ELECTROSTATICS

1. Draw the field lines when the charge density of the sphere is (i) positive (ii) negative.

[Delhi 2008]

2. Draw the equipotential surfaces due to an electric dipole. Locate the points where the potential due to the dipole is zero.

[All India 2009C, 2011C, 2013]

3. Draw a graph of electric fields $E(r)$ with distance r from the centre of the shell for $0 \leq r \leq \infty$.

[Delhi 2009]

4. Two charges of 5μC and -5μC are placed at points A and B 2 cm apart. Depict an equipotential surface of the system.

[Delhi 2013C]

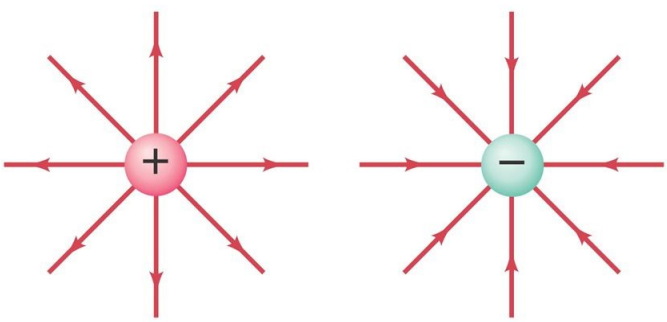
5. Draw equipotential surfaces:
   (i) in case of a single point charge and
   (ii) in a constant electric field in Z-direction. [All India 2016]

6. Draw a graph of E versus r for r >> a. [All India 2017]

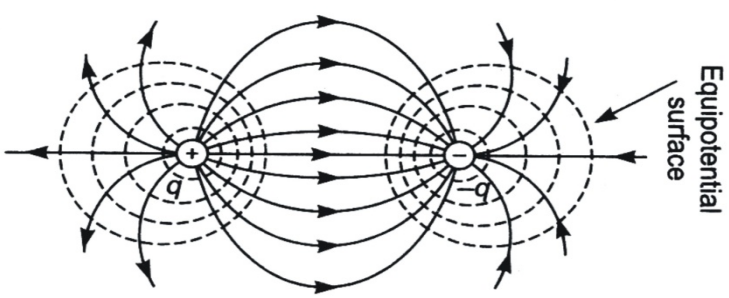
SOLUTIONS

1. Electric field lines when the charged density of the sphere is,

   (i) Positive (ii) Negative



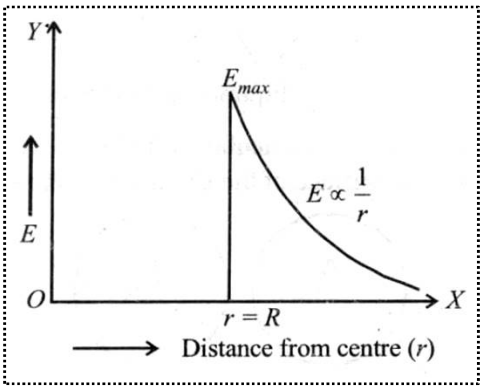
2. Equipotential surfaces due to an electric dipole.



Equipotential surfaces due to electric dipole

Potential due to the dipole is zero at the line bisecting the dipole length.

3. Graph of variation of electric field intensity E(r) with distance r from the centre for shell $0 \leq r < \infty$.



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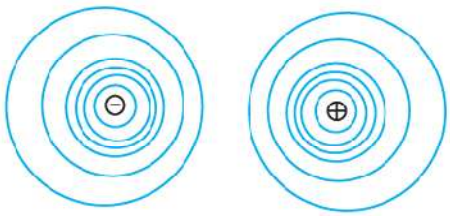
4. The equipotential surface of the system is as shown:

+ 5μC - 5μC



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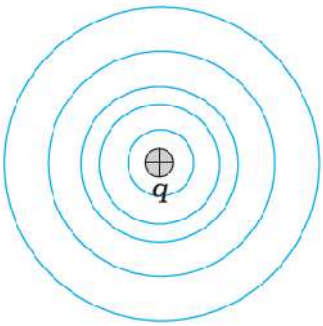
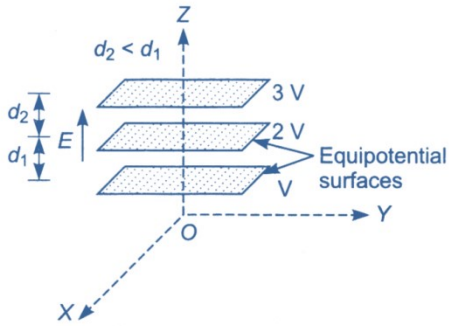
5. (i) Equipotential surface in case of single point charge.



(ii) Equipotential surface in a constant electric field in z-direction.



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6. (b) Graph of E versus r for r >> a

$\because E = \frac{p}{4\pi\varepsilon_0}\frac{2r}{r^4} = \frac{2p}{4\pi\varepsilon_0 r^3}$

$\therefore E \propto \frac{1}{r^3}$