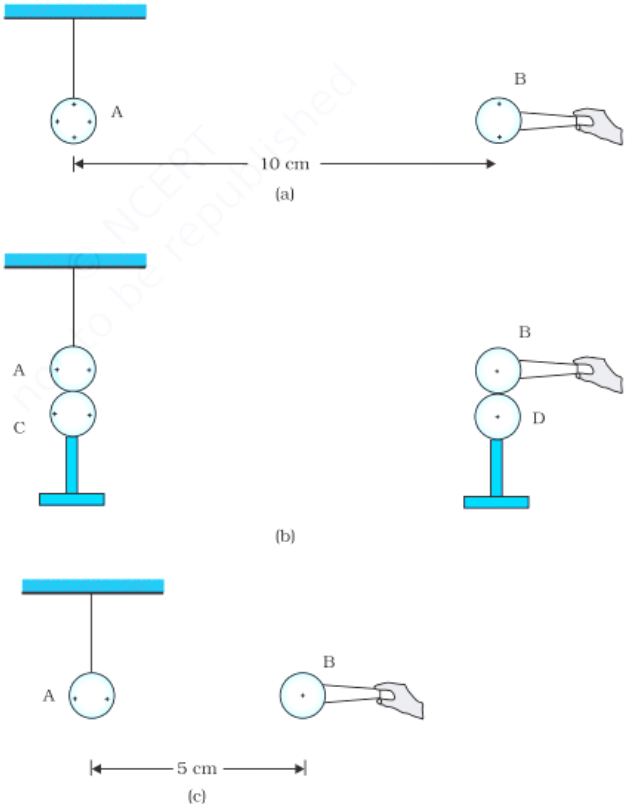
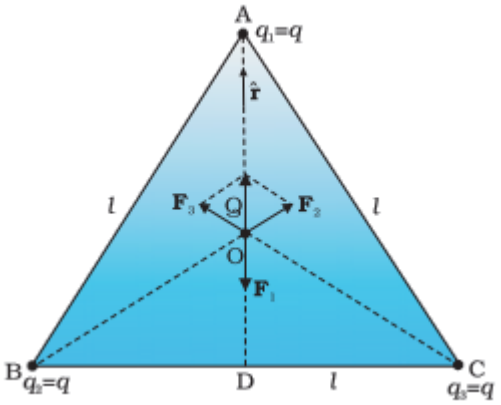
1. ***Which one is bigger, a coulomb or charge on an electron? How many electronic charges from one coulomb of charge?*** *(Coulomb, 0.625×10^{19})*
2. ***How much positive and negative charge is there in a cup of water?*** *($n = 8.365 \times 10^{25}$ & $q = 1.338 \times 10^{7}$ C)*
3. ***If a body gives out 10^{9} electrons every seconds, how much time is required to get a total charge of 1 C from it ?*** *(198.19 year)*
4. ***The electrostatic force of repulsion between two positively charged ions carrying equal charge is 3.7×10^{-9} N, when they are separated by a distance 5 Å. How many electrons are missing from each ion?*** *($n = 2$)*
5. ***A charge q is placed at the centre of the line joining two equal charges Q. System will be in equilibrium when?***
6. ***A charged metallic sphere A is suspended by a nylon thread. Another charged metallic sphere B held by an insulating handle is brought close to A such that the distance between their centres is 10 cm, as shown in Fig. (a). The resulting repulsion of A is noted (for example, by shining a beam of light and measuring the deflection of its shadow on a screen). Spheres A and B are touched by uncharged spheres C and D respectively, as shown in Fig. (b). C and D are then removed and B is brought closer to A to a distance of 5.0 cm between their centres, as shown in Fig. (c). What is the expected repulsion of A on the basis of Coulomb's law? Spheres A and C and spheres B and D have identical sizes. Ignore the sizes of A and B in comparison to the separation between their centres.*** *(will remain same)*



7. ***Two electrons and a positive charge q are held along a straight line. At what position and for what value of q will the system be in equilibrium? Also tell whether the system is stable, unstable or neutral equilibrium.*** *($q = e/4$)*

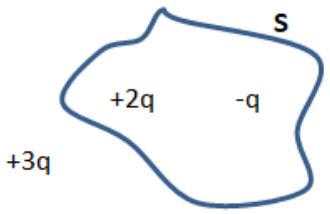
8. ***Consider three charges q_1 , q_2 , q_3 each equal to q at the vertices of an equilateral triangle of side l. What is the force on a charge Q (with the same sign as q) placed at the centroid of the triangle?*** *(zero)*



9. ***Two equally charged particles, held 3.2 x 10^{-3} m apart, are released from rest. The initial acceleration of the first particle is observed to be 7.0 m/s^2 and that of the second to be 9.0 m/s^2. If the mass of the first particle is 6.3 x 10^{-7} kg, what are a) the mass of the second particle and b) the magnitude of the charge of each particle?*** *(4.9 x 10^{-7} kg ; 7.1 x 10^{-11} C)*
10. ***Two identical metallic spheres of exactly equal masses are taken; one is given a positive charge and the other an equal negative charge. What will happen to their masses?***
    a. *(Hint: m_e = 9.1 x 10^{-31} kg)*
11. ***Is the electric force between two electrons greater than gravitational force between them? If so, by what factor?*** *(Yes; 10^{42})*
12. ***An ebonite rod is rubbed with fur or wool. What type of charges do they acquire? (-ve and +ve)***
13. ***What is dimensional formula for ε_0 ?*** *($M^{-1}L^{-3}T^4A^2$)*
14. ***Force of attraction between two point charges placed at a distance d is F. What distance apart should they be kept in the same medium so that force between them is F/3?*** *($\sqrt{3}r$)*
15. ***A copper sphere of mass 2 g contains nearly 2 x 10^{22} atoms. The charge on the nucleus of each atom is 29 e. What fraction of the electrons must be removed from the sphere to give it a charge of + 2 μC?*** *(2.16 x 10^{-11})*
16. ***An attractive force of 5 N is acting between two charges of +2 μC and -2 μC placed at some distance. If the charges are mutually touched and placed again at the same distance, what will be the new force, between them?*** *(F = 0)*
17. ***Two point charges of +2 μC and +6 μC repel each other with a force of 12N. If each is given an additional charge of -4 μC, what will be the new force?*** *(-4N, attractive)*
18. ***How many electrons must be removed form a piece of metal to give it a positive charge of 1.0 x 10^{-7} C ?*** *(6.25 x 10^{11})*
19. ***What is the total charge on 75.0 kg of electrons?*** *(-1.33 x 10^{13}C)*

20. **How far apart two protons be if the electrostatic force exerted be one on other is equal to weight of the electron?** *(5.11m)*
21. **An electric dipole consists of a positive and negative charge of 4 μC each placed at a distance of 5mm. Calculate the dipole moment.** *(2×10^{-8} C-m)*
22. **An electric dipole consists of two charges of opposite nature of magnitude 0.1 μC separated by a distance of 2.0 cm. The dipole is placed in an external field of 10^5 N/C. What maximum torque does the field exert on the dipole?** *(2×10^{-4} N-m)*
23. **An electric dipole of moment 5×10^{-8} C-m is aligned in a uniform electric field of 1.44×10^4 N/C. Calculate potential energy of the dipole to hold the dipole at 60^0 with the direction of electric field.** *(3.6×10^{-4} J)*
24. **What is the direction of field intensity at a point on equatorial line of dipole?** *(Parallel to axis of dipole directed opposite to the dipole moment)*
25. **What is nature of symmetry of the dipole field?** *(Cylindrical symmetry)*
26. **In which orientation, a dipole placed in a uniform field is in i) stable ii) unstable equilibrium?** *(0^0 & 180^0)*
27. **How does a free electron at rest move in an electric field? (Opposite to electric field)**
28. **Is electric field intensity a scalar or vector?** *(Vector)*
29. **What are the units of electric field intensity?** *(N/C)*
30. **What is the net force on a dipole in a uniform electric field?** *(Zero)*
31. **How does a torque affect the dipole in an electric field?** *(Torque align the dipole along the field)*
32. **Two point charges of +3 μC each are 100 cm apart. At what point on the line joining the charges will the electric intensity e zero?** *(At the centre)*
33. **What happens when an electric dipole is held in a non-uniform electric field?** *(Experiences net force and torque)*
34. **What is the symmetry of field due to a point charge?** *(Spherical symmetry)*
35. **When an electric line of force straight?** *(In the field of a single charge)*
36. **At what points, dipole field intensity is parallel to the line joining the charges?** *(At axial line or equatorial line of dipole)*
37. **What does (q1 + q2) = 0 signify?** *(Dipole, which is a vector quantity)*
38. **Calculate the electric field strength required just to support a water drop of mass 10^{-7} kg and having a charge of 1.6×10^{-19} C.** *(6.125×10^{-19} C)*
39. **Two point charges of +16 μC and -9 μC are placed 8 cm apart in air. Determine the position of the point at which the resultant electric field is zero.** *(24 cm to the right of -9 μC charge)*
40. **Two point charges of $+5 \times 10^{-19}$ C and $+20 \times 10^{-19}$ C are separated by a distance of 2m. Find the point on the line joining them at which electric field intensity is zero.** *(2/3 m to the right of first charge)*
41. **Two charges +q and –q are located at points A (0,0,-2) and B (0,0,2) respectively. How much work will be done in moving a test charge from point P (4,0,0) to Q (-5,0,0)?** *(Zero)*

42. ***An electric dipole is placed at an angle of 600 with an electric field of intensity 10^5 N/C. It experiences a torque equal to $8\sqrt{3}$ Nm. Calculate the charges on the dipole, if dipole length is 2 cm.*** *(8×10^{-3} C)*
43. ***A charge Q is placed at a distance a/2 above the centre of a horizontal square surface of edge a. Find the flux of the electric field through the square surface.*** *($\phi = Q/6\varepsilon_0$)*
44. ***A plastic rod of length 2.2 m and radius 3.6 mm carries a negative charge of 3.8 x 10^{-7} C spread uniformly over its surface. What is the electric field near the mid-point of the rod, at a point on its surface?*** *(-8.6 x 10^5 N/C)*
45. ***If a point charge be rotated in a circle of radius r around a charge q, what will be work done?*** *(Zero)*
46. ***A sphere S_1 of radius r_1 enclosed a total charges Q. If there is another concentric sphere S_2 of radius r_2 ($>r_1$) and there be no additional charges between S_1 and S_2, find the ratio of electric flux through S_1 and S_2.*** *($\phi_1/\phi_2=1$)*
47. ***What is the electric field in the cavity, if a conductor having a cavity is charged? Does the result depend on the shape and size of cavity of the conductor?*** *(Zero; Independent form shape and size)*
48. ***Three point charges +2q, -q and +3q. What is the electric flux due to this configuration through this surface S?***



49. ***Do electrons tend to go to regions of high potential or low potential?*** *(Towards High Potential)*
50. ***Is electric flux is a scalar or vector quantity?*** *(Scalar)*
51. ***An electric dipole of dipole moment 20 x 10^{-6} Cm is enclosed by a closed surface. What is the net electric flux coming out of the surface?*** *(Zero)*
52. ***A body can be negatively charged by***
    - ***a) Giving excess of electron to it***
    - *b) Removing some electron from it*
    - *c) Giving some proton it*
    - *d) Removing some neutrons form it*
53. ***Which of the following is not a property of field lines?***
    - *a) Field lines are continuous curves without curves*
    - *b) Two field lines cannot cross to each other*
    - *c) Field lines start at positive charges and end at negative charges*
    - ***d) They form closed loops***
54. ***Gauss's law is valid for***
    - ***a) Any closed surface***
    - *b) Only regular closed surfaces*

c) *Any open surface*
d) *Only irregular open surfaces*

55. The spatial distribution of the electric field due to two charges (A and B) is shown in figure,Which one of the following statement is correct?

a) A is positive and is negative and |A| > |B|
b) A is negative and B is positive |A| = |B|
c) Both are positive but A > B
d) Both are negative but A > B

56. When air is replaced by a medium if dielectric constant K, the force of attraction between two charges separated by a distance r

a) Decreases K times
b) Remains unchanged
c) Increases K times
d) Increases K^{-2} times

57. A hemisphere is uniformly charged positively. The electric field at a point on a diameter away from the centre is directed

a) Perpendicular to the diameter
b) Parallel to the diameter
c) At an angle tilted towards the diameter
d) At an angle tilted away firm the diameter

58. If an object possesses an electric charge, it is said to be electrified or ... A ... When it has no charge, it is said to be ... B ... Here, A and B refer to

a) charged, neutral
b) neutral, charged
c) discharged, charged
d) active, reactive

59. 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

60. 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

61. 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*

62. *The electric field due to an infinitely long straight uniformly charged wire at a distance r is directly proportional to*

a) r
b) r^2
c) $1/r$
d) $1/r^2$

63. *Which of the following statements is incorrect?*

The charge q on a body is always given by q = ne, where n is any integer, positive or negative.
By convention, the charge on an electron is taken to be negative.
The fact that electric charge is always an integral multiple of e is termed as quantisation of charge.
The quatisation of charge was experimentally demonstrated by Newton in 1912.

a) *Only I*
b) *Only II*
c) *Only IV*
d) *Only III*

64. *Gauss's law is true only if force due to a charge varies as*

a) r^{-1}
b) r^{-2}
c) r^{-3}
d) r^{-4}

65. *Field due to multiple charges at a point is found by using*

superposition principle.
Coulomb's law.
law of conservation of charges.

a) *I and II*
b) *II and III*
c) *I and III*
d) *I, II and III*

66. *Select the incorrect statements about electric field lines.*

Two electric field lines can never cross each other.
They start from positive charge and end at negative charge.
Electric field lines form closed loops.

a) *I and II*
b) *I and III*
c) *II and III*
d) *I, II and III*

67. *Select the incorrect statements from the following.*

Polar molecules have permanent electric dipole moment.
CO_2 molecule is a polar molecule.
H_2O is a non-polar molecule.

a) II and III

b) I and II

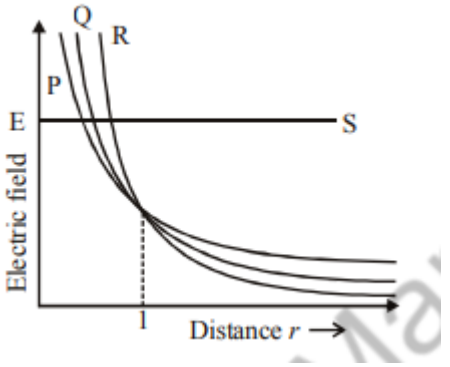
c) I and III

d) I, II and III

68. Match the physical quantities in column I and the information related to them in Column II.

Column I	*Column II*
(A) Electric dipole moment	*(1) Vector product*
(B) Electric field	*(2) Scalar product*
(C) Electric flux	*(3) Points towards positive charge*
(D) Torque	*(4) Points away from positive charge*

69. The curves in the graph show the variation of electric field E with distance r for various kinds of charge distributions given in Column I. Match them with their correct curves in Column II.



Column I	*Column II*
(A) Electric field of a point sized dipole.	*(1) P*
(B) Electric field due to an infinitely long straight uniformly charged wire.	*(2) Q*
(C) Electric field due to a uniformly charged plane sheet.	*(3) R*
(D) Electric field due to a point charge.	*(4) S*

(A)- (2), (B) - (4), (C) - (3), (D) - (1)

(A)- (4), (B) - (3), (C) - (2), (D) - (1)

(A)- (1), (B) - (2), (C) - (3), (D) - (4)

(A) - (3), (B) - (1), (C) - (4), (D) - (2)

70. ***Directions :*** Each of these questions contain two statements, Assertion and Reason. Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.

a) Assertion is correct, Reason is correct; Reason is a correct explanation for assertion.

b) Assertion is correct, Reason is correct; Reason is not a correct explanation for assertion

c) Assertion is correct, Reason is incorrect
d) Assertion is incorrect, Reason is correct.

71. ***Assertion :*** When bodies are charged through friction, there is a transfer of electric charge from one body to another, but no creation or destruction of charge.
Reason: This follows from conservation of electric charges.
72. ***Assertion :*** Coulomb force and gravitational force follow the same inverse-square law.
Reason: Both laws are same in all aspects.
73. ***Assertion :*** The coulomb force is the dominating force in the universe.
Reason: The coulomb force is weaker than the gravitational force.
74. ***Assertion :*** If there exists coulomb attraction between two bodies, both of them may not be charged.
Reason: In coulomb attraction two bodies are oppositely charged.
75. ***Assertion :*** Electric lines of field cross each other.
Reason: Electric field at a point superimpose to give one resultant electric field.
76. ***Assertion :*** On bringing a positively charged rod near the uncharged conductor, the conductor gets attracted towards the rod.
Reason: The electric field lines of the charged rod are perpendicular to the surface of conductor.
77. ***Assertion :*** On going away from a point charge or a small electric dipole, electric field decreases at the same rate in both the cases.
Reason: Electric field is inversely proportional to square of distance from the charge or an electric dipole.

Answers: a, c, d, b, d, b, d

78. The metal knob of a gold leaf electroscope is touched with a positively charged rod. When it is taken away the leaves stay separated. Now the metal knob is touched by negatively charged rod. The separation between the leaves

a) increases
b) decreases
c) remains same
d) first increases then decreases

79. The force between two small charged spheres having charges of 1×10^{-7} C and 2×10^{-7} C placed 20 cm apart in air is

a) 4.5×10^{-2} N
b) 4.5×10^{-3} N
c) 5.4×10^{-2} N
d) 5.4×10^{-3} N

80. 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

a) Q/2
b) –Q/2
c) Q/4
d) –Q/4

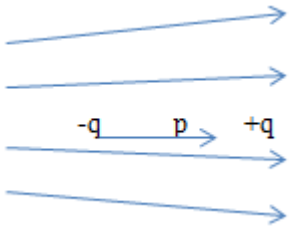
81. A charge Q is enclosed by a Gaussian spherical surface of radius R. If the radius is doubled, then the outward electric flux will

a) increase four times
b) be reduced to half
c) remain the same
d) be doubled

82. An electric dipole is placed at an angle of 30° with an electric field of intensity 2 × 10^5 NC^{-1}, It experiences a torque of 4 Nm. Calculate the charge on the dipole if the dipole length is 2 cm.

a) 8 mC
b) 4 mC
c) 8 PC
d) 2 mC

83. ***Figure shows electric field lines in which an electric dipole p is placed as shown. Which of the following statements is correct?*** [NCERT Exemplar]



a) the dipole will not experience any force.
b) the dipole will experience a force towards right.
c) **the dipole will experience a force towards left**.
d) the dipole will experience a force upwards.

84. 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.

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

(a) amount of charge
(b) polarity of charge
(c) strength of charge
(d) field of charge

86. A method for charging a conductor without bringing a charged object in contact with it is called

(a) electrification
(b) magnetisation
(c) electromagnetic induction

(d) electrostatic induction

87. If $\oint \vec{E}.\overrightarrow{dS} = 0$ over a surface, then [NCERT Exemplar]

(a) the electric field inside the surface and on it is zero.

(b) all charges must necessarily be outside the surface.

(c) the number of flux lines entering the surface must be equal to the number of flux lines leaving it.

(d) both (b) and (c)

88. A cup contains 250 g of water. The number of negative charges present in the cup of water is

(a) 1.34×10^7C

(b) 1.34×10^{19}C

(c) 3.34×10^7C

(d) 1.34×10^{-19}C

89. When the distance between two charged particles is halved, the Coulomb force between them becomes

(a) one-half

(b) one-fourth

(c) double

(d) **four times**.

90. 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

(a) F/K

(b) FK

(c) F/K^2

(d) K^2F

91. Two point charges qt and q2 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

(a) only on die system of units

(b) only on medium between charges

(c) both on (a) and (b)

(d) neither on (a) nor on (b)

92. Three charges +4q, Q and q are placed in a straight line of length l at points at distance 0, l/2, and l respectively. What should be Q in order to make the net force on q to be zero?

(a) **-q** (b) -2q (c) – q/2 (d) 4q

93. ***An electron falls from the rest through a vertical distance h in a uniform and vertically upward directed electric field E. The direction of 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***

(a) **smaller**

(b) 5 times bigger

(c) 10 times bigger
(d) equal

94. Which of the following is the unit of electric charge?

(a) Coulomb (C)
(b) Statcoulomb (stat C)
(c) Abcoulomb (abC or aC)
(d) All the above

95. A body is positively charged. It has

(a) excess of positrons
(b) excess of electrons
(c) deficiency of electrons
(d) deficiency of protons

96. ***A proton at rest has a charge e. When it moves with a high speed, its charge***

(a) > e (b) < e **(c)= e** (d) may increase or decrease

97. What is the value of minimum force (in N) acting between two charges placed at 1 m apart from each other?

(a) ke^2
(b) ke
(c) ke/4
(d) $ke^2/2$

98. A glass rod acquires charge by rubbing it with silk cloth. The charge on glass rod is due to

(a) **friction** (b) conduction (c) induction (d) radiation

99. Find the thickness of a dielectric material which has relative permittivity when two charges experience the same force as in air by a distance r.

(a) $t = \sqrt{\epsilon_r}\, r$ (b) $t = \sqrt{r\, \epsilon_r}$ (c) $t = r\, \epsilon_r$ **(d) $t = \frac{r}{\sqrt{\epsilon_r}}$**

100. ***What will be the value of electric field at the centre of the electric dipole?***

(a) Zero
(b) Equal to the electric field due to one charge at centre
(c) Twice the electric field due to one charge at centre
(d) Half the value of electric field due to one charge at centre

101. Which physical quantity have unit newton /coulomb?

(a) Electric charge
(b) Electric field
(c) Electric force
(d) Electric potential

102. In the process of charging, the mass of the negatively charged body

(a) increases
(b) decreases
(c) remains constant
(d) none of the above

103. Charge on a body is integral multiple of $\pm e$. It is given by the law of

(a) conservation of charge

(b)conservation of mass

(c)conservation of energy

(d) quantisation of charge

104. Electric field intensity due to a short dipole remains directly proportional to (r is the distance of a point from centre of dipole)

(a) r^2 (b) r^3 (c) r^{-2} **(d) r^{-3}**

105. Electric field lines contracts lengthwise, It shows

(a) repulsion between same charges

(b) attraction between opposite charges

(c) no relation between force & contraction

(d) electric field lines does not move in straight path

106. Force F between charges Q_1, and Q_2, separated by r is 25 N. It can be reduced to 5 N if the separation between them is made

(a)$\frac{r}{\sqrt{5}}$

(b)$\frac{r}{2}$

(c)2r

(d)$\sqrt{5}r$

107. Which of the following is the unit of electric field intensity?

(a) NC (b) Nm (c) NC^{-2} **(d) NC^{-1}**

108. The unit of electric dipole moment is

(a) C/m **(b) C-m** (c) C/m^2 (d) $C\text{-}m^2$

109. A slab of dielectric is introduced between two equal positive charges with a fixed separation. As a result

(a) the force between the two charges decreases

(b) the two charges start attracting each other

(c) the slab starts moving

(d) an electric current passes from one charge to the other

110. Two like point charges separated by a certain distance exert a force of 0.04 N on each other. When the distance of separation between them is halved, the force exerted by each on the other will be

(a) 0.16 N

(b) 0.02 N

(c) 0.08 N

(d) 0.01 N

111. When a glass rod is rubbed with a dry silk cloth, the glass rod is positively charged due to the transfer of

(a) protons from silk cloth to glass rod

(b) electrons from silk cloth to glass rod

(c) protons from glass rod to silk cloth

(d) electrons from glass rod to silk cloth

112. The unit of electric permittivity c of a medium is

(a) Nm^2/C^2

(b) Nm^2/C

(c) C^2/Nm^2

(d) C/Nm^2

113. The dimensions of electric permittivity is

(a) $ML^3T^4A^{-2}$ (b) $ML^{-3}T^4A^2$ (c) $M^{-1}L^3T^4A^2$ **(d) $M^{-1}L^{-3}T^4A^2$**

114. An insulated conical shaped metallic conductor is charged positively. The surface charge density on it is

(a) uniform throughout

(b) minimum at the apex

(c) maximum at the apex

(d) maximum at its base

115. The magnitude of force experienced by an electron placed at a point in the electric field equal to its weight mg. The magnitude of $\vec{E}$ is

(a) mge (b) e/(mg) **(c) mg/e** (d) mg/e^2

116. An electric dipole is placed at an angle of 30° with an electric field intensity 2 x 10^5 NC^{-1}. It experiences a torque equal to 4 Nm. The charge on the dipole, if the dipole length is 2 cm, is

(a) 8 mC **(b) 2 mC** (c) 5 inC (d) 7 mC

117. What it the SI unit of electric flux?

(a) $\frac{N}{C}$ **x m^2** (b) N x m^2 (c) $\frac{N}{m^2}$ x C (d) $\frac{N^2}{m^2}$ x C^2

118. The dimensional formula of electric flux is

(a) MLT^{-2} **(b) $ML^3T^{-3}A^{-1}$** (c) $M^2L^2T^{-2}A^{-2}$ (d) $M^1L^{-3}T^3A^1$

119. 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 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.

120. The surface considered for Gauss's law is called

(a) closed surface (b) spherical surface **(c) Gaussian surface** (d) plane surface

121. Charge on a conducting metal sphere is present

(a) on the surface of sphere

(b) inside the sphere

(c) outside the sphere

(d) both inside and outside of sphere

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

(a) more in case of sphere

(b) more in case of cube

(c) same in both case

(d) information incomplete

123. A sphere encloses an electric dipole within it. The total flux across the sphere is

(a) zero
(b) half that due to a single charge
(c) double that due to a single charge
(d) dependent on the position of the dipole

124. A charge q is placed at the centre of a cube, what is the electric flux passing through one of its faces?

(a) $\frac{q}{6\epsilon_0}$ (b) $\frac{q}{\epsilon_0}$ (c) $\frac{6q}{\epsilon_0}$ (d) $\frac{q}{3\epsilon_0}$

125. According to Gauss law, electric field of an infinitely long straight wire is proportional to

(a) r (b) $\frac{1}{r^2}$ (c) $\frac{1}{r^3}$ **(d)** $\frac{1}{r}$

126. A charge q is placed at the centre of a cube of side 0.1 m. Then the electric flux diverging from each face of this cube is

(a) $\frac{q}{\epsilon_0}$ x 10^{-6} (b) $\frac{q}{\epsilon_0}$ x 10^{-4} **(c)** $\frac{q}{\epsilon_0}$ **x** $\mathbf{10^{-6}}$ (d) $\frac{q}{6\epsilon_0}$ x 10^{-4}

127. An electric charge q is placed at one of the corners of a cube of side a. The electric flux on one of its faces will be

(a) $\frac{q}{a\epsilon_0}$ (b) $\frac{q}{\epsilon_0 a^2}$ (c) $\frac{6q}{4\pi\epsilon_0 a^2}$ **(d)** $\frac{q}{24\epsilon_0}$

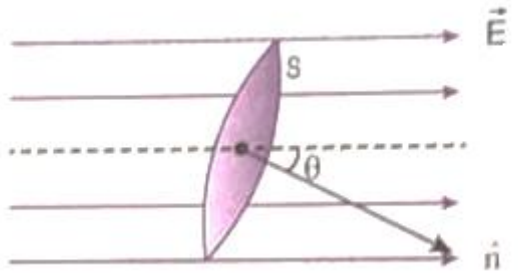
128. Consider a region inside in which there are various types of charges but the total charge in zero. At points outside the region

(a) the electric field is necessarily zero.
(b) the electric field is due to the dipole moment of the charge distribution only.
(c) the work done to move a charged panicle along a closed path, away from the region, will be zero.
(d) None of these

129. If electric field is uniform, then the electric lines of forces are

(a) divergent
(b) convergent
(c) circular
(d) parallel

130. A plane of surface area S is placed in an electric field such that the direction of normal on surface 'S' makes an angle 'θ' with the direction of electric field $\vec{E}$***. The electric flux through the surface is***



(a) ES
(b) ES sinθ
(c) ES cosθ
(d) zero

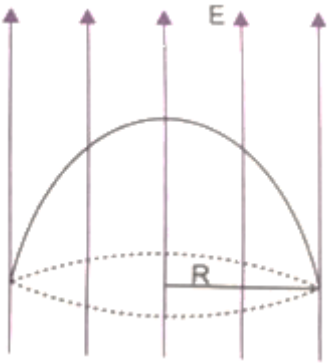
131. In which of the following cases the electric field strength is independent of distance?

(a) Due to a point charge
(b) Due to a line charge
(c) Due to a spherical charge
(d) Due to infinite flat sheet of charge

132. A cylinder of radius R and length L is placed in a uniform electric field E parallel to cylinder 6 axis. The total flux through the surface of the cylinder is given by

(a) $2\pi R^2E$
(b) $2\pi RLE$
(c) $(2\pi R^2 + 2\pi RL)E$
(d) zero

133. A hemispherical surface of radius R is placed with its cross-section perpendicular to a uniform electric field as shown in figure. The electric flux through the surface is



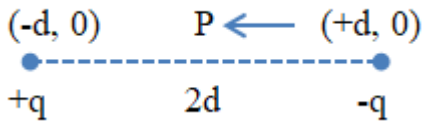
(a) πR^2E
(b) $2\pi R^2E$
(c) $4\pi R^2E$
(d) zero

134. A small metal ball is suspended in a uniform electric field with the help of an insulated thread. If high energy X-ray beam falls on the ball, it will

(a) be deflected in the direction of field
(b) not deflect at all

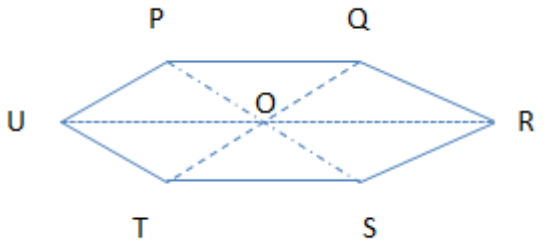
(c) be deflected opposite to direction of field
(d) fly to infinity

135. Two point charges +q and -9 are held fixed at (-d, 0) and (+d, 0) respectively of a (x, y) coordinate system. Then



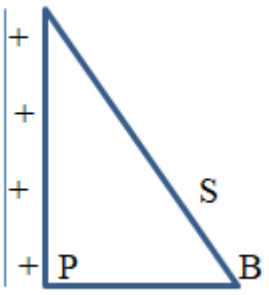
(a) the dipole moment is qd along positive X-axis
(b) the dipole moment is q(2d) along positive X-axis
(c) the dipole moment is q(2d) along positive Y-axis
(d) the dipole moment is q(2d) along negative X-axis

136. Six charges, three positive and three negative are to be placed at the vertices of a regular hexagon such that the electric field at 0 is double the electric field when only one positive charge of same magnitude is placed at R. Which of the following arrangements of charges is be possible for 1: Q, R, S, T and U respectively?



(a) +,-,+,-,-,-
(b) +,-,+,-
(c) +,+,-,
(d) -,+,+,-,+,-

137. A charged ball B hangs from a silk thread S, which makes an angle θ with a large conducting sheet P, as shown in fig., the surface charge density σ of the sheet is proportional to



(a) cotθ
(b) cosθ

(c) tanθ

(d) sinθ

138. Force between two identical charges placed at a distance r in vacuum is F. Now a slab of dielectric of dielectric constant 4 is inserted between these two charges. If the thickness of the slab is $\frac{r}{2}$ then the force between the charges will become

(a) F

(b) F/4

(c) F/2

(d) 4/9F

139. Electric flux is

(a) scalar quantity

(b) vector quantity

(c) sometimes scalar and sometimes vector

(d) neither scalar nor vector.

140. The minimum value of charge on any charged body may be

(a) 1.6×10^{-19} coulomb

(b) 1 coulomb

(c) 1μC

(d) 4.8×10^{-12} coulomb

141. The number of electrons contained in 1 coulomb of charge is equal to

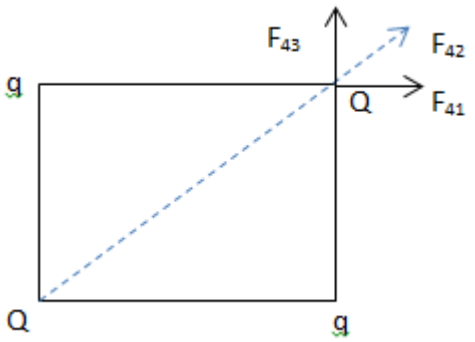
(a) 6.25×10^{17}

(b) 6.25×10^{18}

(c) 1.6×10^{-19}

(d) 0.625×10^{18}

142. A charge Q is placed at each of the opposite corners of a square. A charge q is placed at each of the other two corners. If the net q electrical force on Q is zero,



then Q/q equals

(a) $-2\sqrt{2}$

(b) -1

(c) 1

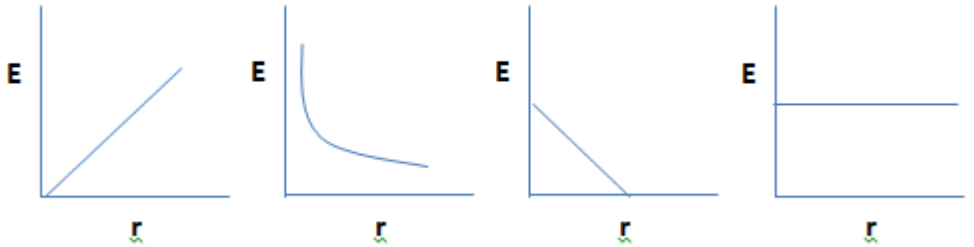
(d) $-\frac{1}{\sqrt{2}}$

143. Three concentric metallic spherical shells of radii R, 2R and 3R are given charges (Q_1, Q_2, Q_3. respectively. It is found that the surface charge densities on the outer

surfaces of the shells are equal. Then the ratio of the charges given to the shells Q_1 : Q_2: Q_3 is

(a) 1:2:3 **(b) 1:3:5** (c) 1:4:9 (d) 1: 8:18

144. For a point charge, the graph between electric field versus distance is given by



145. An infinite number of identically charged bodies are kept along the x-axis at .points, x= 0, 1 m, 2 m, 4 m, 8 m, 16 in and so on. All other charges repel the charge at the origin with a force of 1.2 N. Find magnitude of each charge.

(a) 9 µC **(b) 10 µC** (c) 11 µC (d) 12 µC

146. If the net electric flux through a closed surface is zero, then we can infer [CBSE 2020(55/1/1))

(a) **no net charge is enclosed by the surface**.
(b) uniform electric field exists within the surface.
(c) electric potential varies from point to point inside the surface.
(d) charge is present inside the surface.

147. An electric dipole placed in a non-uniform electric field can experience [CBSE 2020 (55/1/2/1)

(a) a force but not a torque.
(b) a torque but not a force.
(c) **always a force and a torque**.
(d) neither a force nor a torque.

148. 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 [CBSE 2020 (55/1/3))

(a) 2F (b) F/2 (c) F/4 **(d) F/8**.

149. The electric flux emerging out from 1C charge is (CBSE 2020(55/5/1))

(a) $\frac{1}{\epsilon_0}$ (b) 4π (c) $\frac{4\pi}{\epsilon_0}$ (d) ϵ_0.

150. An electric dipole consisting of charges +q and -q separated by a distance r, is kept symmetrically at the centre of an imaginary sphere of radius R (> r), Another point charge Q is also kept is also kept at the centre of the sphere. The net electric flux coming out of the sphere will be CBSE 2020 (55/3/2)

(b) $\frac{-(2q+Q)}{4\pi\epsilon_0}$
(c) $\frac{Q}{\epsilon_0}$
(d) $\frac{(2q+Q)}{\epsilon_0}$

(e) $-\frac{Q}{\epsilon_0}$

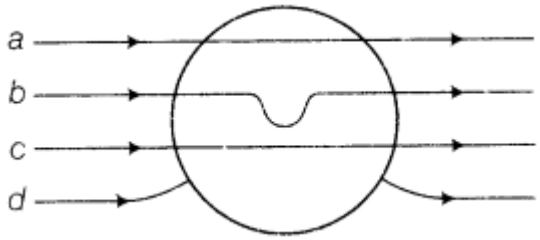
151. ***What is the direction of the electric field at the surface of a charged conductor having charge density σ < 0? (Comptt. Delhi 2012)***
The direction of electric field is normal and inward to the surface.
Two charges of magnitudes – 2Q and + Q are located at points (a, 0) and (4a,0) respectively. What is the electric flux due to these charges through a sphere of radius '3a' with its centre at the origin? (All India 2013)

$$Flux = \frac{Charge\ enclosed}{\epsilon_0} = \frac{-2Q}{\epsilon_0}$$

152. ***Two charges of magnitudes -3Q and + 2Q are located at points (a, 0) and (4a, 0) respectively. What is the electric flux due to these charges through a sphere of radius '5a' with its centre at the origin?***

$$Flux = \frac{Charge\ enclosed}{\epsilon_0} = \frac{-Q}{\epsilon_0}$$

153. ***What is the electric flux through a cube of side 1 cm which encloses an electric dipole? (Delhi 2015)*** (Zero)
154. ***How does the electric flux due to a point charge enclosed by a spherical Gaussian surface get affected when its radius is increased? (Delhi 2016***)
The electric flux due to a point charge enclosed by a spherical gaussian surface remains 'unaffected' when its radius is increased.
155. ***A proton is placed in a uniform electric field directed along the position X-axis. In which direction will it tend to move? [Delhi 2011 c]***
Proton will tend to move along the X-axis in the direction of a uniform electric field.
156. ***Two point charges having equal charges separated by a distance experience a force of 8 N. What will be the force experienced by them if they are held in water at the same distance? (Given, K_{water} = 80).[All India 2010 C]*** (1/10 N)
157. ***A metallic shpere is placed in a uniform electric field as shown in the figure. Which path is followed by electric field lines and why?[HOTS; Foreign 2010]***



Path d is followed by electric field lines. Electric field intensity inside the metallic sphere will be zero, therefore, no electric lines of force exist inside the sphere, also lines fall normally on the surface. Electric field lines are always perpendicular to the surface of the conductor.
158. ***Consider two hollow concentric spheres S_1 and S_2 enclosing charges 20 and 40 respectively, Find out the ratio of the electric flux through them. [All India 2014]*** (1/3)

Assertion and Reasoning

Directions:

Read the following questions and choose any one of the following four responses.

A. If both, Assertion and Reason are to and the Reason is the correct explanation of the Assertion.

B. If both, Assertion and Reason are true but Reason is not a correct explanation of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both Assertion and Reason arc false.

Assertion *Electrons move away from a region of boor potential to a region of higher potential.*

Reason *Since an electron has a negative charge*

(a) A (b) B (c) C (d) D

Assertion *Insulators do not allow flow of current through themselves?*

Reason *They have no free charge carriers.*

(a) A (b) B (c) C (d) D

Assertion *During charging by rubbing, the insulating material with lower work function becomes positively charged.*

Reason *Electrons are negatively charged.*

(a) A (b) B (c) C (d) D

Assertion *If a point a charge q is placed in front of an infinite grounded conducting plane surface. The point charge will experience a force.*

Reason *This force is due to the induced charge on the conducting surface which is at zero potential*

(a) A (b) B (c) C (d) D

Assertion *A metallic shield in the form of a hollow shell, can be built to block an electric field.*

Reason *In a hollow spherical shell, the electric Odd inside is not zero at every point.*

(a) A (b) B (c) C (d) D

Assertion *Work done in moving any charge through any distance on an equipotential surface is zero.*

Reason *An equipotential surface is very smooth.*

(a) A (b) B (c) C (d) D

Assertion *Work done in moving a charge between any two points in an electric field is independent of the path followed by the charge, between these points.*

Reason : *Electrostatic forces are non-conservative*

(a) A (b) B (c) C (d) D

Assertion *Farad is too big a unit of capacity.*

Reason : *Capacity of earth-which is the largest sphere is in microfarad.*

(a) A (b) B c) C (d) D

Assertion Capacity of a parallel plate condenser remains unaffected on introducing a conducting or insulating slab between the plates.

Reason : In both the cases. electric field intensity between the plates increases.

(a) A (b) B c) C (d) D

Answers: a,a,b,a,c,c,c,a,a

Statement based questions

Instructions are same as for assertion and reasoning

Statement-1 : When charges are shared between any two bodies, no charge is really lost, but some loss of energy does occur.

Statement-2 : Some energy disappears in the form of heat. sparking etc.

(a) A (b) B c) C (d) D

Statement-1. Charge is quantized because only integral number of electrons can be transferred.

Statement-2. There is no possibility of transfer of some fraction of electron.

(a) A (b) B c) C (d) D

Statement-1. Force between two charges increases. when air separating the charges is replaced by water

Statement-2. Medium intervening between the charges has dielectric constant K > I .

(a) A (b) B c) C (d) D

Statement-1. Force between two charges is quadrupled when distance between them is halved.

Statement-2. Force is inversely proportional to the square of distance, as per coulomb's law

(a) A (b) B c) C (d) D

Statement-1. The whole charge of a body can be transferred to another body.

Statement-2. Charge cannot be transferred partially.

(a) A (b) B c) C (d) D

Answers: a,a,d,a,c

Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and It are true but R is NOT the correct explanation of A

(c) A is true but It Is false

(d) A is false and It is also false

1. ***Assertion (A)*** *: If there exists coulomb attraction between two bodies, both of them may not be charged.*
   Reason (R): In coulomb attraction two bodies are oppositely charged.
2. ***Assertion (A)*** *: No two electric lines of force can intersect each other.*
   Reason (R) *: Tangent at any point of electric line of force gives the direction of electric field.*

3. ***Assertion (A):*** *Electric force acting on a proton and an electron, moving in a uniform electric field is same, where as acceleration of electron Is 1836 times that of a proton.*
   Reason (R) *: Electron Is lighter than proton.*
4. ***Assertion (A)*** *: As force is a vector quantity, hence electric field intensity is also a vector quantity.*
   Reason (R) *: The unit of electric field intensity is newton per coulomb.*
5. ***Assertion (A)*** *: Sharper is the curvature of spot on a charged body lesser will be the surface charge density at that point*
   Reason (R) *: Electric field is non-zero Inside a charged conductor.16.*
6. ***Assertion (A)*** *: The surface densities of two spherical conductors of different radii are equal Then the electric field intensities near their surface are also equal.*
   Reason (R) *: Surface density is equal to charge per unit area.*
7. ***Assertion (A)*** *: Three equal charges are situated on a circle of radius r such that they form on equilateral triangle, then the electric field intensity at the centre Is zero.*
   Reason (R) *: The force on unit positive charge at the centre, due to the three equal charges are represented by the three sides of a triangle taken In the same order. Therefore, electric field intensity at centre is zero.*
8. ***Assertion (A)*** *: The electric lines of forces diverges from a positive charge and converge at a negative charge.*
   Reason (R) *: A charged particle free to move in an electric field always move along an electric line of force.*
9. ***Assertion (A)*** *: Charging is due to transfer of electrons.*
   Reason (R) *: Mass of a body decreases slightly when it is negatively charged*
10. ***Assertion (A)*** *: Range of Coulomb force Is infinite.*
    Reason (R) *: Coulomb force acts between two charged particles.*
11. ***Assertion (A)****: A point charge is lying at the centre of a cube of each side. The electric flux emanating from ih each surface of the cube is —1/6th of total flux.*
    Reason (R) *: According to Gauss theorem, total electric flux through a closed surface enclosing a charge is equal to 1/€₀ times the magnitude of the charge enclosed.*
12. ***Assertion (A)*** *: A point charge is brought in an electric field. The field at a nearby point Is increase, whatever be the nature of the charge.*
    Reason (R) *: The electric field is independent of the nature of charge.*
13. ***Assertion (A)*** *: For charge to be in equilibrium, sum of the forces on charge due to rest of the two charges must be zero.*
    Reason (R) *: A charge is lying at the centre of the line joining two similar charges each which are fixed. The system will be in equilibrium if that charge is one fourth of the similar charges.*
14. ***Assertion (A)*** *: If a conducting medium is placed between two charges, then electric force between them becomes zero.*
    Reason (R) *: Reduction in a force due to Introduced material is inversely proportional to Its dielectric constant.*

15. ***Assertion (A)*** *: In electrostatics, electric lines of force can never be closed loops, as a line can never start and end on the same charge.*
    Reason (R) *: The number of electric lines of force originating or terminating on a charge is proportional to the magnitude of charge.*
16. ***Assertion (A)*** *: If a point charge q is placed In front of an infinite grounded conducting plane surface, the point charge will experience a force.*
    Reason (R) *: This force is due to the induced charge on the conducting surface which is at zero potential.*
17. ***Assertion (A)*** *: Charge is quantized.*
    Reason (R) *: Charge which is less than 1C is not possible.*
18. ***Assertion (A)*** *: The electric flux emanating out and entering a closed surface are 8 x 10^3 and 2 x 10^3 V m respectively. The charge enclosed by the surface is 0.053 microC.*
    Reason (R) *: Gauss's theorem in electrostatics may be applied to verify.*
19. ***Assertion (A)*** *: A small metal ball is suspended in a uniform electric field with an insulated thread. If high energy X-ray beam falls on the ball, the ball will be deflected in the electric field.*
    Reason (R) *: X-rays emits photoelectron and metal becomes negatively charged.*
20. ***Assertion (A)*** *: If a point charge be rotated in a circle around a charge, the work done will be zero.*
    Reason (R) *: Work done is equal to dot product of force and distance.*

Answers:

1.	***2.***	***3.***	***4.***	***5.***	***6.***	***7.***	***8.***	***9.***	***10.***
b	*a*	*a*	*b*	*d*	*b*	*a*	*c*	*c*	*b*
11.	***12.***	***13.***	***14.***	***15.***	***16.***	***17.***	***18.***	***19.***	***20.***
c	*a*	*b*	*d*	*c*	*a*	*b*	*a*	*c*	*a*