MULTIPLE CHOICE QUESTIONS

1. If the sizes of charged bodies are very small compared to the distances between them, we treat them as _____.
   a. Zero charges **b. Point charges** c. Single charge d. No charges

2. The force per unit charge is known as _____.
   a. Electric current b. Electric potential **c. Electric field** d. Electric space

3. What is the dielectric constant of a metal?
   a. -1 b. 0 c. 1 **d. Infinite**

4. If the charge of 1 C is placed at a distance of 1 m from another charge of the same magnitude in a vacuum, it experiences an electrical force repulsion of magnitude _____.
   a. $9 \times 10^{-9} N$ **b. $9 \times 10^{9} N$** c. $10 \times 10^{9} N$ d. $10 \times 10^{-9} N$

5. The quantisation of charge indicates that
   a. Charge, which is a fraction of charge on an electron, is not possible
   b. A charge cannot be destroyed
   c. Charge exists on particles
   d. There exists a minimum permissible charge on a particle

6. The property which differentiates two kinds of charges is called _____.
   a. Equality of charge **b. Polarity of charge** c. Fraction of charge d. None of the option

7. _____ gives the information on field strength, direction, and nature of the charge.
   a. Electric current b. Electric flux **c. Electric field** d. Electric potential

8. Choose the correct answer.
   $F = k\left(\frac{q_1 q_2}{r^2}\right)$ This is given by which law?
   a. Faraday's law b. Newton's law **c. Coulomb's law** d. Fleming's law

9. What happens when a glass rod is rubbed with silk?
   a. gains protons from silk b. gains electrons from silk
   c. gives electrons to silk d. gives protons to silk

10. If electric flux through a closed surface is zero. It means that:
   (a) the net charge inside the surface is zero.
   (b) the electric field is necessarily zero at all points on the surface.
   (c) no charge exists inside the surface.
   (d) no charge exists outside the surface.

11. When distance between two charges is reduced to one-half of the original distance, the force between them will remain the same if one of the charges is made:
(a) one fourth **(b) four times** (c) double (d) one-halftimes.

12. A unit Coulomb charge is one which when placed in air at a distance of 1 m from an equal and similar charge repel it with a force of
(a) 9×10^9 N (b) 1 N (c) 1 dyne (d) None of these

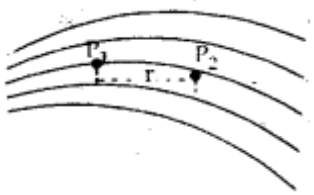
13. When two charged spheres are connected with a wire, the electric charge on them is shared:
(a) inversely as their capacity **(b) equally**
(c) in proportional to their capacity (d) None of these.

14. An electric dipole of moment p is placed in the position of stable equilibrium in a uniform electric field $\vec{E}$. The couple required to rotate it through an angle 6 the initial position is:
(a) -PE cos θ (b) PE tan θ (c) PE cos θ **(d) PE sin θ.**

15. Two point charges each of 20 μC are placed 50 cm apart in air. What is the electric field intensity at the mid point on the line joining the centre of two point charges?
(a) 5×10^6 NC^{-1} (b) 18×10^6 NC^{-1} **(c) Zero** (d) None of these

16. Two charges 10 pC and 5 pC are placed 20 cm apart. The ratio of Coulomb's force experienced by there is:
(a) 2 : 5 **(b) 1 : 1** (c) √3 = √7 (d) None of these

17. The figure here shows electric field lines. The electric field strength at P_1 is E_1 and that at P_2 is E_2 If distance between P_1, P_2 is r, then which of the following statement is true?



(a) $E_1 > E_2$ (b) $E_1 < E_2$ (c) $E_2 = rE_1$ (d) $E_2 = E_1/r^2$

18. The surface charge density oil the copper sphere is σ. The electric field strength on the surface of Sphere of radius r is:
(a) σ2 (b) σ (c) σ2ε0 **(d) σ/ε_0**

17. The position of the charge inside the enclosing surface is changed in such a way that the total charge remains constant. Then the total normal electric flux through the enclosing surface:
(a) increases (b) decreases (c) changes erratically **(d) Remains unchanged.**

18. The gold-leaf electroscope is apparatus to detect
(a) charge on a body is (b) current through wire

(c) voltage across wire (d) intensity of light

19. The SI unit of permittivity of free space(ε_0) is
(a) $C^2 N^{-1}m^{-2}$ (b) $C^2 N^{-1}m$ (c) $C N^{-1}m^{-2}$ (d) no units

20. The charge on a glass rod rubbed with silk is
(a) positive (b) negative
(c) zero (d) positive on one and negative on other end

21. The force per unit charge is known as _____.

a. Electric current (b) Electric potential **(c) Electric field** (d) Electric space

22. What is the dielectric constant of a metal?

a. -1 (b) 0 (c) 1 **(d) Infinite**

23. A body is positively charged, it implies that
(a) there is only positive charge in the body.
(b) there is positive as well as negative charge in the body but the positive charge is more than negative charge
(c) there is equal positive and negative charge in the body but the positive charge lies in the outer regions
(d) negative charge is displaced from its position

24. Quantisation of charge implies
(a) charge cannot be destroyed
(b) charge exists on particles
(c) there is a minimum permissible charge on a particle
(d) charge, which is a fraction of a coulomb is not possible.

25. A positively charged rod is brought near an uncharged conductor. If the rod is then suddenly withdrawn, the charge left on the conductor will be
(a) positive (b) negative **(c) zero** (d) cannot say

26. Two spheres A and B of exactly same mass are given equal positive and negative charges respectively. Their masses after charging
(a) remains unaffected (b) mass of A > mass of B
(c) mass of A < mass of B (d) Nothing can be said

27. When some charge is transferred to …A… it readily gets distributed over the entire surface of … A… If some charge is put on … B…, it stays at the same place. Here, A and B refer to
(a) insulator, conductor **(b) conductor, insulator**
(c) insulator, insulator (d) conductor, conductor

28. What happens when some charge is placed on a soap bubble?

(a) Its radius decreases **(b) Its radius increases**

(c) The bubble collapses (d) None of these

28. Two charges q_1 and q_2 are placed in vacuum at a distance d and the force acting between them is F. If a medium of dielectric constant 4 is introduced around them, the force now will be

(a) F (b) F/2 **(c) F/4** (d) 4F

29. Two similar spheres having +Q and -Q charges are kept at a certain distance. F force acts between the two. If at the middle of two spheres, another similar sphere having +Q charge is kept, then it experiences a force in magnitude and direction as

(a) zero having no direction. (b) 8F towards +Q charge.

(c) 8F towards -Q charge. (d) 4F towards +Q charge.

30. Two charges of equal magnitudes kept at a distance r exert a force F on each other. If the charges are halved and distance between them is doubled, then the new force acting on each charge is

(a) $\frac{F}{8}$ (b) $\frac{F}{4}$

(c) $4F$ (d) $\frac{F}{16}$

31. **The electric field inside a spherical shell of uniform surface charge density is**

(a) zero.

(b) constant, less than zero.

(c) directly proportional to the distance from the centre.

(d) none of the these

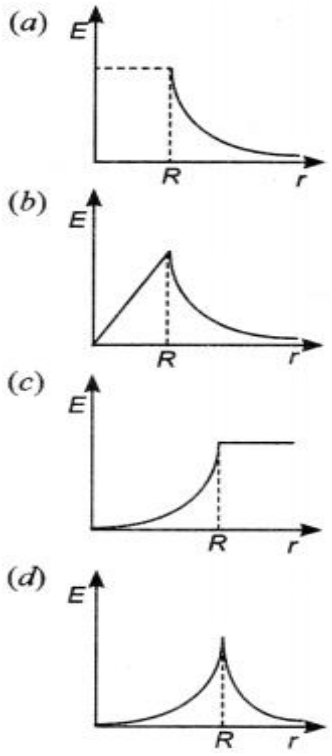
32. **The electric field intensity due to an infinite cylinder of radius R and having charge q per unit length at a distance air r (r > R) from its axis is**

(a) directly proportional to r^2. (b) directly proportional to r^3.

(c) inversely proportional to r. (d) inversely proportional to r^2.

33. Which of the following graphs shows the variation of electric field E due to a hollow spherical conductor of radius R as a function of distance from the centre **of the**

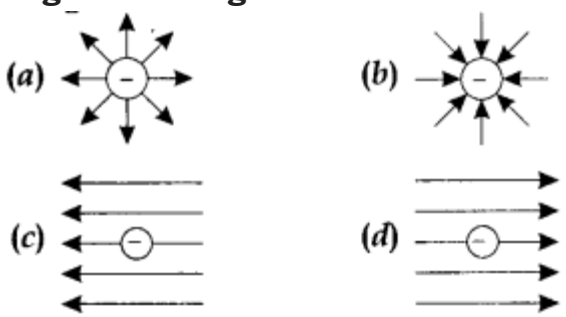
sphere?



34. Which of the following statement is correct? The electric field at a point
    (a) always continuous.
    (b) continuous if there is a charge at that point.
    (c) discontinuous only if there is a negative charge at that point.
    (d) discontinuous if there is a charge at that point.

35. A point charge +q is placed at a distance d from an isolated conducting plane. The field at a point P on the other side of the plane is [NCERT Exemplar]
    (a) directed perpendicular to the plane and away from the plane.
    (b) directed perpendicular to the plane but towards the plane.
    (c) directed radially away from the point charge.
    (d) directed radially towards the point charge.

36. **Which of the following figures represent the electric field lines due to a single negative charge?**

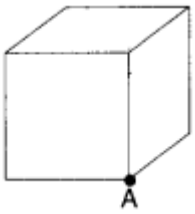


37. The unit of electric dipole moment is
    (a) newton (b) coulomb (c) farad **(d) debye (coulomb meter)**

38. Consider a region inside which, there are various types of charges but the total charge is zero. At points outside the region
(a) the electric field is necessarily zero.
(b) the electric field is due to the dipole moment of the charge distribution only.
(c) the dominant electric field is inversely proportional to r^3, for large r (distance from origin).
(d) the work done to move a charged particle along a closed path, away from the region will not be zero.

39. The surface considered for Gauss's law is called
(a) Closed surface (b) Spherical surface **(c) Gaussian surface** (d) Plane surface

40. The total flux through the faces of the cube with side of length a if a charge q is placed at corner A of the cube is



(a) $\frac{q}{8\varepsilon_0}$ (b) $\frac{q}{4\varepsilon_0}$
(c) $\frac{q}{2\varepsilon_0}$ (d) $\frac{q}{\varepsilon_0}$

41. Which of the following statements is not true about Gauss's law?
(a) Gauss's law is true for any closed surface.
(b) The term q on the right side side of Gauss's law includes the sum of all charges enclosed by the surface.
(c) Gauss's law is not much useful in calculating electrostatic field when the system has some symmetry.
(d) Gauss's law is based on the inverse square dependence on distance contained in the coulomb's law

2 MARKS QUESTIONS:

1. State and explain Coulomb's law in electrostatics.
2. Write Coulomb's law in vector form and explain the terms.
3. Define electric flux through an area element. Mention the SI unit of electric flux.
4. Define electric dipole moment. Give its SI unit.
5. Draw electric filed patterns due to (a) isolated positive charge (b) pair of two equal and opposite charges.
6. State and explain state Gauss's law in electrostatics.

3 MARKS QUESTIONS:

1. Give three properties of electric charges.
2. Write any three properties of electric field lines.
3. Name three types of continuous charge distribution.

4. State and explain Coulomb's law in electrostatics. Define '1coulomb'
5. Using Gauss's law obtain the electric field due to an infinitely long straight uniformly charged wire.
6. Using Gauss's law obtain the electric field due to a uniformly charged infinite plane sheet
7. Using Gauss's law obtain the electric field due to a uniformly charged thin spherical shell

5 MARKS PROBLEMS

1. What is the force between two small charged spheres having charges of 2×10^{-7}C and 3×10^{-7}C placed 30 cm apart in air?
2. The electrostatic force on a small sphere of charge 0.4 mC due to another small sphere of charge –0.8 mC in air is 0.2 N. (a) What is the distance between the two spheres? (b) What is the force on the second sphere due to the first?
3. Four point charges q_A = 2 mC, q_B = –5 mC, q_C = 2 mC, and q_D = –5 mC are located at the corners of a square ABCD of side 10 cm. What is the force on a charge of 1 mC placed at the centre of the square?
4. Two point charges q_A = 3 mC and q_B = –3 mC are located 20 cm apart in vacuum. (a) What is the electric field at the midpoint O of the line AB joining the two charges? (b) If a negative test charge of magnitude 1.5×10^{-9} C is placed at this point, what is the force experienced by the test charge?
5. A system has two charges $q_A = 2.5 \times 10^{-7}$ C and $q_B = -2.5 \times 10^{-7}$ C located at points A: (0, 0, –15 cm) and B: (0,0, +15 cm), respectively. What are the total charge and electric dipole moment of the system?
6. An electric dipole with dipole moment 4×10^{-9} C m is aligned at 30° with the direction of a uniform electric field of magnitude 5×10^{4} NC^{-1} . Calculate the magnitude of the torque acting on the dipole.
7. Consider a uniform electric field E = 3 × 103 î N/C. (a) What is the flux of this field through a square of 10 cm on a side whose plane is parallel to the yz plane? (b) What is the flux through the same square if the normal to its plane makes a 60° angle with the x-axis?