CBSE

ELECTRIC CHARGES AND FIELDS WS 1

Class 12 - Physics

1. A cup contains 250 g of water. The number of negative charges present in the cup of water is **[1]**

   a) 3.34×10^7 C

   b) 1.34×10^7 C

   c) 1.34×10^{19} C

   d) 1.34×10^{-19} C

2. Two point charges q_1 and q_2 are at separation r. The force acting between them is given by $F = K\frac{q_1 q_2}{r^2}$. The constant K depends upon **[1]**

   a) only on the system of units

   b) neither on only on the system of units nor on only on medium between charges

   c) only on medium between charges

   d) both on only on the system of units and only on medium between charges

3. When the distance between two charged particles is halved, the Coulomb force between them becomes **[1]**

   a) one-fourth

   b) one-half

   c) four times.

   d) double

4. Two large conducting spheres carrying charges Q_1 and Q_2 are kept with their centres r distance apart. The magnitude of electrostatic force between them is not exactly $\frac{1}{4\pi\varepsilon_0}\frac{Q_1 Q_2}{r^2}$ because **[1]**

   a) charges will shift towards the portions of the spheres which are closer and facing towards each other

   b) charges on spheres will shift towards the centres of their respective spheres

   c) these are not point charges

   d) charge distribution on the spheres is not uniform

5. 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]**

   a) $\frac{1}{4}$

   b) 2

   c) $\frac{1}{2}$

   d) 4

6. A tennis ball which has been covered with charges is suspended by a thread so that it hangs between two metal plates. One plate is earthed, while other is attracted to a high voltage generator. The ball **[1]**

   a) swings backward & forward hitting each plate in turn

   b) is repelled by earthed plate and stays there

   c) is attracted to the high voltage plate and stays there

   d) hangs without moving

7. A point charge Q is placed at the mid point of a line joining two charges, 4q and q. If the net force on charge q is **[1]**

zero, then Q must be equal to:

a) +q
b) -2q
c) -q
d) +4q

8. A long string of charge per unit length λ passes through an imaginary cube of edge **a**. The maximum flux of the electric field will be **[1]**

a) $\frac{a\lambda}{\epsilon_0}$
b) $\sqrt{3}\frac{a\lambda}{\epsilon_0}$
c) $\sqrt{3}\frac{a^2\lambda}{\epsilon_0}$
d) $\sqrt{2}\frac{a\lambda^2}{\epsilon_0}$

9. An electric dipole with dipole moment $\vec{P} = P_0\,\hat{i} - P_0\,\hat{j}$ is placed in an electric field $\vec{E} = E_1\,\hat{i} + E_2\,\hat{j}$, where P_0, E_1 and E_2 are constants. The torque $\vec{\tau}$ acting on the dipole is: **[1]**

a) $P_0\,(E_2 + E_1)\,\hat{k}$
b) $P_0\,(E_2 - E_1)\,\hat{k}$
c) $P_0\,(E_1 - E_2)\,\hat{k}$
d) $-P_0\,(E_2 + E_1)\,\hat{k}$

10. 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 **[1]**

a) Directed radially away from the point charge.
b) Directed perpendicular to the plane but towards the plane.
c) Directed perpendicular to the plane and away from the plane.
d) Directed radially towards the point charge.

11. Electric charges under the action of electric forces is called: **[1]**

a) electric field lines.
b) electrostatic
c) electric flux
d) electric field

12. 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]**

a) 2
b) 4
c) 1
d) 3

13. An electron is moving round the nucleus of a hydrogen atom in a circular orbit of radius r. The Coulomb force $\vec{F}$ between the two is: **[1]**

a) $\kappa\frac{e^2}{r^3}\vec{r}$
b) $-\kappa\frac{e^2}{r^3}\vec{r}$
c) $-\kappa\frac{e^3}{r^3}\hat{r}$
d) $\kappa\frac{e^2}{r^3}\hat{r}$

14. A point charge +q is placed at the mid point of a cube of side L. The electric flux emerging from the cube is **[1]**

a) zero
b) $\frac{qL^2}{\epsilon_o}$
c) $\frac{q}{6L^2\epsilon_o}$
d) $\frac{q}{\epsilon_o}$

15. In a regular polygon of n sides, each corner is at a distance of r from the center. Identical charges of magnitude Q are placed at (n -1) corners. The field at the center is **[1]**

a) $\frac{n-1}{n}\frac{kQ}{r^2}$
b) $\frac{kQ}{r^2}$

c) $\frac{n}{(n-1)}\frac{kQ}{r^2}$ d) $(n-1)\frac{kQ}{r^2}$

16. A charge Q is placed at the corner of a cube. The electric flux through all the six faces of the cube is **[1]**

a) $\frac{Q}{\varepsilon_0}$ b) $\frac{Q}{6\varepsilon_0}$

c) $\frac{Q}{8\varepsilon_0}$ d) $\frac{Q}{3\varepsilon_0}$

17. A charge q is located at the centre of a cube. The electric flux through any face is **[1]**

a) $\frac{1}{6}\frac{4\pi q}{4\pi\varepsilon_0}$ b) $\frac{2\pi q}{6(4\pi\varepsilon_0)}$

c) $\frac{\pi q}{6(4\pi\varepsilon_0)}$ d) $\frac{q}{6(4\pi\varepsilon_0)}$

18. 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]**

a) q Ey b) q^2 Ey

c) q E^2y d) q Ey^2

19. The magnitude of electric force, F is: **[1]**

a) constant b) directly proportional to the product of both charges.

c) directly proportional to the distance between both charges d) directly proportional to the square of the distance between both charges.

20. Electric lines of force: **[1]**

a) are imaginary b) exist everywhere

c) exist only when both positive and negative charges are near one another d) exist only in the immediate vicinity of electric charges

21. The point charges Q and -2Q are placed some distance apart. If the electric field at the location of Q is E, then the electric field at the location of -2Q will be: **[1]**

a) -2E b) $-\frac{3E}{2}$

c) -E d) $-\frac{E}{2}$

22. Let E_a be the electric field due to a dipole in its axial plane distant l and let E_q be the field in the equatorial plane distant l. The relation between E_a and E_q is: **[1]**

a) $E_a = 2E_q$ b) $E_a = E_q$

c) $E_q = 2E_a$ d) $E_a = 3E_q$

23. A body can be negatively charged by **[1]**

a) Giving some protons to it b) Giving excess of electrons to it

c) removing some electrons from it d) Removing some neutrons from it

24. 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 6.5×10^{-7}C? The radii of A and B are negligible compared to the distance of separation. **[1]**

a) 3.5×10^{-2}N b) 4.5×10^{-2}N

c) $1.5 \times 10^{-2}\mathrm{N}$ d) $2.5 \times 10^{-2}\mathrm{N}$

25. A semi-circular arc of radius 'a' is charged uniformly and the charge per unit lengths is λ. The electric field at the centre is: **[1]**

a) $\frac{\lambda}{2\pi\varepsilon_0 a^2}$ b) $\frac{\lambda}{4\pi\varepsilon_0 a}$

c) $\frac{\lambda}{2\pi\varepsilon_0 a}$ d) $\frac{\lambda^2}{2\pi\varepsilon_0 a}$

26. If σ = surface charge density, ε = electric permittivity, the dimensions of $\frac{\sigma}{\varepsilon}$ are same as **[1]**

a) pressure b) electric force

c) electric charge d) electric field intensity

27. Careful measurement of the electric field at the surface of a black box indicates that the net outward flux through the surface of the box is $8.0 \times 10^3 \mathrm{Nm}^2/\mathrm{C}$. What is the net charge inside the box? **[1]**

a) 0.04 μC b) 0.06 μC

c) 0.05 μC d) 0.07 μC

28. A solid sphere of radius R is uniformly charged so that volume charge density is p. The electric field at a distance r(r < R) is **[1]**

a) $\frac{\rho r}{3\varepsilon_0}$ b) $\frac{\rho r^2}{3\varepsilon_0 R^3}$

c) $\frac{\rho r}{\varepsilon_0 R^2}$ d) $\frac{\rho r^2}{\varepsilon_0 R^3}$

29. The number of electrons for one coulomb of charge is **[1]**

a) 6.25×10^{19} b) 6.25×10^{23}

c) 6.25×10^{21} d) 6.25×10^{18}

30. 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]**

a) 1.12×10^{-14} Cm^{-1} b) 3.08×10^{-15} Cm^{-1}

c) 1.0×10^{-9} Cm^{-1} d) 1.0×10^{-7} Cm^{-1}

31. There are two types of electric charges positive charges and negative charges. The property which differentiates the two types of charges is: **[1]**

a) field of charge b) strength of charge

c) amount of charge d) polarity of charge

32. Two charges are at distance d apart in air. Coulomb force between them is F. If a dielectric material of dielectric constant K is placed between them, the Coulomb force now becomes **[1]**

a) $\frac{F}{K}$ b) $\frac{K^2}{F}$

c) FK d) $\frac{F}{K^2}$

33. The electric charge always resides: **[1]**

a) at the interior of a charged conductor b) at the centre of charged conductor

c) randomly all over the charged conductor d) on the outer surface of a charged conductor

34. Two identical charged spheres suspended from a common point by two massless strings of lengths l, are initially at a distance d(d << l) apart because of their mutual repulsion. The charges begin to leak from both the spheres at a constant rate. As a result, the spheres approach each other with a velocity v. Then v varies as a function of the distance x between the spheres, as **[1]**

a) $v \propto x^{-\frac{1}{2}}$

b) $v \propto x^{-1}$

c) $v \propto x$

d) $v \propto x^{\frac{1}{2}}$

35. The force per unit charge is known as _____. **[1]**

a) electric potential

b) electric field

c) electric current

d) electric flux

36. Select the correct statements. Coulomb's law correctly describes the electric force that: **[1]**

i. binds the electrons of an atom to its nucleus.

ii. binds the protons and neutrons in the nucleus of an atom.

iii. binds atoms together to form molecules.

a) (i), (ii), and (iii)

b) (i) and (iii)

c) (ii) and (iii)

d) (i) and (ii)

37. When air is replaced by a dielectric medium of dielectric constant κ, the maximum force of attraction between two charges separated by a distance: **[1]**

a) remains unchanged

b) decreases κ times

c) decreases κ^2 times

d) increases κ times

38. In a certain region of space, electric field is along the z-direction throughout. The magnitude of the electric field is however not constant, but increases uniformly along the positive z-direction at the rate of 10^5 $NC^{-1}m^{-1}$. The force experienced by the system having a total dipole moment equal to 10^{-7} Cm in the negative z-direction is **[1]**

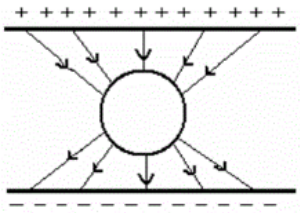
a) -10^{-2} N

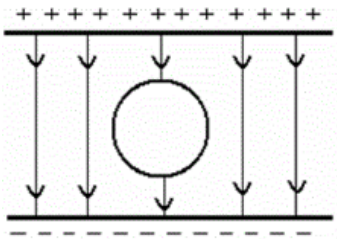
b) 10^{-2} N

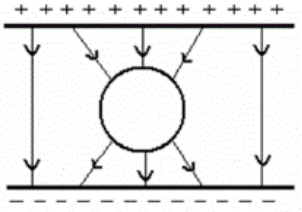
c) -10^{-4} N

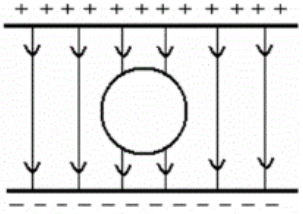
d) 10^{-4} N

39. An uncharged sphere of metal is placed inside a charged parallel plate capacitor. The lines of force look like **[1]**

a) 

b) 

c) 

d) 

40. When a negatively charged conductor is connected to earth **[1]**

a) Electrons flow from the earth to the

b) Protons flow from the conductor to the earth

conductor

c) No charge flow occurs

d) Electrons flow from the conductor to the earth

41. A point charge causes an electric flux of $-1.0 \times 10^3 \mathrm{Nm}^2/\mathrm{C}$ 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]**

a) $-10^3 \mathrm{Nm}^2/\mathrm{C}$

b) $10^4 \mathrm{Nm}^2/\mathrm{C}$

c) $10^3 \mathrm{Nm}^2/\mathrm{C}$

d) $-10^2 \mathrm{Nm}^2/\mathrm{C}$

42. A charged cloud system produces an electric field in the air near the earth's surface. A particle of charge -2 $\times$ 10^{-9} C is acted on by a downward electrostatic force of 3 $\times$ 10^{-6} N when placed in this field. The gravitational and electrostatic force, respectively, exerted on a proton placed in this field are **[1]**

a) 1.64 $\times$ 10^{-26} N, 1.5 $\times$ 10^{3} N

b) 1.64 $\times$ 10^{-26} N, 2.4 $\times$ 10^{-16} N

c) 1.56 $\times$ 10^{-18} N, 2.4 $\times$ 10^{-16} N

d) 1.5 $\times$ 10^{3} N, 2.4 $\times$ 10^{-16} N

43. Which of the following is deflected by electric field? **[1]**

a) γ-rays

b) Neutrons

c) α-particles

d) X-rays

44. A conducting sphere of radius 10 cm is charged with 10 μC. Another uncharged sphere of radius 20 cm is allowed to touch it for some time. After that if the spheres are separated, then surface density of charges on the spheres will be in the ratio of **[1]**

a) 1 : 1

b) 2 : 1

c) 1 : 3

d) 1 : 2

45. 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]**

a) $\frac{F}{2}$

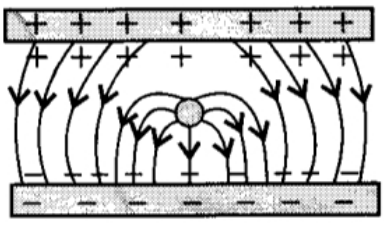
b) $\frac{F}{8}$

c) 2F

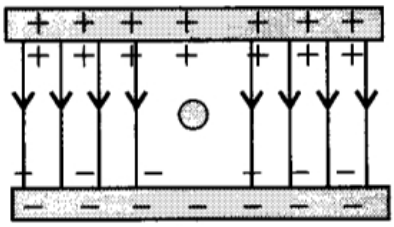
d) $\frac{F}{4}$

46. Which of the diagrams correctly represents the electric field between two charged plates if a neutral conductor is placed in between the plates? **[1]**

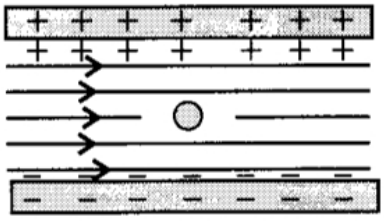
a)



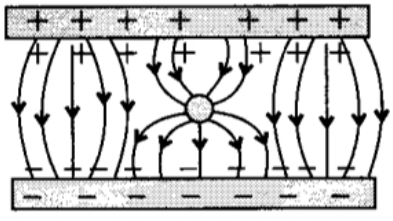
b)



c)



d)



47. An electron experiences a force $\left(1.6 \times 10^{-16}\ \mathrm{N}\right) \hat{\mathrm{i}}$ in an electric field $\vec{\mathrm{E}}$. The electric field $\vec{\mathrm{E}}$ is: **[1]**

a) $-\left(1.0 \times 10^{-3} \frac{\mathrm{N}}{\mathrm{C}}\right) \hat{\mathrm{i}}$

b) $\left(1.0 \times 10^{3} \frac{\mathrm{N}}{\mathrm{C}}\right) \hat{\mathrm{i}}$

c) $-\left(1.0 \times 10^{3} \frac{\mathrm{N}}{\mathrm{C}}\right) \hat{\mathrm{i}}$

d) $\left(1.0 \times 10^{-3} \frac{\mathrm{N}}{\mathrm{C}}\right) \hat{\mathrm{i}}$

48. 1 C charge is equivalent to charge on how many numbers of protons? **[1]**

a) 8×10^{20}

b) 7×10^{18}

c) 6×10^{18}

d) 9×10^{20}

49. A hollow conducting sphere is given a positive charge of 10μC. What will be the electric field at the centre of the sphere if its radius is 2 metres? **[1]**

a) 20 μCm^{-2}

b) 32 μCm^{-2}

c) 5 μCm^{-2}

d) Zero

50. A system has two charges $\mathrm{q_A} = 2.5 \times 10^{-7}\mathrm{C}$ and $\mathrm{q_B} = -2.5 \times 10^{-7}\mathrm{C}$ 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]**

a) zero, $8.5 \times 10^{-8}\mathrm{Cm}$

b) zero, $6.5 \times 10^{-8}\mathrm{Cm}$

c) zero, $7.5 \times 10^{-8}\mathrm{Cm}$

d) zero, $5.5 \times 10^{-8}\mathrm{Cm}$

51. A uniformly charged conducting sphere of 2.4 m diameter has a surface charge density of $80.0\mu\mathrm{C/m^2}$. Find the charge on the sphere. **[1]**

a) $1.25 \times 10^{-3}\mathrm{C}$

b) $1.55 \times 10^{-3}\mathrm{C}$

c) $1.45 \times 10^{-3}\mathrm{C}$

d) $1.35 \times 10^{-3}\mathrm{C}$

52. Point charges +4q, -q and +4q are kept on the X-axis at points x = 0, x = a and x = 2a respectively: **[1]**

a) all the charges are in unstable equilibrium

b) all the charges are in stable equilibrium

c) none of the charges is in equilibrium

d) only - q is in stable equilibrium

53. Two infinite plane parallel non conducting sheets, separated by a distance d have equal and opposite charge densities σ. Electric field intensity at a point between the sheets is: **[1]**

a) depends upon location of the point

b) $\frac{\sigma}{2\varepsilon_0}$

c) zero

d) $\frac{\sigma}{\varepsilon_0}$

54. Two small charged spheres A and B have charges 10 μC and 40 μC 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]**

a) 30 cm

b) 22.5 cm

c) 18 cm

d) 36 cm

55. A body gets positive charge. It means that **[1]**

a) it has gained positrons

b) it has gained α-particles.

c) it has lost electrons

d) it has gained protons

56. If the net electric flux through a closed surface is zero, then we can infer **[1]**

a) no net charge is enclosed by the surface

b) electric potential varies from point to point inside the surface

c) charge is present inside the surface

d) uniform electric field exists within the

surface

57. 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]**

a) The linear momentum of the charge −q is constant

b) The angular velocity of the charge −q is constant

c) The linear speed of the charge −q is constant

d) The angular momentum of the charge −q is constant

58. Match Column I with Column II with appropriate matching. **[1]**

Column I	Column II
a. λ	i. L^2MT^{-2}
b. ρ	ii. electric field intensity
c. Torque	iii. $\frac{q}{V}$
d. electric field	iv. $\frac{q}{L}$

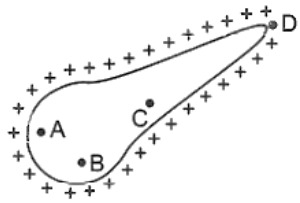
a) (a) - (iii), (b) - (i), (c) - (iv), (d) - (ii)

b) (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)

c) (a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)

d) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)

59. 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]**



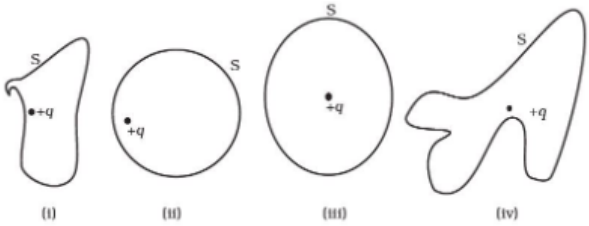
a) $E_D > E_A = E_B = E_C = 0$

b) $E_B = 0$, $E_A = E_C = E_D$

c) $E_A = E_B = E_C > E_D$

d) $E_A = E_B > E_C > E_D$

60. The Electric flux through the surface **[1]**



a) in Fig (iv) is the largest.

b) in Fig. (iii) is the least

c) is the same for all the figures

d) in Fig. (ii) is same as Fig. (iii) but is smaller than Fig. (iv)

61. 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 either charge of the dipole, is **[1]**

a) 8 mC

b) 4 μC

c) 2 mC

d) 7 μC

62. A charged sphere of radius a is put in contact with another uncharged sphere of radius b. The ratio of original surface density to that of final surface density of charge on first sphere is **[1]**

a) $\frac{a}{b}$ b) $\frac{a+b}{a}$

c) $\frac{b}{a+b}$ d) $\frac{b}{a}$

63. 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]**

a) $\frac{qE}{cos\theta}$ b) mg

c) $\frac{qE}{sin\theta}$ d) $\frac{mg}{sin\theta}$

64. The conservation of electric charge implies that **[1]**

a) simultaneous creation of equal and opposite charge is permissible b) charge cannot be created

c) total charge of the entire universe remains constant d) charge cannot be destroyed

65. 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]**

a) $4\pi\varepsilon_0 Ar^3$ b) $\frac{4\pi\varepsilon_0 A}{r^3}$

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

66. There are two kinds of charges-positive charge and negative charge. The property which differentiates the two kinds of charges is called **[1]**

a) strength of charge b) field of charge

c) amount of charge d) polarity of charge

67. Which of the following is not true for a region with uniform electric field? **[1]**

a) it may contain dipoles b) it may have uniformly distributed charge

c) it may have formly distributed charge d) it can have free charges

68. Each of the two-point charges are doubled and their distance is halved. Force of interaction becomes n times, where n is **[1]**

a) 1 b) 18

c) 16 d) 4

69. A charge Q is placed at the centre of a cube. The electric flux through one if its face is **[1]**

a) $\frac{\mathrm{Q}}{6\varepsilon_0}$ b) $\frac{\mathrm{Q}}{8\varepsilon_0}$

c) $\frac{\mathrm{Q}}{\varepsilon_0}$ d) $\frac{\mathrm{Q}}{3\varepsilon_0}$

70. If an electron is accelerated by $8.8\times10^{14}\mathrm{m/s^2}$, then electric field required for acceleration is (given specific charge of the electron = $1.76\times10^{11}\mathrm{Ckg^{-1}}$) **[1]**

a) 52 V $\mathrm{cm^{-1}}$ b) 50 V $\mathrm{cm^{-1}}$

c) 54 V $\mathrm{cm^{-1}}$ d) 56 V $\mathrm{cm^{-1}}$

71. For coulomb force to be operative the least size of the atom will be **[1]**

a) 10^{-8} m

b) 10^{-15} m

c) 10^{-10} m

d) 10^{-12} m

72. 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]**

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

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

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

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

73. Electric charge between two bodies can be produced by: **[1]**

a) sticking

b) rubbing

c) passing AC current

d) oiling

74. Electric force between two charged spheres is 18 units. If the distance between the centres of the sphere is tripled, the electric force will be **[1]**

a) 2 units

b) 54 units

c) 3 units

d) 6 units

75. Deuteron and alpha particle in air are at separation 1 $\mathring{A}$. The magnitude of electric field intensity on α-particle due to deutron is **[1]**

a) 5.76×10^{11} N/C

b) 1.44×10^{11} N/C

c) zero

d) 2.828×10^{11} N/C