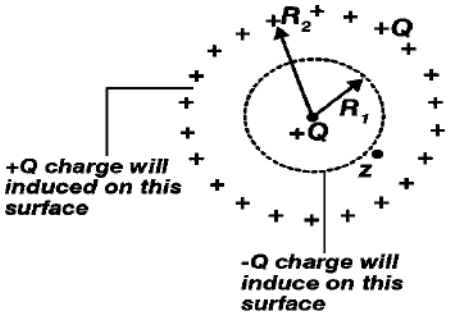
Q49. Two point charges q1 and q2 are located at points (a,0,0) and (0, b, 0) respectively. Find the electric field due to both these charges at the point (0, 0, c).

Q50. The electric field induced in a dielectric when placed in an external field 1/10 times the external field. Calculate relative permittivity of the dielectric.

Q51. S_1 and S_2 concentric spheres such that radius of S_2 is greater than that of S_1 , The spheres enclose charges of Q and 2Q respectively,

1. What is the ratio of electric flux through S_1 and S_2?
2. How will the electric flux through the sphere S_1 change, if a medium of dielectric constant K is introduced in the space inside S_1 in place of air?
3. How will the electric flux through the sphere S_1 change, if a medium of dielectric constant K is introduced in the space inside $S_{2\ in}$ place of air?

Q52. A metallic spherical shell has an inner radius R_1 and outer radius R_2. A charge Q is placed at the centre of the spherical cavity. What will be surface charge density on a) the inner surface b) the outer surface?



Five-mark questions

Q53. (a) Point charge (+Q) is kept in the vicinity of uncharged conducting plate sketch electric field lines between the charge and the plate.

(b) Plot a graph showing the variation of Coulomb force (F) versus $1/r^2$, where r is the distance between two charges of each pair of charges (1μC, 2μC) and (1μC, -3μC). Interpret the graphs.