CHAPTER WISE TEST

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CHAPTER TEST (NEET UG-2025)

Electric Charges and Fields

Subject: Physics **NEET - P - CT - 15**

Time Allowed: 60 min **Maximum Marks – 180**

Instructions for the candidate:

The paper consists of 50**(fifty)** Questions, which are divided in to Two sections

(a) Section A shall consist of 35**(Thirty-five)** Questions. in which all questions are compulsory

(b) Section B shall consist of 15 **(fifteen)** Questions. in which any 10**(Ten)** of them should be answered.

PHYSICS Section - A (Q. No. 1 to 35)

1. The surface considered for Gauss's law is called:
   (1) Plane surface
   (2) Closed surface
   (3) Gaussian surface
   (4) Spherical surface

2. The magnitude of the electric field due to a point charge object at a distance of 4.0 m is 9 N/C. From the same charged object, the electric field of magnitude, $16\frac{N}{C}$ will be at a distance of
   (1) 3 m (2) 1 m
   (3) 6 m (4) 2 m

3. A charge Q is divided into two parts of q and Q, - q. If the coulomb repulsion between them when they are separated is to be maximum, the ratio of $\frac{Q}{q}$ should be
   (1) $\frac{1}{4}$ (2) 2 (3) $\frac{1}{2}$ (4) 4

4. A charge q is located at the centre of a cube. The electric flux through any face is
   (1) $\frac{1}{6}\frac{4\pi q}{4\pi\varepsilon_0}$ (2) $\frac{2\pi q}{6(4\pi\varepsilon_0)}$
   (3) $\frac{\pi q}{6(4\pi\varepsilon_0)}$ (4) $\frac{q}{6(4\pi\varepsilon_0)}$

5. The frequency of oscillation of an electric dipole moment having dipole moment p and rotational inertia I, oscillating in a uniform electric field E, is given by
   (1) $\frac{1}{2\pi}\sqrt{\frac{I}{pE}}$ (2) $\frac{1}{2\pi}\sqrt{\frac{pE}{I}}$
   (3) $(2\pi)\sqrt{\frac{I}{pE}}$ (4) $(2\pi)\sqrt{\frac{pE}{I}}$

6. Under the influence of the coulomb field of charge +Q, a charge - q is moving around it in an elliptical orbit. Find out the correct statement(s).
   (1) The linear momentum of the charge - q is constant
   (2) The angular velocity of the charge - q is constant

(3) The linear speed of the charge - q is constant
(4) The angular momentum of the charge - q is constant

7. Consider a uniform electric field $E = 3 \times 10^3 N/C$ .What is the flux of this field through a square of 10 cm on a side whose plane is parallel to the yz plane?
(1) $30 Nm^2/C$ (2) $20 Nm^2/C$
(3) $40 Nm^2/C$ (4) $25 Nm^2/C$

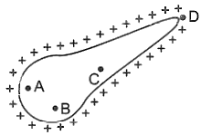
8. A small uncharged metallic sphere is positioned exactly at a point midway between two equal and opposite point charges. If the sphere is slightly displaced towards the positive charge and released, then
(1) it will move further towards the positive charge
(2) its total energy remains constant but it non - zero
(3) it will oscillate about its original position
(4) its electric potential energy will decrease and kinetic energy will increase

9. The force per unit charge is known as
(1) electric potential (2) electric field
(3) electric current (4) electric flux

10. Two small charged spheres A and B have charges 10μ C and 40 μ C respectively and are held at a separation of 90 cm from each other. At what distance from A, the electric intensity would be zero?
(1) 30 cm (2) 22.5 cm
(3) 18 cm (4) 36 cm

11. A uniformly charged conducting sphere of 2.4 m diameter has a surface charge density of $80.0 \mu C/m^2$. Find the charge on the sphere.
(1) $1.25 \times 10^{-3} C$ (2) $1.55 \times 10^{-3} C$
(3) $1.45 \times 10^{-3} C$ (4) $1.35 \times 10^{-3} C$

12. For the isolated charged conductor of given figure, the electric fields at points A, B, C and D are E_A , E_B , E_C and E_D respectively. Then:



(1) $E_D > E_A = E_B = E_C = 0$
(2) $E_B = 0, E_A = E_C = E_D$
(3) $E_A = E_B = E_C > E_D$
(4) $E_A = E_B > E_C > E_D$

13. 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, - 15cm) and B (0, 0, +15cm), respectively. What are the total charge and electric dipole moment of the system?
(1) zero, $8.5 \times 10^{-8} Cm$
(2) zero, $6.5 \times 10^{-8} Cm$
(3) zero, $7.5 \times 10^{-8} Cm$
(4) zero, $5.5 \times 10^{-8} Cm$

14. A charge Q is placed at the mouth of a conical flask. The flux of the electric field through the flask is
(1) $\frac{Q}{\epsilon_0}$ (2) zero
(3) $\frac{Q}{2\epsilon_0}$ (4) $\frac{Q^2}{2\epsilon_0}$

15. A half ring of radius R has a charge per unit length equal to λ . The field at the center is
(1) zero (2) $\frac{2\lambda}{4\pi\varepsilon_0 R}$
(3) $\frac{\lambda}{4\pi\varepsilon_0 R}$ (4) $\frac{3\lambda}{4\pi\varepsilon_0 R}$

16. A hollow spherical conductor of radius 2m carries a charge of 500μ C. Then electric field strength at its surface is
(1) $1.125 \times 10^6 N/C$ (2) Zero
(3) $4.5 \times 10^6 N/C$ (4) $2.25 \times 10^6 N/C$

17. There is a uniform field of strength $10^3 Vm^{-1}$ along the y - axis. A body of mass 1g and charge 10^{-6} C is projected into the field from the origin along the positive x - axis with a velocity of $10ms^{-1}$. Its speed after 10 sec is

(1) $10\sqrt{2}$ (2) 20

(3) $5\sqrt{2}$ (4) 10

18. There are two kinds of charges - positive charge and negative charge. The property which differentiates the two kinds of charges is called

(1) strength of charge
(2) field of charge
(3) amount of charge
(4) polarity of charge

19. Two infinitely long parallel conducting plates having surface charge densities $+\sigma$ and $-\sigma$ respectively are separated by a small distance. The medium between the plates is a vacuum. If ε_0 is the dielectric permittivity of vacuum, then the electric field in the region between the plates is

(1) 0 Vm^{-1} (2) $\frac{\sigma}{\varepsilon_0}$ Vm^{-1}

(3) $\frac{2\sigma}{\varepsilon_0}$ Vm^{-1} (4) $\frac{\sigma}{2\varepsilon_0}$ Vm^{-1}

20. Consider a neutral conducting sphere. A positive point charge is placed outside the sphere. Then the net charge on the sphere is -

(1) Negative and distributed uniformly over the surface of the sphere
(2) Negative and distributed non–uniformly over the entire surface of the sphere
(3) Negative and appears only at the point on the sphere closest to the point charge
(4) Zero

21. 2 equal and opposite charges of 2×10^{-10} C are placed at a distance of 1 cm forming a dipole and are placed in an electric field of 2×10^5 N/C. The maximum torque is;

(1) 4×10^{-7} Nm
(2) 8×10^{8} Nm
(3) $2\sqrt{2} \times 10^{-6}$ Nm
(4) 4×10^{-9} Nm

22. A point charge is situated at an axial point of a small electric dipole at a large distance from it. The charge experiences a force F. If the distance of the charge is doubled, the force acting on the charge will become

(1) $\frac{F}{2}$ (2) $\frac{F}{8}$ (3) 2F (4) $\frac{F}{4}$

23. A particle of mass m and charge q is placed at rest in a uniform electric field E and then released, the kinetic energy attained by the particle after moving a distance y, will be

(1) q Ey (2) q^2 Ey

(3) q E^2 y (4) q Ey^2

24. If electric field in a region is radially outward with magnitude E = Ar. The charge contained in a sphere of radius r centred at the origin is:

(1) $4\pi\varepsilon_0 Ar^3$ (2) $\frac{4\pi\varepsilon_0 A}{r^3}$

(3) $\frac{1}{4\pi\varepsilon_0} \cdot \frac{A}{r^3}$ (4) $\frac{1}{4\pi\varepsilon_0} Ar^3$

25. Two equal negative charges - q are fixed at points (0, a) and (0, - a). A positive charge Q is released from rest at the point (2a, 0) on the x - axis. The charge Q will:

(1) Move to origin and remain at rest
(2) Execute oscillation but not SHM
(3) Execute SHM about the origin
(4) Move to infinity

26. A drop of radius one micron carries a charge of 4 electrons. If the density of oil is 2g/cc, the electric field required to balance it is
(1) 14.83×10^4 V/m
(2) 12.83×10^4 V/m
(3) 13.83×10^4 V/m
(4) 12.03×10^4 V/m

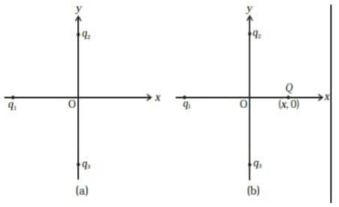
27. Hollow spherical conductor with a charge of 500 C is acted upon by a force 562.5 N. What is E at its surface?
(1) Zero
(2) $4.5 \times 10^{-4} NC^{-1}$
(3) 1.125 NC^{-1}
(4) $2.25 \times 10^{6} NC^{-1}$

28. A point P lies on the perpendicular bisect of an electric dipole of dipole moment p. If the distance of P from the dipole is r (much larger than the size of the dipole), then the electric field at P is proportional to
(1) p and r^{-2}
(2) p and r^{-3}
(3) p^2 and r^{-3}
(4) p^{-1} and r^{-2}

29. If E_1 be the electric field strength of a short dipole at a point on its axial line and E_2 that on the equatorial line at the same distance, then
(1) $E_1 \neq E_2$ (2) $E_1 = E_2$
(3) $E_2 = 2E_1$ (4) $E_1 = 2E_2$

30. An electric dipole of length 2 cm is placed at an angle of 30^o with an electric field 2×10^5 N/C. If the dipole experiences a torque of 8×10^{-3} Nm, the magnitude of charge is;
(1) 8 mC (2) 4μ C
(3) 2 mC (4) 7μ C

31. In Fig, two positive charges q_2 and q_3 fixed along the y axis, exert a net electric force in the + x direction on a charge q_1 fixed along the x axis. If a positive charge Q is added at (x, 0), the force on q



(1) shall increase along the positive x - axis.
(2) shall point along the negative x - axis.
(3) shall decrease along the positive x - axis.
(4) shall increase but the direction changes because of the intersection of Q with q_2 and q_3.

32. If an electron is accelerated by $8.8\times 10^{14} m/s^2$, then electric field required for this acceleration is
(1) 54 Vcm^{-1} (2) 50 Vcm^{-1}
(3) 52 Vcm^{-1} (4) 56 Vcm^{-1}

33. An electron falls from rest through a vertical distance h in a uniform and vertically upward - directed electric field E. The direction of the electric field is now reversed, keeping its magnitude the same. A proton is allowed to fall from rest in it through the same vertical distance h. The time of fall of the electron, in comparison to the time of fall of the proton is
(1) 5 times greater
(2) equal
(3) 10 times greater
(4) smaller

34. Two charged spheres separated at a distance d exert a force F on each other. If they are immersed in a liquid of dielectric constant 2, then the force (if all conditions are same) is
(1) $\frac{F}{2}$ (2) 4F
(3) F (4) 2F

35. When 10^{19} electrons are removed from a neutral metal plate, the electric charge on it is
(1) - 1.6 C (2) 10^{+19} C
(3) +1.6 C (4) 10^{-19} C

PHYSICS Section - B (Q. No. 36 to 50)

36. An electric dipole coincides on Z - axis and its midpoint is on the origin of the coordinate system. The electric field at an axial point at a distance z from the origin is E_z and the electric field at an equatorial point at a distance y from the origin is E_y.
Here z = y >> α, so $\frac{|E_z|}{|E_y|}$ is equal to
(1) 2 (2) 4
(3) 1 (4) 3

37. An infinitely long uniformly charged wire produces an electric field of 18×10^{4} NC^{-1} at a distance of 1.0 cm. The linear charge density on the wire is:
(1) 1.12×10^{-14} Cm^{-1}
(2) 3.08×10^{-15} Cm^{-1}
(3) 1.0×10^{-9} Cm^{-1}
(4) 1.0×10^{-7} Cm^{-1}

38. The magnitude of electric field due to a point charge 2q, at distance r is E. Then the magnitude of electric field due to a uniformly charged thin spherical shell of radius R with total charge q at a distance $\frac{r}{2}$ (r > > R) will be
(1) 0 (2) 2E
(3) $\frac{E}{4}$ (4) 4

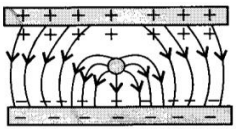
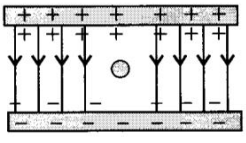
39. A pendulum bob of mass m carrying a charge q is at rest with its string making an angle θ with the vertical in a uniform horizontal electric field E. The tension in the string is
(1) $\frac{qE}{cos\theta}$ (2) mg
(3) $\frac{qE}{sin\theta}$ (4) $\frac{mg}{sin\theta}$

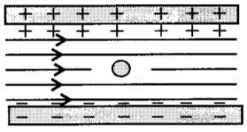
40. A charged oil drop is suspended in uniform field of 3×10^{4} V m^{-1} so that it neither falls nor rises. The charge on the drop will be: (take the mass of the charge 9.9×10^{-15} kg and g =10 ms^{-2})
(1) $3\cdot 3\times 10^{-18}$ C (2) $4\cdot 8\times 10^{-18}$ C
(3) $1\cdot 6\times 10^{-18}$ C (4) $4\cdot 3\times 10^{-18}$ C

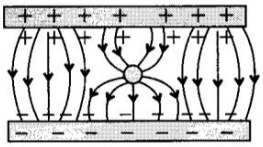
41. A conducting sphere of radius 10 cm has an unknown charge. If the electric field 20 cm from the centre of the sphere is 1.5×10^{3}N/C and points radially inward, what is the net charge on the sphere?
(1) - 6.67 nC (2) 7.67 nC
(3) 7.27 nC (4) 6.27 Nc

42. SI unit of permittivity is
(1) C^2 m^2 N^{-1} (2) C^2 m^{-2} N^{-1}
(3) C^{-1} m^2 N^{-2} (4) C^2 m^2 N^2

43. A point charge causes an electric flux of -1.0×10^{3}Nm^2/C to pass through a spherical Gaussian surface of 10.0 cm radius centred on the charge. If the radius of the Gaussian surface were doubled, how much flux would pass through the surface?
(1) -10^{3}Nm^2/C (2) 10^{4}Nm^2/C
(3) 10^{3}Nm^2/C (4) -10^{2}Nm^2/C

44. Which of the diagrams correctly represents the electric field between two charged plates if a neutral conductor is placed in between the plates?
(1) 
(2) 

(3) 

(4) 

45. Two positive ions, each carrying a charge q, are separated by a distance d. If F is the force of repulsion between the ions, the number of electrons missing from each ion will be

(1) $\sqrt{\frac{4\pi\varepsilon_0 F e^2}{d^2}}$ (2) $\frac{4\pi\varepsilon_0 F d^2}{e^2}$

(3) $\sqrt{\frac{4\pi\varepsilon_0 F d^2}{e^2}}$ (4) $\frac{4\pi\varepsilon_0 F d^2}{q^2}$

46. If a charge q is placed at the centre of the line joining two equal charges Q such that the system is in equilibrium, then the value of q is:

(1) $-\frac{Q}{2}$ (2) $\frac{Q}{4}$ (3) $-\frac{Q}{4}$ (4) $\frac{Q}{2}$

47. An object has charge of 1 C and gains 5.0×10^{18} electrons. The net charge on the object becomes:

(1) +0.20 C (2) +1.80 C

(3) - 0.80 C (4) +0.80 C

48. Two insulated charged copper spheres A and B have their centres separated by a distance of 50 cm. What is the mutual force of electrostatic repulsion if the charge on each is $6.5\times 10^{-7}\mathrm{C}$? The radii of A and B are negligible compared to the distance of separation.

(1) $3.5\times 10^{-2}\mathrm{N}$ (2) $4.5\times 10^{-2}\mathrm{N}$

(3) $1.5\times 10^{-2}\mathrm{N}$ (4) $2.5\times 10^{-2}\mathrm{N}$

49. What is the net charge on a conducting sphere of radius 10 cm? Given that the electric field 15 cm from the centre of the sphere is equal to $3\times 10^{3}\frac{N}{C}$ and is direct inward.

(1) -7.5×10^{-9} C (2) -7.5×10^{-5} C

(3) 7.5×10^{-5} C (4) 7.5×10^{-9} C

50. An electric dipole with dipole moment 4×10^{-9} Cm is aligned at 30° with the direction of a uniform electric field of magnitude $5\times 10^{4}\mathrm{N/C}$. Calculate the magnitude of the torque acting on the dipole.

(1) $1.0\times 10^{-4}\mathrm{Nm}$

(2) $1.5\times 10^{-8}\mathrm{Nm}$

(3) $2.5\times 10^{-4}\mathrm{Nm}$

(4) $3.5\times 10^{-4}\mathrm{Nm}$

SPACE FOR ROUGH WORK